



STUDENT handbook 2023-2024

B.Sc.(Hons) Agriculture

KL College of
Agriculture

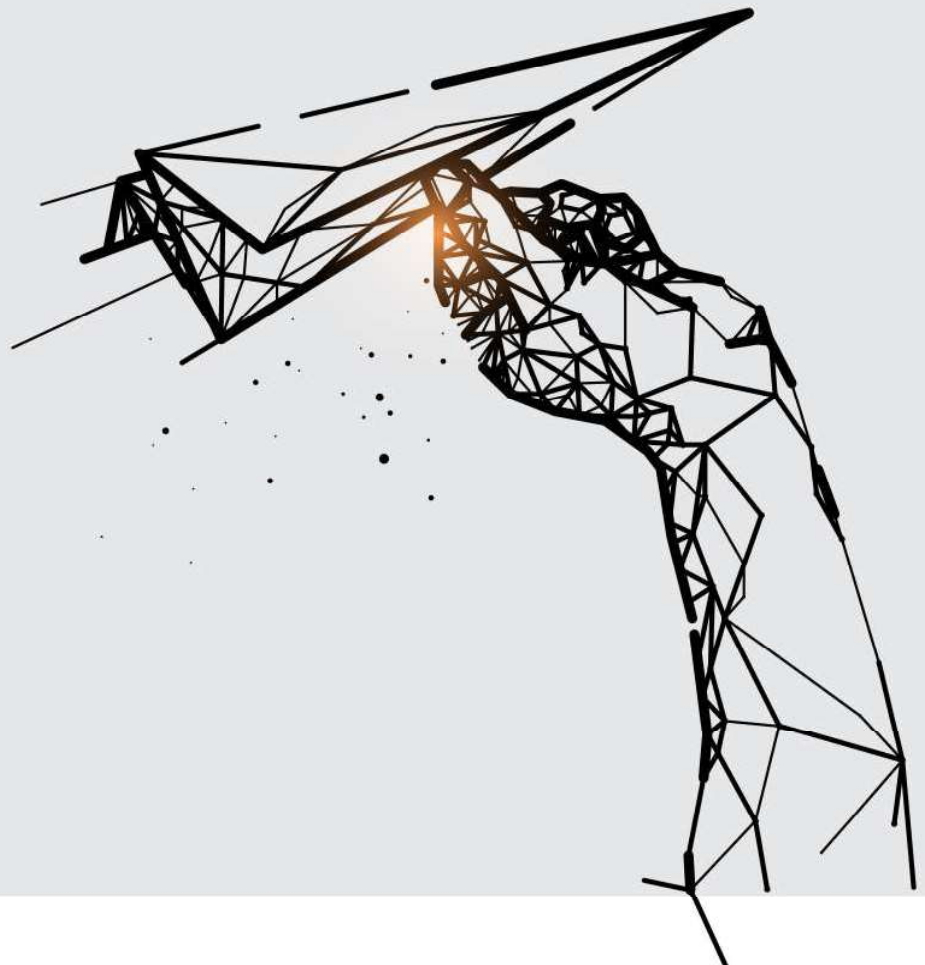


VISION

To be a globally renowned university.

MISSION

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.





**CATEGORY 1
UNIVERSITY**

BY MHRD, Govt. of India

**KL ACCREDITED BY
NAAC WITH A++
GRADE**

nirf NATIONAL
INSTITUTIONAL
RANKING
FRAMEWORK
2023

**RANKED 28
AMONG ALL
UNIVERSITIES**

**43 YEARS OF
EDUCATIONAL
LEADERSHIP**



Koneru Satyanarayana,
Chancellor

Sri Koneru Satyanarayana, BE, FIE, FIETE, MIEEE graduated in Electronics and Communication Engineering in the year 1977. Along with Sri Koneru Lakshmaiah, he is the co-founder of the Institute which was established in the year 1980. He is an educationist of eminence and also an industrialist of great repute. He runs a number of industries in and around Vijayawada.

Dr. K. S. Jagannatha Rao
Pro-Chancellor

Prof. K. S. Jagannatha Rao was one of the leading scientists in neuroscience research in globe. He was the Director on Institute for Scientific Research and Technological Advances (INDICASAT AIP), Republic Panama and contributed lot in building innovation in higher education and research in Panama since 2010. He played a key role in building PRISM (Panamanian Research Institutes of Science and Medicine) in Latin America. Dr. Rao has his research area on Brain Research and established Alzheimer's Centre and published 165 papers in leading Biochemistry and Neuroscience Journals, supervised 19 Ph.D students. He is also adjunct faculty of Biomedical Informatics of UTHS, Houston, and Advisory Board Member of UT- El Paso Minority Health NIH program, USA and Adjunct Faculty, Methodist Research Institute, Houston, USA. He was elected Member of Panamanian Association for the Advancement of Science (APANAC) - Considered as National Science Academy of Panama. He received his undergraduate and Ph.D degrees from Sri Venkateswara University, Tirupati. Later, joined in Central Food Technological Research Institute, Mysore. He received Sir C. V. Raman Award by Karnataka State Council of Science and Technology, 2003.



Prof. G P S Varma
Vice-Chancellor



Prof. G P S Varma, Vice-Chancellor, KLEF, is one of the most widely experienced leaders in Indian higher education, known for his commitment to expanding student opportunity, catalyzing academic innovation, and encouraging university's civic engagement and service to society. He adorned the position of Chairman, ISTE (Indian Society for Technical Education)- AP State, TSEM CET Test Committee Member-2021 nominated By Telangana State Govt, APEAMCET Admission Committee Member in 2016 by Andhra Pradesh State Council of Higher Education, Govt. of Andhra Pradesh. He has been a very farsighted Peer Team Visit Member for National Assessment and Accreditation Council (NAAC), Expert Committee Member for University Grants Commission (UGC) Autonomous Visits. He has been an Advisory Council Member for (CEGR) Centre for Education Growth, and Research India International Centre, New Delhi, and Board Member for Big-Data Analytics Forum.



Dr. A. V. S. Prasad
Pro-Vice Chancellor

Dr. A. V. S. Prasad, M.E and Ph.D from JNTU, Hyderabad is a professor in Civil Engineering. He has a rich experience of 33 years in academics which includes 26 years in administration at various cadres ranging from Head of Department, Dean, Principal, Director and Pro-Vice Chancellor. He has served as Director of Audisankara group of institutions and Narayana Group of Institutions for 18 years and was instrumental in getting these institutions accredited by NAAC, NBA, Autonomous and gained many laurels from the State Government, JNTU etc. He has served as Pro-Vice Chancellor of KL University for 3 years.

He has extensive knowledge of administrative system, maintaining statutory norms of bodies like AICTE, UGC etc and has a good understanding of NBA, NAAC procedures and norms. He served as Member, Chairman of Board of Studies at JNTU(A), KLCE(Autonomous) and KL University.

Dr. Venkatram Nidumolu
Pro-Vice Chancellor

Dr. Venkatram Nidumolu, Pro-Vice Chancellor is High performing, strategic thinking professional with more than 15years of administration experience and 20 years of teaching experience in KLEF and 30 years overall experience in the higher education sector. He graduated in B.Tech (ECE) from Acharya Nagarjuna University, pursued M.S degree from BITS, PILANI in software Systems. He received Ph.D award from Acharya Nagarjuna University. He held the positions like HOD, Joint Register, Principal, and Dean-Academics before becoming Pro-Vice Chancellor. He was core member of all NBA, NAAC, & other accreditations since 2004 and he has good experience in handling of quality issues and assessment related practices.



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ACRONYMS

SI No	Acronyms	Full Form
1	KLEF	Koneru Lakshmaiah Education Foundation
2	CGPA	Cumulative Grade Point Average
3	MHRD	Ministry of Human Resource Development
4	GPA	Grade Point Average
5	SGPA	Semester Grade Point Average
6	LTPS	Lecture, Tutorial, Practical, Skill
7	SEE	Semester-End Examinations
8	IRP	Industrial Relations and Placements
9	OGPA	Overall Grade Point Average
10	AGRO	Agronomy
11	BICM	Biochemistry
12	ENGL	English
13	AECO	Agriculture Economics
14	SSAC	Soil Science and Agriculture Chemistry
15	HORT	Horticulture
16	AEXT	Agricultural Extension
17	COCA	Co-Curricular Activities
18	ENTO	Entomology
19	AENG	Agricultural Engineering
20	CPHY	Crop Physiology
21	PATH	Pathology
22	ELCT	Elective Course
23	RAWEP	Rural Awareness Work Experience Programme
24	ELP	Experiential Learning Programme
25	ABM	Agri Business Management
26	Sq.ft.	Square Feet
27	NCC	National Cadet Corps
28	NSS	National Service Scheme
29	EAMCET	Engineering Agricultural and Medical Common Entrance Test
30	SWEAR	Strength, Weakness, Eligibility, Availability and Resources
31	CO	Course Outcome
32	READY	Rural Entrepreneurship Awareness Development Yojana

CHAPTER 1

INTRODUCTION

The President of Koneru Lakshmaiah Education Foundation, Er. Koneru Satyanarayana, along with Late Sri. Koneru Lakshmaiah founded the K L College of Engineering in the Academic year 1980-81. With the mighty vision and restless efforts of Er. Koneru Satyanarayana K L College of Engineering carved a niche for itself through excellence in engineering education, discipline and record numbers of placements and was the leading college in the state of AP. K L College of Engineering achieved NBA Accreditation for all its B.Tech. Programs in 2004 and later reaccredited in 2007. K L College of Engineering was transformed into an autonomous engineering college in the year 2006. In 2008 this college received a record grade of 3.76 on a 4 points scale with “A” Grade from NAAC; and in February 2009, the college, and Accredited by National Assessment and Accreditation Council (NAAC) of UGC as ‘A++’ with highest Grade of 3.57 CGPA on 4-point scale in 2018, through its founding society “Koneru Lakshmaiah Education Foundation” was recognized as Deemed to be University by the MHRD-Govt. of India, Under Section 3 of UGC Act 1956. This Deemed to be University is named as “KLEF”.

Location

KLEF is situated in a spacious 100-acre campus on the banks of Buckingham Canal of river Krishna, eight kilometers from Vijayawada city. Built within a rural setting of lush green fields, the institute is a virtual paradise of pristine nature and idyllic beauty. The campus has been aptly named "Green Fields" and the splendid avenue of trees and gardens bear testimony to the importance of ecology and environment. The campus ambience is most befitting for scholastic pursuits. The University is situated in a built-up area of around 15, 00,000 sq.ft.

Vision

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Mission

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Facilities

Central Library: E-Resources

The Central Library is the largest and holds materials to serve the whole University community. It has materials relevant to the Engineering, Science & Humanities courses offered by the University. The library system contains more than one lakh and fifty thousand books and periodicals on all subjects related to the teaching and research interests of the University staff and students. The library has over

65,926 electronic journal titles, academic databases and 15,19,512 eBooks. Access is available on campus on student computers and remotely.

The Data Centre

A State-of-the-Art Data centre with advanced servers provides a highly interactive learning environment with full-fledged hardware and software training facilities.

Physical Education- Sports Facilities

KLEF encourages students to explore their latent talents by providing good games and sports facilities. The institute is equipped with the following.

Sport/Game	No. of Courts	Sport/Game	No. of Courts
Athletic track	1	Handball Court	1
Hockey Field	1	Netball Courts	2
Badminton Courts	4	Throw ball courts	2
Tennikoit Courts	2	Beach Volleyball Court	1
Cricket Field with Net practice	3	Football Field	1
Volleyball Courts	2	Basketball Courts	2
Tennis Courts	2	Kabaddi Courts	2
Kho Kho Court	1	Table Tennis	6
Soft Ball	1	Chess	20
Archery	1	Caroms	12

The University had a State-of- the - Art Indoor stadium of 30000 sq.ft with:

- 4 wooden Shuttle Courts/ Basketball Court
- Yoga and Meditation Centre
- Dramatics
- 8 Table Tennis Tables
- Hobby Centre
- Gymnasium for Girls
- Gymnasium for Boys
- Multipurpose room with Chess, Caroms etc.
- Powerlifting/Weightlifting

Accommodation- Hostels

- KLEF has separate hostels for boys and girls with well-furnished rooms and modern amenities
- The overall atmosphere is very conducive for the students to concentrate on their studies
- A state-of-the-art kitchen and spacious dining area have been provided for both hostels

- Generators have been provided as power backup. Emphasis has been placed on hygiene and cleanliness for healthy living. A customized menu caters to the student's needs, it keeps changing according to their tastes.
- Teaching staff will have to address the academic and personal problems of the students. Round-the-clock security, communication, and dispensary facilities are also available.

Facilities in the hostels

- Protected drinking water
- State of the art kitchen, dining hall
- Newspapers, telephones, toilets and bathrooms are well maintained.
- Every student in the hostel is provided with a cot, study table, chair and a rack.
- Fan and light are also provided in each room.
- Gas & Steam based hygienic food preparation.
- Palatable regional, national and international cuisines
- Cleanliness and Safety STD/ISD Facilities
- Medical Kits and First Aid Boxes Soft drinks, snacks, Fruits etc.
- Laundry Stationary shop

Hostel Rules and Regulations

- Students are hereby informed that while staying in the hostel, it is essential to be responsible for maintaining dignity by upholding discipline.
- They must be obedient to the hostel warden/floor-in-charge. Valuable items like jewellery etc. should not be kept with students while staying in the hostel.
- It is the student's own responsibility to safeguard her/his Laptops and money by locking suitcases and bags.
- If any loss is found, management will not take any responsibility. Students must inform the hostel authorities before giving police complaints against losses.
- Students are not allowed to indulge in smoking; consumption of Alcohol, Narcotic drugs etc., and defaulters will be strictly viewed.
- Students are directed that after locking their rooms they must hand over the keys to security and can collect them on returning to the hostel.
- Students must switch off Fans, Lights, Geysers, A/C's etc., before leaving their rooms.
- Visitors are not allowed inside the hostel at any time; however, they are allowed into the visitor's hall with the prior permission of the warden.
- Only family members listed by the parents are allowed to contact the student. Visiting hours are up to 7.30 pm only and after 7.30 pm visitors are required to leave the premises.
- Hostel students are not allowed to come into the hostel after 3.00 pm for morning shift students and 6.00pm for day shift students.

- Those students who are utilizing the computer lab, library etc., after the times specified must submit the permission slip to the security while entering the hostel.
- During public holiday outings, those who seek permission to leave the hostel will have to obtain written permission from the warden. Permission will be given only to those students who get permission from parents to leave the hostel during holidays/outings.
- Moving out of campus without permission is strictly prohibited. Strict study hours from 7.30 am to 10.30 pm shall be maintained in the hostel.
- The hostellers must be in their allotted rooms during study hours. The general complaints of any kind should be noted in the complaint register, which is available at the hostel office.
- Registered complaints will only be entertained. Any health problem should be brought to the notice of the Warden/Floor In – charge for necessary treatment.

Transportation

The institution runs 80 buses covering all the important points in Vijayawada City, Mangalagiri, Guntur & Tenali towns with a total seating capacity of 4000 students in two shifts. Transport is available 24 hrs, In case of any emergency in the institute /hostels. Transportation is available for conducting industrial tours and visits etc. Regular transport facility available up to 10PM.

Healthcare

A full-fledged health center with all the facilities is established to cater the needs of the students, staff, Faculty and the public in the adopted villages. It consists of three doctors (Homoeopathy, Ayurvedic & Allopathy).

Cafeteria

KLEF has a spacious canteen with the latest equipment and hygienic environment which provides quality food and prompts service and caters to the needs of all the students and staff. A central cafeteria of 1500 Sq.m. is available on the campus. Mini cafes and fast-food centres are available in various blocks. The canteen is open from 6:30 a.m. to 8:30 p.m. There is a wide variety of North- Indian and South-Indian cuisine and the students enjoy the pleasure of eating during the breaks. Cool aqua water for drinking is available.

Placements

KLEF has meticulously planned to keep all its outgoing students employed. The University has installed the infrastructure, employed well-experienced faculty, and designed and delivered programs that help to enhance the communication and soft skills that are required for making the students employable. An excellent system is in place that considers all the issues that make a student employable. The University has been successful for the last 7 years in employing all the students who have registered and eligible for placement through its offices located across the country. About 50 trained personnel work extensively to make the students ready for recruitment by the industry.

Counselling & Career Guidance

A special counselling cell consisting of professional student counsellors, psychologists, and Professors

counsels/helps the students prepare themselves to cope with studies, perform well in the tests & various competitions. This Cell provides its services to the students in getting the solutions for their personal problems and provides career guidance with the help of the Industrial Relations and Placements (IRP) department. A group of 20 students are allotted to each faculty member who counsels them regularly and acts as their mentor.

Social Service Wing

KLEF has a social service wing which is used to channel the social service activities of the faculty, staff and students. It has adopted 5 nearby villages and conducts activities like medical camps, and literacy camps and educates the villagers regarding hygiene and health care regularly.

NSS/NCC wings

NCC/NSS is a credit course designed with the intent to transform NCC/NSS activities into curricular activities from extracurricular thereby providing credits to students involved in NCC/NSS along with other attended advantages to the students in the university.

Hobby Clubs

Wholly and solely managed by the students, contributed much to the cultural life of the campus and to the cultural evolution of the students. Few student bodies and clubs operate on the campus like music society, dance club, drama society, literary and debating club, English press club, drawing club, painting club, mime club, computer club etc. Students manage the entire activities and budget of the organization for the entire semester in advance. Around 4000 students are active members of the Hobby Clubs.

Life Skills and Inner Engineering

KLEF feels that it is its responsibility to mold the students as good human beings, contributing to the country and to society by producing responsible citizens. Along with the regular programs every student admitted into KLEF undergoes a one-week special life skills /orientation program. Through this program, KLEF is producing the students with clarity of thought and charity at heart. Strict regularity, implicit obedience, courtesy in speech and conduct, cleanliness in dress. Life skills and inner engineering teach a student his/her obligation towards GOD, himself /herself his/her country and fellow human beings. Every student is encouraged to practice his/her own religious faith and be tolerant and respectful towards other religions.

Technical Festival

KLEF organizes various programs for the all-round development of the students. The technical festival and project exhibition is organized in the odd semester (October) every year to elicit the innovative ideas and technical skills of the students.

Cultural Festival

The cultural festival in the even semester (February) of every year is the best platform for the students to exhibit their talents and creativity. Through these festivals KLEF is imparting organizational skills, leadership skills, competitive spirit, and team behaviour skills to our students. Along with the knowledge, KLEF festivals provide recreation to the student community.

Center for Innovation, Incubation and Entrepreneurship (CIIE)

KLEF being a pioneering institute supporting Academics and Research in Engineering, Science and Technology is endowed with the entire infrastructure and highly experienced faculty, has a Centre for Innovation, Incubation and Entrepreneurship (CIIE) that comprises of: Innovation Centre which aims to inculcate a spirit of innovation. Incubation Centre which aims to incubate innovations through prototype product development. The Entrepreneurship Development Centre (EDC) which aims at fostering entrepreneurial skills among the students.

About KL College of Agriculture

The KL College of Agriculture is a newborn institution equipped by harvesting talented faculty from all across the country and abroad. The faculty has been working diligently and enthusiastically to supersede its peers and become a world-class one. In addition to providing top-class domain knowledge, the faculty encourages students to actively participate in various university, national, and international competitions, scientific research, training, seminars, conferences, symposia, workshops, etc. to become future-ready and to be far ahead of their peers in facing challenges and competitions in building their careers.

Vision

Attainment of far excellence in provision of innovative, proactive and dynamic Agricultural Education to bring out holistic Agricultural Graduates best fit to achieve food and nutritional securities of Regional/Global Society.

Mission

To generate holistic Agriculture Graduates to contribute for food and nutritional security of the ever-increasing population under threats of climate change and environmental pollution.

Mission statements

M1: Rope- in creativity, flexibility and innovativeness in teaching and training

M2: On-field hands-on education builds confidence and competence

M3: Rise in food production with less carbon and water footprints

M4: Cautious and conscious integration of external/inorganic inputs with internal/organic inputs in agriculture does enhance quality and quantity of Agricultural Produce.

Hallmarks of KL College of Agriculture

- Well-appointed Shade net house and Poly-house, each of 1000 square feet area, dedicated for regular practical classes and research activities.
- 43 acres of crop field attributed to the College of Agriculture
- 12 no's of well-facilitated laboratories affiliated with separate departments
- Wifi-enabled, smart board installed and air-conditioned modern classrooms
- Flipped classrooms with advanced teaching methods
- Well-trained faculties from 8 different states of India

CHAPTER 2
PROGRAMS LIST AND ELIGIBILITY CRITERIA

The disciplines in which the courses of study are available at KL College of Agriculture are as follows

Program	Duration	Eligibility	Percentage of marks in the qualifying exam	Total seats
B.Sc.(Hons.)Agriculture	4 years	10+2	45%	240

Admissions will be done on the basis of ranks obtained in EAMCET and Marks/Grades obtained in the qualifying examination and personal interview.

CHAPTER 3
PROGRAM EDUCATIONAL OBJECTIVES (PEOs) AND PROGRAM OUTCOMES
(POs)

Program Educational Objectives (PEOs)

PEO	DESCRIPTION
1	To produce quality graduates in the field of Agriculture
2	To keep student with updated knowledge in Agriculture.
3	To provide practical knowledge in the field of Agriculture.

Program Outcomes (POs):

PO	DESCRIPTION
1	To work as Agricultural Expert/Officer independently in any Government/Quasi-Government/Non-Governmental Institutions/Departments/Organizations.
2	To work as practicing Agrologist/Agronomist/Agricultural Extension Specialist/Agricultural Science and Allied Sciences Consultant.
3	To become expert in diagnosing various plant nutrient deficiencies/toxicities in all field and horticultural crops and be able to suggest ameliorative measures.
4	To gain knowledge and expertise in evaluation of various soils and waters to judge their suitability for agriculture and allied activities and enterprises.
5	To identify various pests and disease of crops both field and Horticultural and suggest management strategies, which are location specific, environmentally safe, and economically sound.
6	To be able to device and manage profitable location-specific farming systems through integration of different enterprises such as crops (Field, Horticultural, Fodder, Flower, medicinal, etc.), live-stock, Agro-forestry, fisheries, sericulture, Apiculture, etc.
7	To be well versed with different methodologies of crop growth monitoring by collecting the data through various field and lab equipment.
8	To be able to help in Agricultural Research Systems in the areas of Crop Management, Crop Production, Irrigation Management, Weed Management and crop improvement programs involving both conventional and biotechnological approaches.
9	To develop oral and written communication skills to articulate the agriculture technologies acting as liaison between Agricultural technologies and farmer community through effective modern communication approaches.
10	To come out as a good Agro-entrepreneur, Farm Manager/Agribusiness Person with sound knowledge in rural credit flow, banking systems, farm/enterprise budgeting, project management, marketing, supply chain management, Agricultural Policies for Governments
11	To be able to device and manage profitable location-specific farming systems through integration of different enterprises such as crops (Field, Horticultural, Fodder, Flower, medicinal, etc.), live-stock, Agro-forestry, fisheries, sericulture, Apiculture, etc. duly managing Agri-Resources by iteratively and continuously learning and implementing the solutions for effective implementation for sustainable Agriculture with less environmental footprints.

Program Specific Objectives (PSOs):

PSO	DESCRIPTION
1	Make students to understand the knowledge of agriculture science with respect to agronomical and horticultural crops and to develop skills to solve complex problems at farmers field level
2	To intensify student`s knowledge and skills with different methodologies of crop growth monitoring, soil analysis methods, plant protection analysis, production and processing of seed (both straight varieties and hybrids) of various crops
3	To be well versed with various pests and disease of crops both field and Horticultural and suggest management strategies
4	Inculcate and device and manage profitable location-specific farming systems through integration of different enterprises such as crops (Field, Horticultural, Fodder, Flower, medicinal, etc.), live-stock, Agro-forestry, fisheries, sericulture, Apiculture, etc.

CHAPTER 4

ACADEMIC REGULATIONS OF KL COLLEGE OF AGRICULTURE (With effective from the Academic Year 2023)

This document supplements the KLEF rules and regulations to assist all students. It is required that every individual must abide by these regulations. The regulations stated in this document are subject to change or can be relaxed/modified without prior notice at the discretion of the Hon'ble Vice Chancellor.

Terminology

- **Short Title:** Under graduate courses of study leading to the award of the degrees **B.Sc.(Hons)Agriculture** in the faculty of Agriculture
- **Academic Bank of Credits (ABC):** It helps the students to digitally store their academic credits from any higher education institute registered under ABC in order to award Certificate / Diploma / Degree / Honors based on the credits earned by the student. All the credits acquired by the students are stored digitally by registering into Academic Bank of Credits (ABC) portal. It also supports retaining the credits for a shelf period and continue their program study with multiple breakovers.
- **Academic Council:** The Academic Council is the highest academic body of the University and is responsible for the maintenance of standards of instruction, education and examination within the University. The Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.
- **Academic year:** The academic year of the University shall ordinarily be from July to May (except in the case of year of admission) and shall consist of two semesters.
- **Semester:** A minimum duration of 110 working days, consisting of 95 instructional days and 15 examination days except during the year of admission. For a short semester in the year of admission the number of classes should be increased proportionately.
- **Credit hour:** Each credit hour represents one hour lecture or two hours of laboratory or field practical each week in a semester. It is also known as semester credit or credit.
- **Course:** A course is a unit of instruction or segment of subject matter (as specified in the course catalogue) to be covered in a semester. It has a specific number, title and credits.
- **Course Handout:** Course Handout is a document which gives a complete plan of the course. It contains the details of the course viz. Course title, Course code, Pre-requisite, Credit structure, team of instructors, Course objectives, Course rationale, Course Outcomes and the relevant syllabus, textbook(s) and reference books, Course delivery plan and session plan, evaluation method, chamber consultation hour, course notices and other course related aspects. In essence, course handout is an agreement between students (learners) and the instructor.

- **Curriculum:** Curriculum is a standards-based sequence of planned experiences where students practice and achieve proficiency in content and applied learning skills. Curriculum is the central guide for all educators as to what is essential for teaching and learning, so that every student has access to rigorous academic experiences. KL College of Agriculture is strictly implementing Indian Council of Agriculture Research (ICAR) syllabus.
- **ERP:** ERP (Enterprise Resource Planning) system is a comprehensive software solution designed to streamline and automate various administrative, academic, and financial processes within the University. It manages student information, including admissions, registration, enrolment, attendance, grades, and academic records.
- **Grade point of a course:** It is the value obtained by dividing the percentage of marks secured in a course by 10. The grade point is expressed on a 10 point scale upto 1 decimal place.
- **Credit point of a course :** It is the product of credit hours and grade point obtained by a student in a course.
- **Grade Point Average (GPA):**It is the quotient of the total credit points obtained by a student in various courses at the end of each semester divided by the total credit hours taken by him/her in that semester. The grading is done on a 10 point scale. The GPA is to be corrected up to first decimal place.
- **Overall Grade Point Average (OGPA)**
It is the quotient of cumulative credit points obtained by a student in all the courses taken by him/her from the beginning of the first semester of the degree course divided by the total credit hours of all the courses which he/she had completed upto the end of a specified semester from the first semester.
- **Study load for semester**
For the purpose of calculation of study load, number of credits registered in a semester includes fresh courses and courses registered for want of attendance. The total study load for a student shall not be more than 26 credit hours per semester
- **Attendance**
Every student shall ordinarily attend all classes in a course. However, the minimum attendance prescribed in a course is 75%. The attendance shall be reckoned for theory. And practical's separately. A student who fails to put in the minimum attendance either in theory or practical examination and his/her registration, for that course shall be treated as cancelled.
The minimum attendance requirements can be relaxed upto 10% on medical grounds (i.e., upto 65% for theory and practical separately) only in case of indoor hospitalization.
- **Mid-semester examinations/Sem-in examination:**
There shall be one mid –semester/sem-in examination to be conducted by the teacher offering the course after 50% of the working days are over in a semester. The duration for mid-semester examination shall be for one and half hours.

- The marks allotted for mid-semester and semester final theory examinations shall be 50 and 100, respectively. This repeat examination shall be held within two weeks from the date of examinations so missed and shall be a common examination for all such students.
- **Semester End examination:** The semester end examinations shall be held at the end of each semester in each course. The semester final examination in the theory portion shall be of three hours duration.
- **Computation and award of course grades:** In the allocation of marks for the course, each credit shall be evaluated for 50 marks. Marks allotted for theory and practical shall be in proportion to the credits for the theory and practicals. The proportion of marks for the semester final common theory examinations and mid-semester examinations shall be 50:50 respectively. Marks for the practical marks shall be based on continuous evaluation of practical classes and a final practical examination which shall include a *viva-voce* examination.
- The proportion of marks between continuous internal evaluation of practical work and final practical examination shall be of 1:1. In respect of Student READY programmes – Experiential Learning on Business Model/Hands on Training ,Experiential Learning on Skill Development, Rural Awareness Works Experience(RAWE) Internship/In-plant Training/ Industrial attachment and Student Projects., the criteria for evaluation of students as prescribed in manuals of respective programmes shall be followed.
- **Mass absence of students from a class or examination:** Absence of students ‘enmasse’ from a class or examination shall not be condoned. The Associate Dean, in addition, may order suspension of the course, if deemed necessary.
- **Academic status and scholastic deficiencies**
 A student shall get minimum of 50% marks in both final theory and final practical examinations separately for a pass in the final examination of a course.
 A student obtaining a grade point of 5.0 shall be considered to have passed the course. A student getting less than 5.0 shall be deemed to have failed in the course and ‘F’ shall be indicated in the grade report. A student who secured grade point below 5.0 or who secures above 5.0 but scores less than 50% marks in semester final theory/practical examination of the course (or) was marked absent has to appear for either final theory or practical examination or both (as the case maybe).
 With respect to Physically challenged (Handicapped) students a reduction of pass marks in each subject by 10% is allowed*.
 A student may also have the option to write the mid-semester examination of the course in the same semester when he/she next takes the final examination of that particular course.
- **Promotion to final year:** To get the eligibility for registering for the EL programme, the students should have completed all the courses successfully. No student should be allowed to take up the EL programme with backlog/repeat courses.

- **Graduation requirements:** The minimum residential requirements is eight semesters for U.G. Degree Programmes in the University. The maximum duration of degree is fourteen semesters (7 academic years).
- **Requirements for Bachelor's Degree:** A student undergoing course of study leading to award of the B.Sc. (Hons) Agriculture in Faculties of Agriculture as the case may be shall pass courses and complete the minimum number of credit hours prescribed there for by the Academic Council from time to time by obtaining minimum OGPA of 5.00 in the 10 point scale.
- **Classification of Successful candidates:** The successful candidates after completion of graduation requirements who secured an OGPA of 5.00 or more in the 10 point scale shall be classified as under
 - Pass 5.00 to 5.99
 - Second Class 6.00 to 6.99
 - First Class 7.00 to 7.99
 - First Class with Distinction 8.00 and above
- **Award of degrees:** A degree under the seal of the University and duly signed by the officers authorized in this behalf shall be presented at a convocation to each candidate who has successfully completed the graduation requirements for the award of degree.
- **Amending or cancellation of result:** If the result of a candidate is discovered to be vitiated by error, malpractice, fraud, improper conduct or any other reasons, the Vice-chancellor shall have the power to amend the result in such a manner as to accord with the true position, and to make such declaration as the Vice-Chancellor may deem necessary in that behalf.
- **Transitory provision:** These regulations shall apply to the students who shall be admitted from the academic year 2023 and onwards.

Academic Instructions

Student should communicate in English with faculty and other students while he/ she is in campus.

- Students are expected to wish/greet all officials of the KLEF with due respect.
- Students should be courteous and polite while communicating with all Faculty & staff.
- Students should maintain silence and/or speak in a polite way in and around the classrooms, library, laboratories, and offices of the Deans, Program Chairs, Senior Officials, faculty rooms and corridors of academic buildings.
- It must be noted that shouting, talking in loud voice or in chorus, using indecent, abusive and discourteous language anywhere within the institution premises are considered serious acts of indiscipline and are punishable.
- Students should not loiter during the free time in the university campus.

- Students should not issue any public or press statement, send letters to editors, government, public servants or notaries without prior permission and approval of the Registrar of KLEF in writing.
- Students should keep the status, dignity, prestige and reputation of KLEF high and not engage in anything that might directly or indirectly undermine the standing of the institution.
- Students must always adhere to a prescribed/decent dress code befitting the dignity of a technical/professional student within the campus.
- Ragging of any student is a serious act of indiscipline and has been totally banned by the Hon'ble Supreme Court of India.
- A student found involved in any form of ragging, verbal or physical, inside or outside the institutional campus, hostels, or buses shall be treated as per the anti-ragging rules of the KLEF.
- Students must not be involved in quarreling or fighting or any indecent verbal or physical activity among themselves, or with staff and faculty or visitors.
- Direct or indirect involvement in any such activity will be considered as serious breach of discipline and strict disciplinary action will be taken against the students that engage in such activities.
- Students are not allowed to sit on the steps, boundary walls on the higher floors of any building, or engage in gossiping, making noise or any other such activity.

Working Hours

The University operates between 9:20am to 5:00pm on all weekdays.

Class Environment

The institute is a community of learners. Students have a responsibility of creating and maintaining an environment that supports effective learning to receive effective instructions in classrooms and laboratories. KLEF expects students to conduct themselves in an orderly and cooperative manner by adhering to University Rules & Regulations.

Field and Laboratory Environment

A conducive learning environment in the field and laboratory is essential and the students are advised to follow the guidelines mentioned below:

- Always students should wear uniform, shoes and should bring a hat and water bottles while doing field operations
- Always listen carefully to the faculty especially for the safety precautions to take in the moot court or laboratories.
- Accidents resulting in injuries may occur if precautions are not taken.

- Eating in moot court hall or laboratories is strictly prohibited.
- Proper dress code is to be followed as prescribed by faculty.
- Students should familiarize themselves with the location of all the equipment which may be available.
- Follow evacuation procedures quickly and quietly, if needed.
- Students should always conduct themselves in a responsible and cautious manner. Risky behaviors such as pushing, running, jumping etc., are unwarranted.
- Only materials required to complete and record the experiment instructions, (e.g. pencils, books, memorials, paper, etc.) should be brought into the laboratory.
- Equipment must be carefully handled to prevent breakage or damage, otherwise appropriate penalties/disciplinary action may be levied/imposed.
- Lab station must be cleaned prior to leaving.
- Any accident, no matter how small or big, must be reported to the concerned faculty immediately.

Registration Process

For every course, the student must undertake the registration process prior to commencement of the coursework, based on the following conditions:

- Registration into a course will be permitted only for such courses, which are offered by KLEF in that semester.
- A student must clear the pre-requisite(s) if any, to register into a course. ▪ KLEF reserves the right to register.
- Registration for add/drop/change of a course will be permitted only within one week from the scheduled date of commencement of classes.
- Students can register up to a maximum of 32 credits of their choice in a semester to meet their Program requirements.
- Students, who wish to register for additional credits through Overloading or less credits through Under loading, must seek prior permission from Dean-Academics.
- Students who have opted for minor degree, honors degree, can register for a greater number of credits in a semester through Overloading (subjected to guidelines appropriate to compliance on eligibility).
- KLEF reserves the right to withdraw within one week of the commencement of the semester any elective course offered, if adequate number of students have not registered or for any other administrative reasons. In such cases, the students are permitted to register for any other elective course of their choice provided they have fulfilled the eligibility conditions.
- KLEF reserves the right to cancel the registration of a student from a course or a semester or debar from the degree on disciplinary / plagiarism grounds.

- A student is solely responsible to ensure that all conditions for proper registration are satisfied. If, there is any clash in the timetable, it should be immediately brought to the notice of the 18 Department Year coordinator for necessary corrective action. The registration may be cancelled for a course or the entire semester either by KLEF if any irregularity is found at a later stage.

Student Course Registration Process

To complete the student registration, student login to new ERP portal with their valid login credentials. After login student should click on Academic Registrations Student Course Registration. Now Student can view the courses and sections in dropdown menus. Student can select the sections against the courses on their own choice as mentioned in the following screen shot. Student can view the timetable on top of the selection of each course and section. After completing the selection student need to click on Save to save the timetable. After duly verifying the timetable student needs to click on Submit to complete the Registration process. On successful completion of registration, a pop-up message, “Student Registration Successfully Completed” appears.

CHAPTER 5

PROGRAM CURRICULUM

For an academic program the curriculum is the basic framework that will stipulate the credits, category, course code, course title, course delivery (Lectures / Practical's / Projects etc.), in the Choice Based Credit System. However, all such are essentially designed, implemented and assessed in Outcome Based Education Framework.

Program Structure:

- An Academic Year is made of two semesters each is of, approximately 16+1-week duration and each semester is classified as:
 - Odd Semester (July to December)
 - Even Semester (December to May).
- KLEF may offer summer term between May and June.
- Student can register for a maximum of 26 credits, other than audited and certificate courses per semester.

Course Structure:

- Every course has a Lecture-Tutorial-Practice-Skill (L-T-P-S) component attached to it
- Based upon the L-T-P-S structure the credits are allotted to a course using the following criteria
 - Every 1 hour of Lecture / Tutorial session is equivalent to one credit
 - Every 2 hours of Practical session is equivalent to one credit
 - Every 4 hours of skill-based practice is equivalent to one credit

Course Classification:

Any course offered under B.Sc. (Hons.) Agriculture program is classified as:

- **Humanities & Social Science Courses (HSS):** Humanities and social sciences (HSS) courses are a broad field of study that encompasses the study of human culture and society. These courses focus on developing students' critical thinking, problem-solving, and communication skills. These skills are valuable in a variety of careers, and they can also help students become more engaged citizens.
- **Professional Core Courses (PCC):** Professional core courses are a set of courses that are essential for all agriculture students. These courses provide students with the knowledge and skills they need to be successful in their chosen under graduate discipline.
- **Professional Elective Courses (PEC):** Professional electives are a set of courses that are chosen by students to supplement their agriculture education. Professional electives are a great way for students to customize their under graduate education and prepare for their future careers. By choosing electives that are relevant to their interests and goals, students can gain the knowledge and skills they need to be successful in their chosen field.
- **Project Research & Internships (PRI):** Project, Research and Internships can help students gain a better understanding of their chosen field by giving them the opportunity to apply their knowledge and

skills to real-world problems. These can help students explore their interests by giving them the opportunity to work on projects that they are passionate about.

CHAPTER 6
REQUIREMENTS FOR THE AWARD OF DEGREE

A student undergoing courses of study leading to award of the B.Sc. (Hons) Agriculture, shall pass courses and complete the minimum number of credit hours prescribed there for by the Academic Council from time to time by obtaining minimum OGPA of 5.00 in the 10-point scale. A student undergoing instructions in UG courses of study leading to the award of B.Sc. (Hons) Agriculture in the Faculty of Agriculture; shall have to complete satisfactorily the Student READY programmes - Experiential Learning on Business Model/ Hands on Training, Experiential Learning on Skill Development, Rural Awareness Works Experience (RAWES), Internship/ In-plant Training/ Industrial attachment and Student Projects during the final year of the course as prescribed from time to time.

The successful candidates after completion of graduation requirements who secured an OGPA of 5.00 or more in the 10-point scale shall be classified as under:

Pass	5.00 to 5.99
Second Class	6.00 to 6.99
First Class	7.00 to 7.99
First Class with Distinction	8.00 and above

Note: Class/division shall not be mentioned in the degree certificate but classification may be given in the transcript as footnote.

CHAPTER 7

ATTENDANCE RULES AND DETENTION POLICY

Attendance Policy for Promotion in a Course

A candidate shall be deemed to have eligibility to appear for end-semester exams in any course if the student has attended a minimum of 75% of classes held in the course concerned, including the practical classes conducted in the course. If any student for any exceptional reasons fails to attend 75% of the classes held in any course, the Director of the College may allow the student to take the exam, if the student concerned attended at least 65% classes held in the course concerned and 75% of the classes in all the courses in entire semester taken together. In case of medical exigencies, the student/parent should inform the Director of the College within a week by submitting necessary proofs and in such cases the attendance can be condoned up to an extent of 10% by Director on the recommendation of the committee established for condonation.

- Attendance in a course shall be counted from the date of commencement of the classwork only and not from the date of his/her registration.
- Attendance for the students who are transferred from other institutes and for new admissions, attendance must be considered from the date of his/her admission.
- In case of attendance falling marginally below 75% due to severe medical reasons or any other valid reasons, the Director / Program chair may bring such cases, along with valid and adequate evidence to the notice of the Dean Academics. The condonation board formed by Vice-Chancellor under the chairmanship of Dean-Academics will consider any further relaxation in attendance from the minimum attendance percentage requirement condition after going through case by case.

Attendance Condonation for Participation in KLEF / National / International Events

Only those students nominated / sponsored by the KLEF to represent in various forums like seminars / conferences / workshops / competitions or taking part in co-curricular / extra-curricular events will be given compensatory attendance provided the student applies in writing for such a leave in advance and obtain sanction from the Principal basing on the recommendations of the Head of the Department (HoD) for academic related requests; or from the Dean Student Affairs for extracurricular related requests. For participation in the KLEF's placement process the names of students will be forwarded by the placement cell in-charge to the respective Heads of the Departments. Students participating in KLEF/National/International events like technical fests, workshops, conferences etc., will be condoned for 10% of total classes conducted for each course in the semester.

Course Based Detention Policy

In any course, a student must maintain a minimum attendance as per the attendance policy for promotion in a course, to be eligible for appearing in the Sem-End examination. Failing to fulfill this condition, will deem such student to be detained in that course and become ineligible to take semester end exam.

Eligibility for Appearing in Sem-End Examination

A Student registered for a course and maintained minimum attendance of 75% is eligible to write the Semester-End Examination for that course unless found ineligible due to one or more of the following reasons:

- Shortfall of attendance
- Detained
- Acts of indiscipline
- Withdrawal from a course

CHAPTER 8

ASSESSMENT AND EVALUATION PROCESS

Fifth Deans' Committee deliberated on the examination and evaluation system being followed by different universities. The Committee recommends Uniform Grading system to be followed with uniform OGPA requirements for award of degrees at all levels and uniform conversion formulae to be followed for declaration of I, II and III divisions, distinctions etc. Declaration of division in the degree certificate to be made compulsory by all universities:

EXAMINATION

- External theory (50%)
- Internal Theory + Practical (50%)
 - ❖ Courses with Theory and Practical
Mid-term Exam (30%) + Assignment (5%) in practical oriented courses + Practical (15%)
 - ❖ Courses with only Theory
Mid-term Exam (40%) + Assignment (10%)
 - ❖ Courses with only Practical:
(100%) Internal
- Paper to be set by external: HOD shall ensure the coverage of syllabus. If needed moderation can be done.
- Evaluation to be done internally by the faculty other than the Course Instructor. Syllabus of the concerned course shall be sent to the external examiner, who shall prepare the question papers. For practical, it is recommended that examination shall be conducted by course instructor(s) and one teacher nominated by HOD.

EVALUATION

Y23 Regulation-Evaluation plan

Sl.No	Course L-T-P-S info	L-T-P-S	Internal Weightage (40%)	External Weightage (60%)
1	Purely Theory Based Course	X-0-0-0	Semester In Exam 1 – 40M	Assignment— 10M End semester exam—50M
2	Theory and Practical Based Course	X-0-X-0	Semester In Exam-I— 30M Assignments/ALMs/etc.- 5M Continuous Lab evaluation—5M	End semester exam—50M Lab End Sem Exam—10M
3	Purely Laboratory course	0-0-X-0	Lab Continuous evaluation—20M Field work/Lab In semester Exam—20M	Lab End Sem Exam—60M

Degree	Percentage of marks obtained	Conversion into points
B.Sc.(Hons.) Agriculture	100	10 Points
	90 to <100	9 to <10
	80 to <90	8 to <9
	70 to <80	7 to <8
	60 to <70	6 to <7
	50 to <60	5 to <6
	<50 (Fail)	<5
	Eg. 80.76	8.076
	43.60	4.360
	72.50 (but shortage in attendance)	Fail (1 point)

OGPA	Division
5.000 – 5.999	Pass
6.000 – 6.999	II division
7.000 – 7.999	I division
8.000 and above	I division with distinction

GPA = Total points scored / Total credits (for 1 semester)

CGPA = Σ Total points scored / Course credits

OGPA = Σ Total points scored (after excluding failure points)/ Course credits

% of Marks = OGPA x 100/10

CHAPTER 9

PROMOTION

Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of B. Pharm. program if he/she secures at least 50% marks in that particular course including internal assessment. For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

Award of Medals

KLEF awards Gold and Silver medals to the top two candidates in each program after successful completion of their study. The medals are awarded based on their CGPA during the Annual Convocation with the following constraints:

- a. The grade obtained through betterment/ supplementary will not be considered for this award
- b. The student must have obtained first class with distinction for the award of Gold or Silver-medal

Academic Bank of Credits:

ABC helps the students to digitally store their academic credits from any higher education institute registered under ABC in order to award Certificate/Diploma/Degree/Honors based on the credits earned by the student. All the credits acquired by the students are stored digitally by registering into Academic Bank of Credits (ABC) portal. It also supports retaining the credits for a shelf period and continue their program study with multiple breakovers. Students may exit from their current program of study due to any unforeseen reasons or to focus on their chosen career path. In such cases, the student may break for a period of time (preferably not in the middle of an academic year) and may continue with the program of study at a later stage. Moreover, students must be able to complete their program by not exceeding the maximum duration of the program. If not, they may be issued with a Certificate, diploma, degree or honors based on the credits acquired over the period of time for all the programs approved by UGC.

CHAPTER 10

STUDENT COUNSELLING AND FEEDBACK

Student Counselling

Academic Counselling Board

Academic Counselling Board is constituted by the Dean Academics. This board shall comprise of the Chairman, Convener, Principal/Director, HOD and Professor/Associate Professor.

A student will be put under Academic Counselling Board in the following circumstances:

1. Has CGPA of less than 6.00.
2. Has 'F' grade or 'Detained' in multiple courses.

The first level of Counselling for such students will be done by the Mentor of the student and the HoD followed by the ACB and the list of students who have to undergo the ACB counselling be forwarded by the HoD to the Office of Dean Academics.

The students undergoing the Academic Counselling Board process may be allowed to register only for a few courses based on the recommendation of Academic Counselling Board.

Counselling Policy

Student counselling takes great place in K L University. Counselling is designed to facilitate student achievement, improve student behaviour, subject analysis levels, attendance, and help students develop socially, professionals with bachelor's, master's degrees or beyond. Faculty counsellors provide counselling and serve an educational role in K L University. We have Mentors, Academic, Career, Physiological, Co-Curricular & Extra-Curricular activities counsellors to support students who are experiencing personal or academic challenges, help students choose careers and plan for university and intervene when students face behavioural, physical, or mental health challenges.

Academic Counselling

1. Counsellor shall acquire backlog data and record the same into the counselling sheets.
2. Counsellor will acquire data about the attendance and performance in the internal evaluation and record them into the counselling data sheet.
3. Counsellors shall counsel the students regularly to track the performance of the students.
4. The counselling data sheet shall be submitted to the principal for verification and approval.
5. At the end of the semester a summary report will be sent to Dean Academics Office.

Career Counselling

1. Counsellor has to take SWEAR analysis data in first year.
2. Counsellor shall acquire the data related to performance of the students in all the soft skills and other courses that contributes towards employability/ entrepreneurship/ career advancement the career counselling data sheets.
3. Counsellor will acquire data about the attendance and performance of the students during all the placement drives conducted by KLU and records the same into the counselling sheet.

4. Counsellors shall counsel the students regularly when the performance of the student is found to be unsatisfactory.
5. The counselling sheet shall be verified by principal and corrective actions if any will be recommended to the respective departments.
6. At the end of the semester a summary report will be sent to Dean Academics Office.

Psychological Counselling

1. Counsellor shall acquire data pertaining to psychological status of the students and record the same into the counselling sheets.
2. Counsellor will acquire data about the attendance and performance in the internal evaluation and record them into the counselling sheet and see whether the performance is in any way related.
3. Counsellor shall counsel the students regularly when the performance of the student is found to be un-satisfactory.
4. Counsellors should identify the need of any therapy required.
5. Once it is identified, the counsellor will arrange the treatment according to the psychological status of the student.
6. Counsellor should maintain the progression level of the student periodically.
7. The counselling sheet shall be verified by principal and corrective actions if any will be recommended to the respective departments.
8. At the end of the semester a summary report will be sent to Dean Academics Office.

The duties of counsellors

Mentoring: Plan and design a system for student behavior, mental health and academic challenges, define structural and functional characteristics of the system in detail, plan provisions for academic mentoring apart from classroom interaction.

Academic Counselling: Develop a systematic and process-oriented mechanism to improve academic counselling in relation to student attendance, punctuality, performance of students in internal and semester examinations, course / program to be enrolled based on the strength and weakness of the student.

Career Counselling: Conduct personality test (SWEAR) to find suitable career path, create awareness on the job opportunities, career paths that exist in a specific discipline.

Psychological Counselling: Organize and strengthen the student counselling services, engage qualified and experienced mentors and advisories for each class of students for providing psychological guidance as required.

Guidance on Co-Curricular & Extra-Curricular activities

Form student clubs to give train and encourages the students to improve their skills, physical fitness and mental strength.

Counselling Procedures

- The HOD will allot 20 Students once admitted into a program to a faculty with allocation priority commencing from professors and onwards.
- The faculty concerned will be called a counsellor/mentor.
- One hour per week will be allocated by the departments to enable the counsellors to counsel the students on various aspects.
- The counsellor will maintain a separate sheet to record student performance and also different kinds of counselling undertaken.
- Counsellor shall communicate with parents through mail, SMS and also through telephonic conversations. Student's attendance, marks, placement etc. data must inform to parents once in a month.
- The communication undertaken shall be recorded in a separate register.

Feedback System

At KLEF, monitoring of feedback is a continuous process. Feedback is obtained from students and parents on various aspects. Feedback is taken through personal interaction with students, interaction with parents in addition to mid-semester and end-semester feedback. The institution assesses the learning levels of the students, after admission and organizes special programs for advanced learners and slow learners.

Feedback Types

In first year SWEAR analysis is done for every student in such a way it identifies their interests, preexisting knowledge, aspects to improve technical and logical skills based on their career choice.

The following are the different types of feedback taken at regular intervals:

1. Student General Feedback (Twice in a Sem.)
2. Student Satisfaction Survey (Once in a Sem.)
3. Student Exit Feedback (Once in a Year)
4. Academic Peers Feedback on Curriculum (Once in a Sem.)
5. Parents Feedback on Curriculum (Once in a Sem.)
6. Alumni Feedback on Curriculum (Once in a Sem.)
7. Industry Personnel Feedback on Curriculum (Once in a Sem.)
8. Student Feedback on Curriculum (Once in a Sem.)
9. Faculty Satisfaction Survey (Once in a Sem.)
10. Parent Teacher Association (Once in a Sem.)

Feedback Procedure

- General Feedback to be taken from the students on the aspects like Course Contents, Teaching Learning Process, Outcomes, Resources and Evaluation twice in every semester (Mid semester and End Semester Feedback) in a structured format floated by dean academics office.

- Student Satisfaction Survey (SSS) to all innovative methods and approaches should be recorded at appropriate intervals and the process should be refined based on that. Students should be sensitized on the process and methods and their understanding of the same should be assured.
- Exit survey feedback to be taken from the final year students on the aspects like entrance test, admission process, Course Contents, Teaching Learning Process, Outcomes, Resources and Evaluation, placements etc.
- Structured feedback for design and review of syllabus – semester wise / year wise is received from Students, Alumni, Peers, Parent, Industry Personnel.
- Satisfaction Survey to be taken from the existing faculty on Course Contents, Teaching Learning Process, Outcomes, Resources and Evaluation once in every semester in a structured format floated by dean academics office.
- Parent Teacher Association (PTA) to develop the potential of parents and to strengthen their relationship with their children through planning and conducting a variety of developmental and recreational activities.
- Online Feedback is collected from all the students once at the end of the semester using well designed questionnaire. Informal feedback will be collected in parallel from selected student representatives within 4-5 weeks of commencement of the semester by the Office of Dean Academics.
- HODs have to submit monthly /semester / Academic Year Feedback reports with necessary comments and proofs to Dean Academics office duly signed by concerned Principal/Director.

CHAPTER 11
PROGRAM STRUCTURE

Sl No	Course Code	Course Title	Category	L	T	P	S	Ch	Cr	Pre-requisite
1.	22AGRO 101	Agriculture Heritage	PC	1	0	0	0	1	1	-----
2.	22AGRO 102	Fundamentals of Agronomy	PC	2	0	2	0	4	3	-----
3.	22BICM 101	Fundamentals of Plant Biochemistry and Biotechnology	PC	2	0	2	0	4	3	-----
4.	22ENGL 101	Comprehension and Communication Skills in English	HSS	1	0	2	0	3	2	-----
5.	22SSAC 121	Fundamentals of Soil Science	PC	2	0	2	0	4	3	-----
6.	22AECO 141	Fundamentals of Economics	PC	3	0	0	0	3	3	-----
7.	22HORT 181	Fundamentals of Horticulture	PC	1	0	2	0	3	2	-----
8.	23UC1203	Design, Thinking and Innovation	PC	0	0	4	0	4	2	-----
9.	22AEXT 190	Human Values and Ethics (non gradial)	HSS	1	0	0	0	1	1	-----
10	22AEXT 191	Rural Sociology and Educational Psychology	PC	1	0	2	0	3	2	Fundamental course
11	22COCA 100	NSS/NCC/Physical Education and Yoga Practices	HSS	0	0	4	0	4	2	Fundamental course
12	22CPHY 161/23SMC A101	Introductory Biology/Elementary Mathematics	BSS	1	0	2	0	3	2	Fundamental course
13	22AMBE 101	Agricultural Microbiology	PC	1	0	2	0	3	2	Fundamental course
14	22AGRO 103	Introductory Agrometeorology and Climate Change	PC	1	0	2	0	3	2	Fundamental course
15	22AGRO 104	Introduction to Forestry	PC	1	0	2	0	3	2	Fundamental course
16	22GPBR 111	Fundamentals of Genetics	PC	2	0	2	0	4	3	Fundamental course
17	22ENTO 131	Fundamentals of Entomology I(Insect Morphology and Taxonomy)	PC	2	0	2	0	4	3	Fundamental course
18	22AENG 151	Soil and Water Conservation Engineering	PC	1	0	2	0	3	2	Fundamental course
19	22CPHY 162	Fundamentals of Crop Physiology	PC	2	0	2	0	4	3	Fundamental course
20	22PATH 171	Fundamentals of Plant Pathology I (Plant Pathogens - An Introduction)	PC	2	0	2	0	4	3	Fundamental course
21	22HORT 182	Production Technology of Fruits and Plantation Crops	PC	1	0	2	0	3	2	Fundamental course
22	22FIT2101	Fundamentals of Information Technology	PC	2	0	0	0	2	2	Fundamental course

23	22AGRO 201	Crop Production Technology - I (<i>Cereals, Millets and Pulses</i>)	PC	2	0	2	0	4	3	23AGRO 101
24	22GPBR 211	Fundamentals of Plant Breeding	PC	2	0	2	0	4	3	Fundamental course
25	22ENTO 231	Fundamentals of Entomology II (Insect Ecology and Concepts of IPM)	PC	1	0	2	0	3	2	23ENTO 131
26	22AECO 241	Agricultural Finance and Co-operation	PC	1	0	2	0	3	2	23AECO 141
27	22AENG 251	Farm Machinery and Power	PC	1	0	2	0	3	2	Fundamental course
28	22CPHY 261	Eco-physiology	PC	1	0	2	0	3	2	23CPHY 162
29	22PATH 271	Fundamentals of Plant PathologyII(PlantPathologyPrinciples)	PC	1	0	2	0	3	2	23PATH 171
30	22HORT 281	Production Technology for Vegetables and Spices	PC	1	0	2	0	3	2	23HORT 181
31	22AEXT 291	Fundamentals of Agricultural Extension	PC	2	0	2	0	4	3	Fundamental course
32	22COCA 200	Education Tour**	PC	0	0	4	0	4	2	NONE
33	22AGRO 202	Crop Production Technology - II(Oilseeds, Fibre, Sugar, Tobacco and Fodder crops)	PC	2	0	2	0	4	3	23AGRO 101
34	22AGRO 203	Farming Systems and Sustainable Agriculture	PC	1	0	0	0	1	1	23AGRO 101
35	22AGRO 204	Irrigation Water Management	PC	1	0	2	0	3	2	23AGRO 101
36	22SMCA 201	Statistical Methods	PC	1	0	2	0	3	2	23CPHY 161/23SMCA101
37	22LSPM 201	Live-stock and Poultry Management	PC	2	0	2	0	4	3	Fundamental course
38	22SSAC 221	Manures, Fertilizers and Soil Fertility Management	PC	2	0	2	0	4	3	23SSAC 121
39	22AECO 242	Agricultural Marketing, Trade and Prices	PC	2	0	2	0	4	3	23AECO 141
40	22AENG 252	Renewable Energy and Green Technology	PC	1	0	2	0	3	2	23AENG 151
41	22HORT 282	Production Technology for Ornamental Crops, Medicinal and Aromatic Plants and Landscaping	PC	1	0	2	0	3	2	23HORT 181
42	22AEXT292	Entrepreneurship Development and Business Communication	PC	1	0	2	0	3	2	23AEXT 291
43	ELCT 222/272/283	ELECTIVE COURSE	PE	2		2			3	Applied courses
44	22AGRO 301	Geoinformatics and Nanotechnology for Precision Farming	PC	1	0	2	0	3	2	23AGRO 101
45	22AGRO 302	Practical Crop Production	PC	0	0	2	0	2	1	23AGRO 101
46	22BICM 300	Principles of Food Science and Nutrition	PC	2	0	0	0	2	2	Fundamental course
47	22GPBR 311	Crop Improvement - I (<i>Cereals, Millets, Pulses and Oilseeds</i>)	PC	1	0	2	0	3	2	23GPBR 111

48	22GPBR 313	Intellectual Property Rights	PC	1	0	0	0	1	1	Value added Course
49	22SSAC 321	Problematic Soils and their Management	PC	1	0	2	0	3	2	23SSAC 121
50	22ENTO 331	Pests of Field crops and Stored Grain and their Management	PC	2	0	2	0	4	3	23ENTO 131
51	22AENG 351	Protected Cultivation and Post-harvest technologies	PC	1	0	2	0	3	2	23AENG 151
52	22CPHY 361	Environmental Studies and Disaster Management	PC	1	0	2	0	3	2	23CPHY 261
53	22PATH 371	Diseases of Field and Horticultural Crops and their Management - I (Field Crops)	PC	2	0	2	0	4	3	23PATH 171
54	22PATH 373	Principles of Integrated Pest and Disease Management	PC	1	0	2	0	3	2	23PATH 171
55	22ELCT305/ 333/342/362/ 382	ELECTIVE COURSE	PE	2	0	2	0	4	3	Applied courses
56	22AGRO303	Rainfed Agriculture and Watershed Management	PC	1	0	2	0	3	2	23AGRO 101
57	22AGRO304	Principles of Organic Farming	PC	1	0	2	0	3	2	23AGRO 101
58	22SMCA 301	Agriculture Informatics	PC	1	0	2	0	3	2	23SSAC 121
59	22GPBR312	Crop Improvement-II (<i>Fibre, Sugar, Starches, Narcotics, Vegetables, Fruits and Flowers</i>)	PC	1	0	2	0	3	2	23GPBR 111
60	22GPBR314	Principles of Seed Technology	PC	2	0	2	0	4	3	Fundamental course
61	22ENTO332	Pest of Horticultural Crops and their Management and Beneficial insects	PC	2	0	2	0	4	3	23ENTO 131
62	22AECO341	Farm Management, Production and Resource Economics	PC	1	0	2	0	3	2	23AECO 141
63	22PATH372	Diseases of Field and Horticultural Crops and their Management -II (Horticultural Crops)	PC	1	0	2	0	3	2	23PATH 171
64	22HORT381	Post-harvest Management and Value Addition of Fruits and Vegetables	PC	1	0	2	0	3	2	23HORT 181
65	22AEXT391	Communication Skills and Personality Development	HSS	1	0	2	0	3	2	23AEXT 291
66	22ELCT 306/315/334/ 383	ELECTIVE COURSE	PE	2		2			3	Applied courses
67	22RAWE	Crop Production	PC						5 (0+5)	Applied course
68	22RAWE	Crop Protection	PC						4 (0+4)	Applied course
69	22RAWE	Rural Economics	PC						3 (0+3)	Applied courses

70	22RAWE	Extension Programme	PC							4 (0+4)	Applied course
71	22INTERNS HIP	Research Station / KVK /DAATT Centre activities and attachment to Agro based industries	PC							4 (0+4)	Applied course
72	22ELP	Experiential Learning Programme (ELP)	PC							0+20	Applied course
		ELECTIVES									
1	ELCT 222	Soil, Plant, Water and Seed Testing	PE	1	0	4	0	5	3		Applied course
2	ELCT 272	Food Safety Issues	PE	2	0	2	0	4	3		Applied course
3	ELCT 283	Hi-tech. Horticulture	PE	2	0	2	0	4	3		Applied course
4	ELCT 305	Agricultural Waste Management	PE	2	0	2	0	4	3		Applied course
5	ELCT 306	Weed Management	PE	2	0	2	0	4	3		Applied course
6	ELCT 315	Commercial Plant Breeding	PE	1	0	4	0	5	3		Applied course
7	ELCT 333	Biopesticides and Biofertilizers	PE	2	0	2	0	4	3		Applied course
8	ELCT 334	Agrochemicals	PE	2	0	2	0	4	3		Applied course
9	ELCT 342	Agribusiness Management	PE	2	0	2	0	4	3		Applied course
10	ELCT 362	Micro propagation Technologies	PE	1	0	4	0	5	3		Applied course
11	ELCT 382	Landscaping	PE	2	0	2	0	4	3		Applied course
12	ELCT 383	Protected Cultivation	PE	2	0	2	0	4	3		Applied course

CHAPTER 12

PROGRAM ARTICULATION MATRIX - 2023-24

S. No	Course Code	Course Name	PO											PSO				
			1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	
1	22AGRO 101	Agriculture Heritage	3												3	2		
2	22AGRO 102	Fundamentals of Agronomy			1			2		3					3	2		
3	22BICM 101	Fundamentals of Plant Biochemistry and Biotechnology		1		1	1	2	2	3	1	3	2			3	1	
4	22ENGL 101	Comprehension and Communication Skills in English								2	3				3			
5	22SSAC 121	Fundamentals of Soil Science			3											3	1	
6	22AEEO 141	Fundamentals of Economics					2		1	2		3			1	2		3
7	22HORT 181	Fundamentals of Horticulture	2		3										3	1		
8	22AEXT 190	Human Values and Ethics (non gradial)	1							3								3
9	22AEXT 191	Rural Sociology and Educational Psychology	1				2			2					3			
10	22COCA 100	NSS/NCC/Physical Education and Yoga Practices								2					3			1
11	22UC1102J	Design Thinking & Innovation	1												3	2		1
13	22AGIC 101	Introduction to computers	1												3	2		1
14	22CPHY 162	Introductory Biology	1												2	3		1
12	22AMBE 101	Agricultural Microbiology	1	2	1	1	2	3	2	3	3		2	1			3	
13	22AGRO 103	Introductory Agrometeorology and Climate Change		2	3										3	1		
14	22AGRO 104	Introduction to Forestry	1	3		2	3		2	3					3	1		2
15	22GPBR 111	Fundamentals of Genetics		1		1	2	3	2	3	2	3	2	1	2	3		
16	22ENTO 131	Fundamentals of Entomology I(Insect		2	3												3	

		Morphology and Taxonomy)															
17	22AENG 151	Soil and Water Conservation Engineering	1	3		2	3		2	3				2	1		3
18	22CPHY 162	Fundamentals of Crop Physiology		1		1	2	3	2	3	2	3	2	3	2		1
19	22PATH 171	Fundamentals of Plant Pathology I (Plant Pathogens - An Introduction)	1	3	3									1	2	3	
20	22HORT 182	Production Technology of Fruits and Plantation Crops	3		2	3								1	3		2
21	22UC1102	Design Thinking & Innovation	1											3	2		1
22	22AGRO 201	Crop Production Technology - I (<i>Cereals, Millets and Pulses</i>)	1		1	2								3	2		1
23	22GPBR 211	Fundamentals of Plant Breeding	1	2	1	1	2	3	2	3	3	3	2	2	3		1
24	22ENTO 231	Fundamentals of Entomology II (Insect Ecology and Concepts of IPM)		3	3									2	1	3	
25	22AECO 241	Agricultural Finance and Co-operation									3			3	1		2
26	22AENG 251	Farm Machinery and Power	2	3	2	3	1	2	2	3	2		3		3		2
27	22CPHY 261	Eco-physiology	3	2	3	3		2	2	2		1		1	3	2	
28	22PATH 271	Fundamentals of Plant Pathology II (Plant Pathology Principles)	3	2	2									2	1	3	
29	22HORT 281	Production Technology for Vegetables and Spices	3		3									2	3		1
30	22AEXT 291	Fundamentals of Agricultural Extension					3			3				2	3		1
31	22COCA 200	Education Tour**									2			2	1		3
32	22AGRO 202	Crop Production Technology - II (Oilseeds, Fibre, Sugar, Tobacco and Fodder crops)			3			1		2				2	3		1
33	22AGRO 203	Farming Systems and Sustainable Agriculture				1		2						2	3		1

34	22AGRO 204	Irrigation Water Management						3		3				2	3		1
35	22SMCA 201	Statistical Methods			2				3						3		2
36	22LSPM 201	Live-stock and Poultry Management									2	3					3
37	22SSAC 221	Manures, Fertilizers and Soil Fertility Management			2									2	3		1
38	22AECO 242	Agricultural Marketing, Trade and Prices							2		2	2	3		3		2
39	22AENG 252	Renewable Energy and Green Technology	1	1	3		2	3	2		1	2	2	2			3
40	22HORT 282	Production Technology for Ornamental Crops, Medicinal and Aromatic Plants and Landscaping	2	2	1		2		3		1	3		1	3		2
41	22AEXT292	Entrepreneurship Development and Business Communication								1	2				2		3
42	22AGRO 301	Geoinformatics and Nanotechnology for Precision Farming	3		1	1	2		2	1	3		1	1	3		2
43	22AGRO 302	Practical Crop Production			1						3			2	3		1
44	22BICM 300	Principles of Food Science and Nutrition			2	3									2		3
45	22GPBR 311	Crop Improvement - I (<i>Cereals, Millets, Pulses and Oilseeds</i>)	1	3			2						2	2	3		1
46	22GPBR 313	Intellectual Property Rights			2		2		1	2		3		2	3		1
47	22SSAC 321	Problematic Soils and their Management				3								2	3		1
48	22ENTO 331	Pests of Field crops and Stored Grain and their Management		2	2		3								2	3	1
49	22AENG 351	Protected Cultivation and Post-harvest technologies	2	2	1	1	3	2		2	3	2	1		2		3
50	22CPHY 361	Environmental Studies and Disaster Management	1	2	1	2	3	1						2	3		1
51	22PATH 371	Diseases of Field and Horticultural Crops and their Management - I (Field Crops)	1	3	2					2					2	3	

52	22PATH 373	Principles of Integrated Pest and Disease Management	1	3	2					2				1	2	3	
53	22AGRO303	Rainfed Agriculture and Watershed Management	3	2					3								3
54	22AGRO304	Principles of Organic Farming	3				2	1						2	3		
55	22SMCA 301	Agriculture Informatics			3			1	3	2							3
56	22GPBR312	Crop Improvement-II (Fibre, Sugar, Starches, Narcotics, Vegetables, Fruits and Flowers)			3			3	3	2				2	3		1
57	22GPBR314	Principles of Seed Technology	1	1	1	2	3	2	2	2	3	2	2		3		2
58	22ENTO332	Pest of Horticultural Crops and their Management and Beneficial insects				2								1	2	3	
59	22AECO341	Farm Management, Production and Resource Economics						1	1		1	2	3		3		2
60	22PATH372	Diseases of Field and Horticultural Crops and their Management -II (Horticultural Crops)	1	2	3					3					2	3	
61	22HORT381	Post-harvest Management and Value Addition of Fruits and Vegetables			2								3		3	1	2
62	22AEXT391	Communication Skills and Personality Development								3	2			3			2
63	22RAWE	Crop Production	3												3		
64	22RAWE	Crop Protection		3				3								3	
65	22RAWE	Rural Economics				3			3					3			2
66	22RAWE	Extension Programme			3					3				3			2
67	22RAWE	Research Station / KVK / DAATT Centre activities and attachment to Agro based industries					3				3			3			2
68	22ELP	Experiential Learning Programme (ELP)						3					3	3			2
69	22 ELCT 222	Soil, Plant, Water and Seed Testing	1		3										3		

70	22 ELCT 272	Food Safety Issues	1	1	1			2		2			3		2	
71	22 ELCT 283	Hi-tech. Horticulture	3		2										3	
72	22 ELCT 305	Agricultural Waste Management	1	2		2				3						3
73	22 ELCT 306	Weed Management		1		2				3					3	
74	22 ELCT 315	Commercial Plant Breeding	2		2	2	1			3					3	
75	22 ELCT 333	Biopesticides and Biofertilizers	1			2										3
76	22 ELCT 334	Agrochemicals			1					1						3
77	22 ELCT 342	Agribusiness Management							1				2			3
78	22 ELCT 362	Micro propagation Technologies						2			1				3	
79	22 ELCT 382	Landscaping								2			3		3	
80	22 ELCT 383	Protected Cultivation					3					2			3	

COURSE ARTICULATION MATRIX-2023-24

S.No.	Course Code	Course Title	CO NO	Description of the Course Outcome	1	2	3	4	5	6	7	8	9	10	11			
1	22AGRO101	Agricultural Heritage	CO1	Understand ancient agricultural practices and it's relevance to modern agriculture practices and appreciate the agriculture practiced throughout the world and to know the richness of agricultural heritage in India	1					1								
			CO2	Understand judicious traditional agricultural practices and relate with modern methods and Our journey (Developments) in agriculture and vision for the Future	1		1											
			CO3	Illustrate how we can make use of agricultural resources	2													
			CO4	Understand agricultural concepts	3													
2	22AGRO102	Fundamentals of Agronomy	CO1	Understand the principles of agronomy often involves a summoning of resources from related disciplines such as Botany, Soil Science, Irrigation, plant protection, Plant Genetics and Breeding, Agrometeorology etc						1		2						
			CO2	Understand the various nutrients and their effects on plant health and Plan irrigation measures for plant growth and development			1		2		3							
			CO3	Illustrate the weeds in a field. Plan for sustainable agricultural production, and apply scientific methods and tools in field preparation and for designing cropping			1		2		3							
			CO4	Illustrate the impact of the professional agricultural solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development			1		2		3							

3	22BICM101	Fundamental of Biochemistry and Biotechnology	CO5	Demonstrate and Identification and proper crop management practices with practical knowledge to produce food for humans. Learning aspects to do calculations on fertilizers dose and water requirement for crops and also usage of different tillage implements			1			2		3						
			CO1	Memorize the knowledge on Carbohydrates, Lipids and Proteins		1												
			CO2	Understand the enzymes and nucleic acids functions				1		2								
			CO3	Apply the metabolic pathways to plants.		1	2									3		
			CO4	Apply the biotechnology in crop improvement						1		2	3	4		5		
			CO5	Apply the qualitative test for Carbohydrates, amino acids, and Nucleic acids				1			2							
4	22ENGL101	Comprehensio& Communication Skills in English	CO1	Understand the various types of passages to know the theme,tone,andmainideaofthepassageandimprovelistening skills.									1					
			CO2	Understand and apply the concepts of writing skill for draftingprofessional transactions.									2					
			CO3	Practicetelephoneetiquetteatdifferentofficial/informal contexts											3			
			CO4	Recognize and reproduce English sounds											1			
			CO5	Practicing Communication skills.											3			

5	22SSAC121	Fundamentals of Soil Science	CO1	Understand the basic concepts of Rocks and Minerals and their association with the protolith and Soil Profile			1												
			CO2	Understand the physical soil properties and water movement in soil			2												
			CO3	Understand chemical properties of soil and colloids			3												
			CO4	Understand soil biology, and soil group of India			1												
			CO5	To Understand/Determination phase and chemical properties of soil through experiments			2												
6	22AEEO141	Fundamentals of Economics	CO1	understand the nature, scope and subject matter of economics							1								
			CO2	understand the consumer and producer's behaviour								2							
			CO3	understand the different market forms, factor pricing and public finance											3				
			CO4	understand the concepts associated with national income, population, banking and economic system.					2										
7	22HORT181	Fundamentals of Horticulture	CO1	Understand the scope and importance of horticulture, divisions of horticulture, classification of horticultural crops, climate and soil requirements	1		2												
			CO2	Application of propagation methods and orchard establishment.	2		3												
			CO3	Apply knowledge of aspects of orchard management viz training, pruning, management of juvenility, flower bud differentiation and unfruitfulness problems in addition to vegetable and ornamental gardens.			1												
			CO4	Apply knowledge of fertiliser and irrigation management schedules in addition to lawn making and use of growth regulators.			3												
			CO5	Implement basic plant propagation and irrigation methods.	1		2												
8	22AEXT190	Human Values & Ethics (non gradial)	CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession	1									2					
			CO2	Understand the Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, Ethics- Professional, environmental, ICT.	1										3				

			CO3	Understand the Positive attitude and scientific temper, Teamwork and volunteering, Rights and responsibilities, Road safety, Human relations and family harmony, modern challenges and value conflict	1										3					
			CO4	Understand the role of a human being in ensuring harmony in society and nature and Sensitization against drug abuse and other social evils, by developing personal code of conduct (SWOT/SWOC/SNAC Analysis).	1										2					
9	22AEXT191	Sociology & Educational Psychology	CO1	Evaluate the knowledge of rural sociology its importance and characteristics of Indian rural society, social groups, social stratification, in agricultural extension	1										2					
			CO2	Explain the concept of educational psychology, intelligence, perceptions, in agricultural extension	1				2											
			CO3	Apply the knowledge of culture, social values, social institutions, and social change, social control and attitudes, leadership and training in Agricultural Extension	1				2											
			CO4	Apply educational psychological methods to assess farmer's personality and understand different types of emotions, frustrationdeterminants, and motivate them by different teaching learning methods, to bring in a behavioural change	1				2											
			CO5	Apply and understand the Rural sociology and educational psychology for practical purpose.	1				2											

10	22COCA100	NSS/NCC/Physical Education and Yoga Practices	CO5	NSS programmes and activities, Youth development programmes and Vocational skill development													2					
11	22AGIC 101	Introduction to computers	CO 5	Apply the basics of computers to real life and to do basic level of programming.	1																	
12	22CPHY 162	INTRODUCTORY BIOLOGY	CO1	Understand Concepts of prokaryotes and eukaryotes	1																	
			CO2	Understand Concepts of cell organelles	1																	
			CO3	Understand Concepts of morphology of flowering plants	2																	
			CO4	Understand Concepts of systematics of flowering plants	2																	
			CO5	Apply principles of morphology of plants	1																	
13	22AMBE101	Agricultural Microbiology	CO1	Explain the contributions of eminent scientists in microbial world, Role of microbes in fermentation, Protection against infection, applied aspects of Microbiology, morphological types of Bacteria	1	2	3															
			CO2	Explain the Microbial Nutrition, Metabolic pathways, Cell Division, Bacterial genetics	1	2	3															
			CO3	Explain the role of microbes in fertility of soils and plant growth, Nitrogen cycle, Nitrogen, PGPR Organisms in human welfare	1	2	3															

			CO4	Explain the Types of fermentations, Bio-fertilizers Bio-pesticides, Bio-fuel Production- Biodegradation - Biogas, Bio-manures and Composting Technologies for the welfare of agricultural society	2	1	3														
			CO5	Use basic laboratory equipment, apparatus and procedures for the study of microorganisms and to isolate and recognize major groups of microorganisms	1	2	2	2													
14	22AGRO 103	Introductory Agrometeorology and climate change	CO1	Understand agrometeorology (definitions, aims, scope and importance) and to learn about the characteristics, behaviour of the atmosphere and agroclimatic zones.	1																
			CO2	Understand roles of agrometeorology in agriculture and the changes of individual weather elements and their relation to crop production. Gain the information of weather and climate which are considered as basic input in agricultural planning		2															
			CO3	Summarize the importance of monsoon in agriculture and the management of weather hazards for improving crop productivity		3															
			CO4	Illustrate the Weather forecasting and impact of climate change on agriculture		2															
			CO5	Illustrate with the meteorological instruments and recording the observation from the agro meteorological observatory and also about the measurement and computation of different weather parameters.									2								
15	22AGRO104	Introduction to forestry	CO1	Understand various imparted basic information about various harvesting, transportation and processing systems used in the management of forest resources and production of forest products	1																
			CO2	Discuss acquainted with the management plans with multiple objectives and constraints	2																
			CO3	Understand how to develop and apply silviculture prescriptions appropriate to the management objectives															2		
			CO4	Illustrate and analyze the forest inventory information and project future forest stand and tree conditions																3	
			CO5	Apply laboratory equipment, and procedures for the study about the tree species description and aware of the growing stock and the management practices of forest										2							

16	22GPBR111	Fundamentals of Genetics	CO1	Understand the basic knowledge about the pre-mendelian and mendelian genetics, chromosome structure and function, cell division and its significance in the life processes, mendelian principle of heredity and different laws, cell structure, gene interaction studies, prediction of monohybrid and dihybrid crosses based on probability and chi-square test. Analysis of dominance and co-dominance phenomenon on the field level and farm management.	1	2														
			CO2	Understand the major characteristic features of the genetic interactions and epistatic effect, self-incompatibility, pleiotropic effect, linkage, crossing over and its significance in the plant breeding. To impart knowledge to students about the chromosome mapping and the genetic and cytological maps.			1	2	3											
			CO3	Develop and understand about sex determination and sex linkage traits, qualitative and quantitative traits, chloroplast and mitochondrial inheritance and their characteristic features. Study of biotechnological tools like DNA and RNA structure and its replication, protein synthesis at transcriptional and translational level.						2	3									
			CO4	Analyse and gain knowledge about characteristic features of protein synthesis steps, eukaryote and prokaryote gene regulation, mutations: types and role in plant breeding, methods of inducing mutations, molecular basis and significance in the plant breeding, chromosomal aberrations: deletion, duplications and their role in plant breeding, inversion types, translocation: types and role in breeding.						2	3									
			CO5	Practical study of microscope, cell structure, mitotic and meiotic cell division. Calculation based practical on probability, chi-square, monohybrid and dihybrid crosses, epistasis interactions including test and back cross, linkage determination and crossing over analysis through two point and three-point test cross data				1	2			3		2						
17	22ENTO131	Fundamentals of Entomology I	CO1	Understand various morphological structures like insect body segmentation, different parts of head, thorax and abdomen along with modifications			1													
			CO2	Understand various morphological structures like insect legs, wings, sensory organs, metamorphosis, digestive, circulatory and excretory systems.			2													

			CO3	Understand the nervous, reproductory, endocrine systems in insects and classification of Orders viz.,Orthoptera, Dictyoptera and Isoptera			3													
			CO4	Understand systematic arrangement of Hemiptera, Lepidopteta, Coleoptera and Diptera			2													
			CO5	Apply the methods of collection and preservation of insects, observe external features of insects, study the mouthparts, digestive system and reproductive system of insects by dissection and observation and identification of different insects of some important families		2														
18	22AENG 151	SOIL AND WATER CONSERVATION ENGINEERING	CO1	Understand the concepts of soil, water, and wind erosion along with their various conservation practices	1		2													
			Co2	Comprehend about terraces, contours, and grasses waterways in order to prevent erosion at different grades of slopy land		3			2											
			CO3	Characterize the concepts of irrigation water measurement and various irrigation methods - micro-irrigation, underground pipeline system.	1		2													
			CO4	Understand the water conservation structure, and the systems associated with wells to drive water out of them to irrigate the agricultural land	1			2												
			CO5	Apply the solutions to the real-life problems through laboratories' work.	1		2			3										

19	22CPHY162	Fundamentals of Crop Physiology	CO1	Apply the basic knowledge and history of crop physiology it's important in agriculture, cell overview, seed germination and metabolic changes during seed development and plant Growth and its Development. Impart an insight into the various plant water relations.			2	3												
			CO2	Apply higher levels of learning about the Rate of transpiration and Water use efficiency in C3, C4 and CAM plants. Assimilation of mineral nutrients in crop plant and also about photosynthesis and its reaction centre in crop plant		1			2	3										
			CO3	Illustrate the mechanism of various metabolic processes in crop. The factor affecting photosynthesis, Respiration, Biosynthesis of fatty acids in plastids, Physiology of flowering, vernalizationin, Occurrence of auxin, transport of auxin, biosynthesis of auxin and its mode of action.					1				3							
			CO4	Acquire basic knowledge about growth and development in plants like Auxin, Gibberellins, Cytokinins, Abscisic acid and Ethylene. They learn about senescence, abscission and post-harvest physiology					1				2				3			
			CO5	Apply Practical study of Seed vigour and viability tests, seed germination, leaf area measurement, Growth analysis, measurement of water status in plants, leaf anatomy of C3 and C4 plants and the students has developed their skills and techniques related to crop physiology. So that they can design their own experiments.					1					2	3	2				
20	22PATH171	FUNDAMENTALS OF PLANT PATHOLOGY I	CO1	Understand the basic knowledge on the introduction of plant pathology, objective of plant pathology, history of plant diseases, plant pathogens, plant diseases, symptoms and disorders. Important plant diseases caused by fungi, bacteria, virus, spiroplasm etc. general characteristic features of plant parasitic organisms its physiological and morphological traits, its taxonomical classification.		1	2													
			CO2	Understand the major characteristic features of the Kingdom Fungi, Phylum Chytridiomycota, Phylum Zygomycota, Phylum Ascomycota, Phylum Basidiomycota, Kingdom Chromista, Protozoa.		2	3													
			CO3	Develop and understand the Phylum Basidiomycota, Sub phylum, Kingdom Chromista, their classification and different characteristic features.		1	2													

			CO4	Gain knowledge about characteristic features of Kingdom Protozoa, Characteristics features of (prokaryotes) plant pathogenic bacteria, classifications, and identification. Phylum Firmicutes, Virus and viroid, its important characteristic plant virus and viroid, classification, and taxonomy. To know about the Nematodes, importance in agriculture, general characteristics and diseases caused by plant parasitic nematodes.		1	2													
			CO5	Practical study on Microscopy, morphological identification of different fungi, disease symptoms caused by pathogen. Phytopathogenic bacteria isolation and its characteristics, transmission of plant virus and plant parasitic nematodes.	1	3	2													
21	22HORT182	Production Technology for Fruits and plantation crops	CO1	Understand the basics of fruit and plantation crop industry	1		2													
			CO2	Apply principles of crop production of major fruit crops	3		2													
			CO3	Apply principles of crop production of minor fruit crops and plantation crops	1		2													
			CO4	Apply principles of crop production of cashew, tea, coffee and rubber	1			3												
			CO5	Hands on approach on identification of suitable crop varieties, pests and diseases in fruit crops	1			2												
22	20AGRO 201	CROP PRODUCTION TECHNOLOGY-I	CO1	Illustrate about origin, geographical distribution, and economic importance of Kharif crops.					1		3									
			CO2	Illustrate about Soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.			1		2		3									
			CO3	Apply the constraints in production of oilseeds and pulses maybe identified through course content.			1		2		3									
			CO4	Apply the production technology of Kharif cereals and millets fulfil the need of human consumption and milch cattle. Analysis of comparative benefits of the different kharif crops			1		2		3									
			CO5	Demonstrate on seed to seed of field management practices and also identification of growth stages critical stages, pest and disease management etc. Which can be solved at field level. Also, complete awareness on crop cultivation practices of Kharif crops			1		2		3									

23	22GPBR211	Fundamentals of Plant Breeding	CO1	Understand the basic knowledge about the plant breeding, modes of reproductions, self and cross pollination, self-incompatibility and male sterility in crops. Study about the plant introduction agencies in India and their role.	1	2														
			CO2	Gain knowledge and expertise in different breeding methods for self-pollinated and cross-pollinated crops and concept of population genetics and manage the crops on field level and statistical analysis.			1	2	6											
			CO3	Become expert in the genetic basis of heterosis, inbreeding depression to solve the agricultural problems and development of inbred lines, hybrids, composite and synthetic varieties. To be well versed with different methodologies for asexually propagated crops and wide hybridization area.						2	3									
			CO4	Analyse and gain knowledge about the polyploidy and mutation breeding concepts. To be able to help in Agricultural Research Systems in the areas of crop improvement through breeding for important biotic and abiotic stresses involving both conventional and biotechnological approaches.				1				2	3							
			CO5	Practical study of germplasm in various crops, emasculation and hybridization techniques in self and cross- pollinated crops. Study of male sterility systems, Analysing statistical parameters, design, heterosis, heritability estimation and prediction of hybrid performance on field level and work out the extent of natural out crossing in crops.				1	2			3	2							
24	22ENTO231	FUNDAMENTALS OF ENTOMOLOGY II (INSECT ECOLOGY AND CONCEPTS OF IPM)	CO1	Understand various abiotic and biotic factors of insect ecology			1													
			CO2	Acquainted with the concepts, components and tools of Integrated Pest Management			2													
			CO3	Acquainted with the mechanical, physical, biological and microbial control of insects			3													
			CO4	Awareness of recent formulations and application methods of chemical control of insects		2														
			CO5	Apply of sampling techniques, calculations of insecticides doses, mass multiplication of biological agents and identification of non-insect pests		3														

25	22AECO241	Agricultural Finance and Co-operation	CO1	understand the importance of credit in agriculture and the criteria to avail credit															1					
			CO2	recognize the source of credit, crop loan system, and financial inclusion.																	2			
			CO3	identify the different schemes for financing weaker sections, also Understand higher financing agencies present in India and world along with crop insurance schemes																		3		
			CO4	understand the agricultural project and its cycle, cooperation, and its history along with cooperative institutions in India																		2		
			CO5	Analysing the progress of priority sector lending, working out different repayment plans and prepare balance sheet along with income statement																		3		

26	22UC1102J	Design Thinking & Innovation	CO1	Understand the importance of Design thinking process for contextualized problems.	2				3											
			CO2	Analyze define, and ideate for solutions			3			2										
			CO3	Develop and test the prototype made.					1	2										
			CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity.					1		2									
27	22UC1102	Design Thinking & Innovation	CO1	Understand the importance of Design thinking process for contextualized problems.	2				3											
			CO2	Analyze define, and ideate for solutions			3			2										
			CO3	Develop and test the prototype made.					1	2										
			CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity.					1		2									
28	22AENG251	Farm Machinery and Power	CO1	Understand the working principles of IC engines with its different components and terminologies						3	1									
			CO2	Characterize the primary and secondary tillage implements with its functions, constructions and maintenance.						3	1									
			CO3	Comprehend the details of harrows, sowing equipment, and harvesting equipment.							3	1								
			CO4	Understand the systems of tractor mounted equipments for land development and soil conservation.							3	1								
			CO5	Apply the field equipments knowledge into the agricultural field.		2					3	1								
29	22CPHY26 1	Eco-Physiology	CO1	Basic principles of Ecosystem, structure, components, types of ecosystem, types of food chains, pathways of energy in the biosphere and Agro-climatic zones of India – Crop distribution in India and Andhra Pradesh.	3	2								1						

			CO2	Basic processes in physiology and their environments Edaphic factors and their Classification, Physiographic factors of Land, and Biotic and abiotic Factor affecting in Plants	1	2				3											
			CO3	Physiological approaches for climate resilient in agriculture. Knowledge of Allopathy and Phyto- remediation in agriculture		2						3									
			CO4	The impact of different Pollution, Global warming, Controlled environment and Effects on crop yields and limitations.		2					1	1									
			CO5	To study Hydrophytes, Mesophytes, Xerophytes and the effects of light and shade on crop growth, competition in crop plants and soil pollution on crop growth,				3	2	1											
			CO1	Understand the history of plant pathology, terms and concept of plant pathology, survival of plant pathogens, dispersal of plant pathogens.	1	1	2	3													
30	22PATH271	Fundamentals of Plant Pathology-II (Plant Pathology Principles)	CO2	Understand the phenomenon of infection, pathogenesis, toxins, defense mechanisms in plant.	1			3	2	1	1										
			CO3	Develop and understand biochemical defense mechanism, general principles of plant disease management, eradication- cultural methods, physical methods of eradication.					2	2											
			CO4	Gain knowledge about important fungal and bacterial biocontrol agents, contact and systemic fungicides, contact and systemic fungicides, mode of action and formulations of fungicides, introduction to botanicals and other non-chemical preparations etc.				3	2												
			CO5	Practical study on various laboratory equipments, preparation of media, isolation and Koch's postulates. Study of fungicides and their formulations. Methods of pesticide application. Calculation of fungicide sprays concentrations. Bioassay of fungicides, Bio-control of plant pathogens, Preparation of non- chemicals and botanicals against disease management.				3					1	2							

31	22HORT281	Production Technology for Vegetables and Spices	CO1	Apply the production practices of Tomato, Brinjal & Chilli, Okra & Leafy vegetables			2	1		3									
			CO2	Apply the production practices and their management of melons			2	1		3									
			CO3	Apply the constraints in productions aspects of root and bulb crops.			2	1		3									
			CO4	Apply the scope, importance and future perspective of spices.					1	2									
			CO5	Demonstrating the seed extraction, nursery raising, direct seed sowing and transplanting, Harvesting & preparation for market, of vegetables and spices cultivation.						1	3								
32	22AEXT291	Fundamentals of Agricultural Extension	CO1	Understand the term Education; Extension Programme planning Meaning, Process, Principles and Steps in Programme Development Agricultural developmental programs launched by different organisations in India	3	1													
			CO2	Analyse the Agricultural developmental programs and new trends in Agricultural Extension, and community development and Rural development in India	3							1							
			CO3	Analyse the Panchayat Raj system, poverty alleviation programs, women development programs, PRA, rural leadership and training and administration of extension in rural areas	3							2							
			CO4	Explain the transfer of technology, training of farmers, Extension teaching methods, functions of communication methods, Agriculture journalism, Diffusion and adoption of innovation and its characteristics.	2							3	1						
			CO5	Use different types of extension teaching methods evaluation and visits relevant to the course under practical work.	2							3	1						

33	22COCA200	Education Tour	CO5	Visit to the research station to impart research to the students			1					3									
34	22AGRO202	Crop Production Technology-II (Oil seeds, Fibre, Sugar, Tobacco and Fodder crops)	CO1	Illustrate with the knowledge of profitable crop Production technology.	2						3										
			CO2	Complete knowledge on Origin, geographical distribution, economic importance, soil and climatic Requirements, important varieties, pest, and diseases resistance varieties, cultural practices, and yield of Rabi crops			1	2			3										
			CO3	Apply on Identification on different weeds in rabi season crops like Pulses, oilseeds, sugar crops and forage crops with details study on improving their package and practices and storage technologies					2	1				2							
			CO4	Illustrate with proper knowledge about irrigation scheduling in Rabi season crops, the additional area can Increase of low water required crops.			2			2	3										
			CO5	Demonstrate on seed to seed of field management practices and also identification of growth stages critical stages, pest and disease management etc. Which can be solved at field level. Also, complete awareness on crop cultivation practices of Rabi crops			1	2			3										
35	22AGR O203	Farming Systems and Sustainability	CO1	Apply major aspects of agricultural practices and traditions through time and throughout the world.					3		2										

			CO2	Illustrate with gaining knowledge about general relationships among culture, economics, politics, science, and agricultural development.			1	2			3								
			CO3	Apply various enterprises including farming system. Students studied types of farming, crop rotation and other practices of field.			1				3	2							
			CO4	Apply to show how agricultural scientists are attempting to minimize agricultural pollution and sustain food production adequate for the world's population	2	3						1	1						
36	22AGRO204	Irrigation Water Management	CO1	Illustrate the knowledge of irrigation water management to maximising crop yield and quality by developing irrigation and water management techniques can help growers demonstrate best practice to retailers and consumers.			2			1	1								
			CO2	Apply the ways for growers to improve crop performance by evaluating the different types of irrigation and water managements systems available.			2			3		1							
			CO3	Apply the knowledge of various irrigation methods which are more efficient to minimize the water loss and improve the water use efficiency of crop and water requirements of the crops,			2			3		1							
			CO4	Apply the knowledge on Water requirements of crops, soil-plant- relationship, Irrigation requirements, duty and delta, Irrigation efficiencies, methods of irrigation, Quality of irrigation water.			2	3			1		1						
			CO5	Demonstrate on increasing need for efficient and effective irrigation and water management to maximize crop yield and quality whilst making best use of the water available.			3			2									

37	22SMCA201	Statistical Methods	CO1	Understand various definitions of Statistics - Singular and plural reference of Statistics - A comprehensive definition of Statistics - Importance of Statistics in agriculture - limitations of statistics	3	2	1														
			CO2	Understand the Probability – Addition - Multiplication theorems - Binomial and Poisson distributions	3	2	1														
			CO3	Understand the Chi-Square test for 2x 2 and m x n contingency Table - Yate's correction for Continuity, Correlation, regression, ANOVA and block designs.	3	2	1														
			CO4	Understand ANOVA with Two way Classification (RBD) - Layout and analysis, Advantages and disadvantages, Sampling methods.	3	2	1														
			CO5	Analyze the data using various descriptive and inferential statistics using R/Excel	3	2	1														
38	22LSPM201	Live-stock and Poultry Management	CO1	Understand the role and importance of live-stock			2		3	2											
			CO2	Apply principles of livestock rearing			2		3	1											
			CO3	Apply principles of Management of different types of cattle			2		3	1											
			CO4	Apply principles of Formulation of rations and feeding			2		3	1											
			CO5	Identification methods of farm animals and poultry and identification methods of farm animals and poultry			2		3	1											
39	22SSAC221	Manures, Fertilizers	CO1	Introduction - Scientists responsible for the essentiality of nutrients- Essential nutrients –	2	3															

				Deficiency symptoms of nutrients -Nitrogen - Leaching losses of nitrate nitrogen – Phosphorus - Potassium																	
			CO2	Calcium - Sulphur - Micronutrient - Zn and Mn - Fe and Cu -Boron and Molybdenum - Chlorine - Soil fertility Evaluation	1	3															
			CO3	Plant analysis – Soil test based fertilizers recommendation -Nutrient use efficiency - Methods of application of nutrients underrained and irrigated conditions - Introduction and importance oforganic manures - Bulky organic manures – Compost andcomposting – Methods of preparation of rural and urban compost.	1	3															
			CO4	Green manures –Definitions of penning, sewage, sewerage, sullage, poudrette, Activated compost process - Chemical fertilizers –Phosphatic fertilizers – Secondary and micronutrient fertilizers – Amendments - Mixed fertilizers –Fertilizer Control Order (FCO)	1	2	3														
			CO5	Acquaint with the analytical instruments and recording theobservations from the soil samples and plant samples and also about the estimation and identification of different nutrients.	2	1	3				2										
			40	22AECO242	Agricultural Marketing, Trade and Prices	CO1	Understand the concept of market and its types, demand-supply of farm products, exchange functions, facilitating functions and market functionaries									3	2				
CO2	Understanding the marketing channels, supply chain, marketing mix, product life cycle, pricing, market promotion, segmentation, and integration													3	2						
CO3	Explain the marketing costs, margins, and price spread, regulated markets, APMC, cooperative													3	2						

				marketing, types of risk in marketing, future trading and commodity exchanges																	
				CO4 Describe the agricultural product price, CACP, MSP, international trade, WTO and its agreements, TRIPS and IPR in Indian agriculture								1	3	2							
				CO5 Analyse elasticities and plot demand supply curve for agricultural commodities, study market arrival, prices, and comparative advantage, compute marketable and marketed surplus, construct index numbers, estimate costs, margins and price spread								1	3	2							
41	22AENG252	Renewable Energy and Green Technology	CO1	Understand the classification of biogas plant with to produce the energy from biogas.				1	2					3							
			CO2	Characterize the gasifiers, solar energy and solar appliances.					2						3						
			CO3	Comprehend the solar heating and cooling, photovoltaic system, and wind energy.					2							3					
			CO4	Understand the details of wind mills, biofuels, biodiesel production and ethanol from agriculture produce.			3		2												
			CO5	Apply the lab experiments knowledge by performing 3 various experiments in renewable energy.				1		2											
42	22HORT282	Production Technology for Ornamental Crops, Medicinal and Aromatic Plants and Landscaping	CO1	Understand the importance and scope of ornamental crops and landscaping			2	1						1							
			CO2	Apply the production practices of commercial flowers in protected cultivation.				3		1					2						
			CO3	Apply the scope, importance and future prospectus in cultivation of medicinal and aromatic plants.				3		1						2					
			CO4	Apply the techniques of processing and value addition in ornamental crops and MAPs produce				3	1							2					

			CO5	Apply nursery techniques viz. bed preparation, seed sowing, training and pruning, harvesting and post- harvest handling of cut and loose flowers.							3	2	1							
43	22AEXT292	Entrepreneurship Development and Business Communication	CO1	Analyze the business environment in order to identify business opportunities, and learn the basic terms entrepreneurship developmental programs	2							3	1	1						
			Co2	Explain the Generation, incubation and commercialization of business ideas and SWOT analysis and government policies for the rural economic development. And identify the elements of success of entrepreneurial ventures,				3				3	1	1						
			CO3	Consider the legal and financial conditions for starting a business venture, and stems in establishment of MSME management	3								3							
			CO4	Evaluate the effectiveness of different entrepreneurial strategies, program planning, marketing skills and assessment of entrepreneurial skills.	2								1	3	1					
			CO5	Specify the basic performance indicators of entrepreneurial activity, Field visits to study any one Agri - based industries/ business – Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. And go to the visit to different industries to understand the business skills under practical work	2								1	3	1					
44	22AGRO30 1	Geoinformatics and Nanotechnology	CO1	Understand precision agriculture concepts and techniques, principles and practices, geoinformatics concepts, use and crop discrimination monitoring techniques	1			2		2										

			<p>CO2 Understand geodesy principles, management of spatial data, global positioning system and application of nanotechnology in rainfed agriculture.</p> <p>CO3 Describe about cartography, application of remote sensing techniques in rainfed agriculture, fertilizer recommendation using geospatial technologies in precision farming</p> <p>CO4 Apply geo referencing, Nanotechnology concepts and techniques, nano sensors, Nano-fertilizers and nano pesticides</p> <p>CO5 Apply knowledge on use of GPS for watershed management, crop yield, GIS software, image processing software, remote sensing and nano technology</p>	1				1	2		3						
45	22AGRO302	Practical Crop Production	<p>CO5 To know cultivation technology of different crops in respect to different situations and understand crop cycle, environmental requirements, agronomic management and economics of crop production.</p>						3								
46	22BICM300	Principles of Food Science and Nutrition	<p>CO1 Evaluate the information on food science and nutrition issues appearing in the popular press.</p> <p>Co2 Discuss the important pathogen and spoilage microorganism in foods, and preservation techniques</p> <p>CO3 Discuss basic principles and practices of cleaning and sanitation in food preparation operation</p> <p>CO4 Explain the malnutrition, energy metabolism, balanced diet, menu planning and new trends in food science and nutrition in maintaining health.</p>	3							2						
				3	1												
											3						

48	22GPBR3 13	Intellectual Property Rights	CO1 Understand the basic knowledge about the IPR, different organizations working under IPR. Study about the treaties for IPR protection and types of IPR and legislations covering IPR in India.	3			1											
47	20GPBR311	Crop Improvement-I (Cereals, Millets, Pulses and Oil Seeds)	CO1 Memorize the basic knowledge about the plant breeding. Study about the conventional and modern innovative approaches for the development of hybrids/varieties in cereals like wheat, barley and rice.	2	1													
			CO2 Explain the different breeding methods for the development of hybrids and varieties in major and minor millets.	2	1				3									
			CO3 Understand the knowledge regarding the conventional and modern innovative approaches for the development of hybrids or varieties in pulses like, chickpea, pigeonpea, urd bean, mung bean, soybean, cowpea and horsegram and field management.	2	1				3									
			CO4 Assign the breeding procedures in oilseeds. To be able to help in Agricultural Research Systems in the areas of crop improvement through conventional and modern innovative approaches for the development of hybrids and varieties in oilseed crops like groundnut, castor, sesame, sunflower, safflower, rapeseed, mustard, linseed, niger, coconut and oil palm.	1	1				2									
			CO5 Employ the knowledge about the floral biology, emasculation and pollination techniques in cereals, millets, pulses and oilseeds. Visit to Agriculture research stations/AICRP projects and policies of crops. To gain knowledge about the parentage of released varieties and about the specialized characters in various crops.			1			3	1								

			<p>CO2 Explain the patent systems in India and management strategies related to patent allied activities. To be well versed with different methodologies for UPOV for protection of plant varieties and plant breeders' rights and utilization of agriculture technologies to modernize it.</p>	3	2															
			<p>CO3 Assign the registry of plant varieties under PPV&FR Act, 2001, breeders' rights, researcher rights, farmers rights and rights of TK holders and their management in the agriculture research system.</p>	1								3								
			<p>CO4 Adapt the knowledge about the convention of biological diversity. To be able to help in Agricultural Research Systems through the gain of knowledge regarding the international treaties on plant genetic resources for food and agriculture. To impart knowledge to make the environment safe i.e., Indian biological diversity act, 2002 and its salient features, access and benefit sharing.</p>				3			2										
49	22SSAC321	Problematic soils and their Management	<p>CO1 To understand the concepts of problematic soils, definition, distribution in India and Andhra Pradesh. Saline and sodic soils visual symptoms, characteristic features, Effect of salinity and sodicity on plant growth and development, reclamation measures and management practices</p>	1			3													
			<p>CO2 To apply the concepts of acid, acid sulphate soils area, distribution in India and andhra pradesh. Land degradation problems and sources of polluted soils</p>				2			3										
			<p>CO3 To analyze the soil pollution management practices, Bio remediation problems and Land capability and land suitability classification</p>	2			3			1										
			<p>CO4 To apply the concepts of Remote sensing and GIS techniques, Soil healthy and Quality, Irrigation water</p>	2			3													

				quality standards, Guidelines for judging the water quality.															
			CO5	To analyze the problematic soils identification, determination of infiltration rate, pH, EC, ESP,GR,LR, CaCO ₃ , Ca and Mg, CO ₃ and HCO ₃ , Na and K, RSC and SAR	1		3	2											
50	22ENTO331	Pests of Field Crops and Stored Grain and their Management	CO1	Study of Economic Entomology, Rice and Sorghum pests		1	3												
			CO2	Acquainted with the pests of Sugarcane, cotton and other fiber crops		1	3												
			CO3	Acquainted with the pests of oil seeds and pulses		1	3												
			CO4	Awareness of stored grain pests and their management		1	3												
			CO5	Evaluation of crop pests and stored grain pests damage		1	3												
51	22AENG351	Protected Cultivation and Post-Harvest Technologies	CO1	Understand the greenhouse gases with it's type, shape and response to the environment.	1		2	2	3										
			CO2	Comprehend the planning and construction of greenhouse gas chamber.	1			3	2										
			CO3	Understand the details of post-harvest equipment used in grains processing after harvest from the field.	1				2	3									
			CO4	Characterize the drying, moisture measurement and handling and grains during post-harvest operation.	1					2									
			CO5	Apply the greenhouse gas chamber and food processing operations from the lab to land condition.	1			3		2									
52	22CPH Y361	Environmental Studies	CO1	Understand the basic knowledge about the Environmental studies - Natural resources - Renewable and non-renewable resources, Water	1	3													

			resources – Sources, uses and over utilization of surface and groundwater - Dams – Benefits and problems, Food resources – Food sources, world food problems and food security																
			CO2 Gain knowledge and expertise in different Energy resources – Renewable and non-renewable energy sources, Land resources – Land degradation, desertification and land use planning, Biodiversity – Definition – Types of biodiversity – Bio-geographical classification in India, Threats to biodiversity – Habitat loss – Poaching of wildlife – Man-wild life conflicts.				2	3											
			CO3 Develop and understand the knowledge regarding the Environmental, Causes, effects and control measures of soil pollution, Causes, effects and control measures of thermal, marine and noise pollution, Solid waste management – Need of waste management – Types of solid waste – Management processing technologies.			2			3										
			CO4 Analyse and gain knowledge about the Disaster management - Natural Disasters, Man-made disasters – Nuclear disasters, chemical disasters, biological disasters, International strategy for disaster reduction - Concept of disaster management - National disaster management framework - Financial arrangements - Role of NGOs, community based organizations and media, Central, state, district and local administration, Social issues and the environment – Unsustainable to sustainable development – The Environment Protection Act, Human immuno-deficiency virus (HIV)/ Acquired Immunodeficiency Syndrome (AIDS) – Role of information technology on environment and human health.	3		2			1										

				CO5	Practical study of Collection, processing and storage of effluent samples and Determination of chemical oxygen demand in waste water sample also how to Estimation of dissolved oxygen in waste water sample and Assessment of chlorophyll content in plants and gain knowledge about the parentage of released varieties and about the specialized characters in various crops.	1					2	3										
53	22PATH371	Diseases of Field and Horticultural crops and their Management – I (Field Crops)		CO1	Understand the symptom, etiology, disease cycle and management of major diseases of the crops Rice, Wheat, Sorghum.		3	1	2													
				CO2	Understand the symptom, etiology, disease cycle and management of major diseases of the crops Sorghum, Maize, Bajra, Ragi, Cotton, Sugarcane.		3	1	2													
				CO3	Develop and understand the symptom, etiology, disease cycle and management of major diseases of the crops Sugarcane, Tobacco, Groundnut, Sesamum, Castor, Sunflower.		3	1	2													
				CO4	Gain knowledge about the symptom, etiology, disease cycle and management of major diseases of the crops Safflower, Mustard, Red gram, Bengal gram, Black gram and Green gram, Soybean, Cowpea.		3	1	2													
				CO5	Practical study on identification and histopathological studies of selected diseases of field crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium.		3	1	2	2												
54	22PATH373	Principles of Integrated Pest and	CO1	By the end of the course students will know the insect pests and diseases, IPM (Introduction, history, importance, concepts, principles, and tools of IPM). Economic importance of insect pests, diseases, and	1	3	2		2													

			pest risk analysis, Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of economic threshold level.																
			CO2 Students will understand the impact of plant Diseases, Disease severity, and Area under the Disease Progress Curve. They will be able to recognize many ways of managing. Host plant resistance, mechanical, physical, legislative, biological, and chemical measures.			3	2												
			CO3 Students will be able to apply the calculations and dynamics, detection and diagnostic of insect pests, ecological principles, and crop management by implementing the different methods of IPM. And also develop and understand the ecological management of crop environment. Introduction to conventional pesticides for insect pests and disease management.			3	2												
			CO4 Students will be able to solve and give awareness about the safety issues in pesticides, legislative measures, IPM, issues on Environmental impact, Farmer participation, Government and other organizations. Gain knowledge on survey, surveillance and forecasting of Insect pests and diseases. Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide use. The political soci and legal implication of IPM. Case history			3	2												
			CO5 Practical study on various laboratory Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield	1	3		2			2									

			losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of Trichoderma, 136 Pseudomonas, Trichogramma, NPV etc. Identification and nature of damage of important insect pests and diseases and their management.																		
55	22ELCT333	Biopesticides and Biofertilizers	CO1	To apply History and concept, Importance, scope and potential and classification of biopesticides and their advantages and limitations. To apply Entomopathogenic viruses, Entomopathogenic fungi, Entomopathogenic Protozoa, Entomopathogenic Nematodes and Botanical pesticides against pests.	2		3														
			CO2	To apply Biorationals and to Mass produce Entomopathogenic bacteria, Entomopathogenic virus, Entomopathogenic fungi, Entomopathogenic protozoa and EPN, Formulations, Methods of quality control and techniques of bio pesticide evaluation and Impediments or limitations in mass production and use of biopesticides		2	3														
			CO3	To apply Introduction, status and scope, Structure and characteristic features of bacterial biofertilizers and to apply Rhizobium, Azotobacter, Azospirillum, Mechanism of phosphate solubilization and Actinorrhizal Symbiotic N2 fixer-Frankia			3														
			CO4	To apply Cynobacterial biofertilizers, Fungal biofertilizers, Nitrogen fixation, Production technology, FCO specifications and quality control, Application technology, Storage, shelf life, quality control and Factors influencing the efficacy of biofertilizers			3														

			CO5	To analyze mass production technology of bacteria, Entomopathogenic virus, Entomopathogenic fungi, EPN, preparation of important botanical insecticides, Isolation of Rhizobium, Azospirillum and Azotobacter, P and K solubilizers and Mass production technology of BGA, Azolla, Isolation of and purification of VAM and Quality assessment of different biofertilizers	2	3	3	2													
56	22ELCT342	Agribusiness Management	CO1	Learning and Understanding the basics of various fundamental concepts in Agribusiness management. These basic concepts are needed for further proper understanding of the course and subject.							3	2	1								
			CO2	Understanding the concept of how to enter a market or industry. The requirements to build a factory/plant/company for goods production or service production. The marketing techniques that can be used will be understood.									3	2							
			CO3	Understanding the next steps after planning and setting up of a factory/plant/company. To decide on the product mix, the packaging decisions, selling strategy. Capital management, financial awareness for establishing a business with strong foundation will be understood.										3							
			CO4	Understanding various techniques of appraisal of the business in terms of finance, product, market share etc. Understanding the product and project cycle to know what kind of decisions to be made at what time.											3						
			CO5	Balance sheet analysis, profit & Loss analysis, Break even analysis, Financial ratio analysis for a business, planning of a hypothetical business to understand the real world situations and problems that one has to face during setting up of a business.											3						

57	22ELCT382	Landscaping	CO1	Understand the scope and importance landscaping and its principle, Garden types, Terrace gardening, Vertical gardening		1					3											
			CO2	Application of Garden components or features in Arches and Pergolas, Garden adornments, Lawn making, Turfing		1						3										
			CO3	Apply knowledge on Gardens for special purposes- Trees, Shrubs, Herbaceous perennials, Climber and creepers, Ornamental grasses		1						3										
			CO4	Apply knowledge on Cacti, Bio-aesthetic Planning, Landscaping of urban and rural areas, Landscaping of schools, Bonsai, Computer Aided Designs		1						3										
			CO5	Implement basic knowledge on landscaping and designing		1							3									
58	22ELCT383	Protected Cultivation	CO1	Understand the scope and importance Protected cultivation, Green houses, Greenhouse design, Cladding material involved in greenhouse, Environment control	1			2		2	3											
			CO2	Application of Soil preparation and management, Types of benches and containers, Irrigation management, Automation	1						3	2										
			CO3	Apply knowledge on Fertilizer requirement of Carnation, Chrysanthemum, Gerbera, Orchids, Anthurium, Tulip	1							2	3									
			CO4	Apply knowledge on cultivation of Tomato, Bell pepper, Cucumber, Strawberry, Pot plants, Off-season production of flowers and vegetables , Disease management in green houses	1									2								
			CO5	Implement basic knowledge on protected cultivation of commercial crops	1					3			2									

59	22AGRO304	Principles of Organic Farming	CO2	Describe different tillage practices for rainfed crops, losses due to erosion, management of rainfed crops	2																
			CO3	Discuss different harvesting structures, conservation measures, using of fertilizers in rainfed areas and the different cropping systems in rainfed regions	2																
			CO4	Apply contingent crop planning, evapotranspiration and land capability classification	2																
			CO5	Apply Acquaint practical knowledge on cropping pattern of dryland areas, cultural practices in dryland areas, soil moisture conservation measures, watershed and rainfall analysis									3								
			CO1	Discuss the concept and principles of organic production technology ³ and Role of organic farming in National economy.	3																
			CO2	To Explain the method of composting and nutrient management in organic farming.								1									
			CO3	Comprehend the details of harrows, sowing equipment, and harvesting equipment.								1									
			CO4	Understand the systems of tractor mounted equipment's for land development and soil conservation.								2									
			CO5	Apply the field equipment's knowledge into the agricultural field.												3					
60	22AENG252	AGRICULTURE INFORMATICS	CO1	Understand the computers, Hardware and software aspects.					1				2								
			CO2	Understand MS excel, word, power point.					3					2							
			CO3	Understand the internet and web.					2					2							
			CO4	Understanding the databases and programming in computers.					2					2							
			CO5	Apply principles of Agricultural informatics											3						

61	22GPBR 312	Crop improvement-I (Fibres, Sugars, Starches, Narcotics, <i>Vegetables, Fruits and Flowers</i>)	CO1	Understand the basic knowledge about the plant breeding. Study about the conventional and modern innovative approaches for the development of hybrids/varieties in fibres crop like cotton and jute and in sugar and starches.			1			1		2				
			CO2	Gain knowledge and expertise in different breeding methods for the development of hybrids and varieties in narcotics like tobacco and in vegetable crops like tomato, brinjal, chilli, okra, cucumber, cabbage, cauliflower, garlic, onions, gourds and melons.			1			1		2				
			CO3	Develop and understand the knowledge regarding the conventional and modern innovative approaches for the development of hybrids or varieties in fruit crops like banana, guava, mango, papaya, lime, lemons, apple, pomegranate and sapota and field management.			1			1		2				
			CO4	Analyse and gain knowledge about the breeding procedures in flower crops. To be able to help in Agricultural Research Systems in the areas of crop improvement through conventional and modern innovative approaches for the development of hybrids and varieties in flower crops like rose, jasmine, chrysanthemum and marigold.			1			1		2				
			CO5	Practical study of floral biology, emasculation and pollination techniques in fibres, vegetables, fruit crops and in flowers. Visit to Agriculture research stations/AICRP projects and policies of crops. To gain knowledge about the parentage of released varieties and about the specialized characters in various crops.			3			3		1				
62	22GPBR314	Principles of Seed Technology	CO1	Understand the basic knowledge about the seed and seed technology, seed quality parameters, Loss of genetic purity and its maintenance. Study about the history and development of seed industry and their functions.	1	1				3						
			CO2	Gain knowledge and expertise in seed certification programme in different crops like cereals, millets, oilseeds, pulses and fibres and farming methods along with agricultural practices						2						
			CO3	Become expert in the organic seed production strategies, identify the problems and management strategies. To be well versed with different methodologies about GoT, GMO detection through molecular and conventional approaches both on lab and field level. Study of seed processing parameters inclusive of seed drying, seed cleaning, coating, packaging, storage and marketing.			1	2			2		3			

			CO4	Analyse and gain knowledge about the seed act, central seed committee, regulation of notified varieties and seed testing parameters for quality assessment. Also, identification of good quality seeds through seed testing.				1		2	2	
			CO5	Practical study of seed production in cereals, pulses, oilseeds. Seed purity assessment both on field and lab level. GoT analysis through conventional and molecular approaches for varietal identification. Industrial visit to seed testing laboratories, seed processing plants and seed production field.			1		1	1		2
63	22ENTO 332	Pests of Horticultural crops and beneficial insects	CO1	Apply Study of Vegetable crop pests			1					
			CO2	Understand and Acquainted with the pests of Fruit crops pests			1					
			CO3	Understand and Apply Acquainted with the pests of Plantation crops			2					
			CO4	Apply Awareness of Beneficial insects and their economic importance			2					
			CO5	Apply practical principles of Pests of Horticultural crops and beneficial insects			2					
64	22PAECO 341	Farm management, production and resource economics	CO1	Understand about farm management, systems of farming, production function, factor-product relationship				1				
			CO2	Determine the optimum input and output, factor-factor and product-product relationship and study about different enterprises					1			
			CO3	Remember the meaning of cost and its function, cost-output relationship, farm inventory, farm planning and budgeting and linear programming								2
			CO4	Understand the concepts like risk and uncertainty in agriculture, economy and environmental linkages, environmental costs of economic growth, India's environmental policy							1	
			CO5	Computing depreciation cost, profitable level, least cost combination, opportunity cost, apply cost principles, farm business analysis, budget preparation, collect and analyse data on natural resource in India								

65	22PATH 372	Diseases of Field an Horticultural Crops and their Management-II (Horticultural Crops)	CO1	Understand the etiology, symptoms, host-parasite relationship and specific management practices of the following horticultural crop diseases are citrus diseases, Mango diseases, Guava, Papaya, Ber and sapota diseases	2	3													
			CO2	Understand the etiology, symptoms, host-parasite relationship and specific management practices of the following horticultural crop diseases are Grapevine diseases, Apple and peach diseases, chillies diseases, Brinjal and Okra diseases.	2	3													
			CO3	Develop and understand the etiology, symptoms, host-parasite relationship and specific management practices of the following horticultural crops diseases are Potato diseases, Tomato diseases, Crucifers and cucurbits diseases.	1	3													
			CO4	Gain knowledge and understand the etiology, symptoms, host-parasite relationship and specific management practices of the following horticultural crops diseases are Beans, Colocasia and Coriander diseases, Coconut and oil palm diseases, Turmeric, ginger, mulberry diseases, Rose diseases.	1	2													
			CO5	Practical study on various laboratory identification and histopathological studies of selected diseases of horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.	1	2	3						3						
66	22HORT 381	Post-Harvest Management and value Addition of Fruits and Vegetables	CO1	To interpret the scope and importance of post-harvest technology of fruits and vegetables			1												
			CO2	To explain about the important disease, disorders and factors responsible for post-harvest losses in fruits and vegetables.														3	
			CO3	To understand post-harvest handling, different methods storage, principles and methods of preservation.			2												
			CO4	To gain knowledge on processing, value addition and packaging of fruits and vegetables			2												

			CO5	Demonstration of chilling and freezing injury in vegetables and fruits, Extraction and preservation of pulps and juices, Preparation of products, quality control			1												
67	22AEXT391	Communication skills and personality development	CO1	Analyze basic communication skills, voice modulation, while giving presentations to the public.											1				
			CO2	Analyze intercultural communication skills, Reading and comprehension of general and technical articles and precise writing - summarizing, abstracting, individual group presentations, human behaviour.									2	1					
			CO3	Analyze interpersonal communication skills and transactional analysis.										3	2				
			CO4	Analyze public speaking communication skills, Negotiation skills, stress management and conflict management - Meaning, concept, steps and techniques, emotional intelligence, teamwork, and creativity.										2	1				
			CO5	Use the better communication methods for the better understanding of the rural people.											2				
68	22RAWE	Crop Production	CO5	Hands on experience on crop production			3								3				
69	22RAWE	Crop Protection	CO5	Hands on experience on crop protection				3											
70	22RAWE	Rural Economics	CO5	Hands on experience on rural economics					3					3					
71	22RAWE	Extension Programme	CO5	Hands on experience on rural economics			3						3						

72	22RAWE	Research Station / KVK /DAATT Centre	CO5	Apply the principles of crop production based on Research Station / KVK /DAATT Centre activities and Agro based industries	3							3									
73	22ELP	Experiential Learning Programme (ELP)	CO5	Apply the all-round principles of crop cultivation	3													3			
74	22ELCT 222	SOIL, PLANT, WATER AND SEED TESTING	CO1	Apply the working methods of testing instruments														3			
			CO2	Apply the principles of soil analysis	1																
			CO3	Apply the principles of plant testing and analysis	1																
			CO4	Apply the principles of water testing and analysis	1																
			CO5	Demonstrate techniques of soil, plant, water and seed testing	1																
75	22ELCT 272	Food safety issues	CO1	To understand the knowledge on weed biology, their classification, reproduction and characteristics of weeds, crop weed competition, survey of weeds in varied ecosystem and their management			1			2		2						3			
			CO2	To acquire knowledge on herbicide mode of action, their classification, formulations and their selectivity	1																
			CO3	To describe herbicides compatibility with nutrients, integrated weed management and management of weeds in different crops						2		2								3	
			CO4	Discuss the weed management in aquatic ecosystems, management of problematic weeds and resistance of herbicides in weeds																	
			CO5	To illustrate on Techniques of weed preservation, weed identification, Study of herbicide formulations and mixture of herbicide, Herbicide and nutrient compatibility, methods of herbicide application, spraying equipments and Calculations of herbicide doses, weed control efficiency and weed index		1					1										

76	22ELCT 283	Hi-Tech Horticulture	CO1	Understand the scope and importance of hi-horticulture, Micro propagation, Nursery management, Mechanization, Protected cultivation	3	1														
			CO2	Application of Greenhouse technologies, Micro irrigation systems, Canopy management,		1														
			CO3	Apply knowledge of High Density orcharding, Precision farming, Remote sensing, Geographical Information System, Differential Global Positioning System.		2														
			CO4	Apply knowledge of Variable Rate applicator, Precision farming, Mechanized harvesting of produce, Green food production		1														
			CO5	Implement basic knowledge on nursery and greenhouse management	3	2														
77	22ELCT 305	Agricultural Waste Management	CO1	Understand Various eco-friendly methods for agricultural waste management.	1															
			CO2	Understand Nutritive value and energy production potential of agro wastes.	2															
			CO3	Describe effectively in written essays showing the principals of waste management		2														
			CO4	Apply use of calculations and writing assignments to show effective knowledge of waste management issues as they relate to poultry production.		2														
			CO5	Illustrate on Techniques of Agriculture waste management, and critical thinking skills to show how to solve waste management problems									3							
78	22ELC T306	Weed Management	CO1	Understand the knowledge on weed biology, their classification, reproduction and characteristics of weeds, crop weed competition, survey of weeds in varied ecosystem and their management	1															

			CO2	Classify on herbicide mode of action, their classification, formulations and their selectivity		1													
			CO3	Discuss the herbicides compatibility with nutrients, integrated weed management and management of weeds in different crops				2											
			CO4	Discuss the weed management in aquatic ecosystems, management of problematic weeds and resistance of herbicides in weeds				2											
			CO5	Illustrate on Techniques of weed preservation, Weed identification, Study of herbicide formulations and mixture of herbicide, Herbicide and nutrient compatibility, methods of herbicide application, spraying equipments and Calculations of herbicide doses, weed control efficiency and weed index								3							
79	22ELCT 315	Commercial Plant Breeding	CO1	Memorize the basic knowledge of line development and genetic purity testing of hybrids.	1			2				3							
			CO2	Understand the hybrid seed production of different crops.	2				1										
			CO3	Employ the biotechnological tools for line and cultivar development.	1								2						
			CO4	Observe and understand about the IPR in plant breeding and seed production techniques for self- and cross-pollinated crops.	1		2												

CHAPTER 13
SYLLABUS

HUMANITIES AND SOCIAL SCIENCES (HSS)

i. Comprehension and Communication Skills in English (CCSE)

COURSE CODE	23ENGL101	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	Fundamental Course
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand various strategies of reading and use them in interpreting the text	2	PO9,PSO1
CO2	Understand and apply the concepts of writing skill for drafting professional transactions	3	PO9,PSO1
CO3	Understand the concepts of grammar to improve Communication Skills	4	PO9,PSO1
CO4	Demonstrate the ability in interactive skills of speaking and writing that are better suited for corporate environment.	3	PO9,PSO1
CO5	Practicing Communication skills	4	PO8,PO9, PSO1

Syllabus

Module 1	War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw. Reading Comprehension, Vocabulary-: Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations .
Module 2	Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.
Module 3	Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration.
Module 4	The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews
Module 5	practical Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussion

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Communication for Professional Structures.	E.Suresh Kumar and B.Sandhya	Orient BlackBlackswan	2013

2	Technical Communication skills	Dr. Meenakshi Raman and Dr. Sangeetha Sharma	Oxford University press: Delhi	2016
3	Living English Speech,	Stannard Allen, William	Orient Long man	1974,
4	Telephoning and Teleconferencing Skills, Hyderabad,	Ken Taylor	Orient Black Swan S	2011
5	Developing Communication Skills.	Krishna Mohan and meera Banerjee	Mc Millan India Ltd. New Delhi	1990

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

INTRODUCTORY BIOLOGY (IB)

COURSE CODE	23CPHY161	MOD E	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23CPHY161
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand Concepts of prokaryotes and eukaryotes	2	PO1,PO3
CO2	Understand Concepts of cell organelles	3	PO7,P8,PO5
CO3	Understand Concepts of morphology of flowering plants	3	PO9
CO4	Understand Concepts of systematics of flowering plants	4	PO2,PO4
CO5	Developing fundamental laboratory skills, such as handling laboratory equipment, performing basic experiments, and following safety protocols. Gaining a practical understanding of key biological concepts, such as cell structure, genetics, metabolism, and biodiversity, through hands-on experimentation and observation.	4	PO6

Syllabus

Module 1	Introduction to living world - Properties of life or living things – Growth, development and reproduction, regulation and homeostasis - Diversity of Life – Major domains/kingdoms of living beings – Bacteria (Eubacteria), Archaea (Archebacteria) and Eukarya (Protista, fungi, plantae, animalia) - Concepts of prokaryotes and eukaryotes, unicellular and multicellular organisms, plants and animals, sporophyte and gametophyte, monocots and dicots - Salient features, classification and alternation of generations of the plants of the following groups – Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms - Evolutionary relationships and differences among different kingdoms, viruses, viroids, prions and lichens and their special features. Origin of life – Theories of origin of life - Special creation, extra-terrestrial and spontaneous - Location of origin of life - Miller-Urey's experiment, Path of evolution of chemical molecules of living beings, theories of origin of cells – Endosymbiotic theory, Bubble theory. Evolution and eugenics – Theories of evolution, eugenics - History, meanings and types. Nomenclature of living beings - Basics in biological classification, need for classification, importance of classification, nomenclature – Polynomial, binomial and trinomial systems of nomenclature - Rules of binomial nomenclature, hierarchy of classification.
Module 2	Cells – Cell structure and organization of plants and animals - Cell theory and cell as the basic unit of life - Overview of the cell. Prokaryotic cells, ultra structure of plant cell (structure in detail and functions in brief) - Cell membrane, cell wall, cell organelles - Morphology and function: Endoplasmic reticulum, mitochondria, plastids, ribosomes, golgi bodies, vacuoles, lysosomes, microbodies, centrosome and centriole, cilia, flagella, cytoskeleton and nucleus. Chromosomes -Number, structural organization - Nucleosome. Cell cycle, cell division - Somatic cell division or mitosis – Stages and phases - Reproductive cell division or meiosis – Stages and phases and significance. Morphology of flowering plants - Roots - Characters, types and modifications of roots, basic external and internal structural organization of root in monocots and dicots.
Module 3	Morphology of flowering plants - Stems - Characters, functions and modification of stems - Basic external and internal structural organization of stem in monocots and dicots. Morphology of flowering plants - Leaf - Parts, functions, types and modifications of leaves - Leaf venation and phyllotaxy. Morphology of flowering plants - Inflorescence - types of inflorescences, types of racemose inflorescence, types of cymose inflorescence - Special types of inflorescences. Morphology of flowering plants - Flower - Structure and parts of flower, types of flowers based on sex distribution, structural symmetry, position of gynoecium, aestivation - Description of types of calyx, corolla, stamens and ovary; Seed - Structure and organization of seed in monocots and dicots - Seed germination - Necessary conditions for germination.
Module 4	Plant systematics – Brassicaceae - Distribution, important plants, economic importance, vegetative and floral characters, pollination, fruit and seed characters. Plant systematics - Fabaceae - Distribution, important plants, economic importance, vegetative and floral characters, pollination, fruit and seed characters. Plant systematics - Poaceae - Distribution, important plants, economic importance, vegetative and floral characters, pollination, fruit and seed characters. Role of animals in agriculture–Animals of draught and milch, fur, wool, etc. - Different animal products used as manure.
Module 5	External morphology of monocot roots - Rice and maize. External morphology of dicot roots - Brassica and any legume. External morphology of monocot stem - Rice and maize. External morphology of dicot stem - Brassica and any legume. External morphology of monocot leaf - Rice and maize. External morphology of dicot leaf – Brassica and any legume. Structure and organization of plant cell. Study of different types of tissue systems - Parenchyma, collenchyma and sclerenchyma. Study of mitosis through onion root tip cells. Study of meiosis through onion anther cells. Internal anatomy of monocot stems and roots - Rice and maize. Internal anatomy of dicot stems and roots - Brassica and any legume. Internal anatomy of ovary of monocots and dicots

	- Any millet and legume. Description of Brassicaceae with live specimens. Description of Fabaceae with live specimens. Description of Poaceae with live specimens.
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Biology –, 10th edition,.	Raven P, Mason Johnson G B, Losos J. B, Singer. S.S	McGraw Hill Publications.	2014
2	Plant systematics.	M.G. Simpson,	Elsevier Publications.	2006.
3	College Botany	H. C. Gangulee	SCIENTIFIC PUBLISHERS (INDIA)	1972
4	A class book of Botany Botany for Degree Students,	A. C. Dutta 1964	Oxford University Press, Calcutta.	1964
5	Agricultural Botany. 2nd edition.	N. T. Gill.	SPRINGER	1966.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	20	
	Atten (AG)	5	
			25
In-Sem Summative	Mid Semester Exam	20	
			25
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

NSS/NCC/PHYSICAL EDUCATION & YOGA PRACTICES

COURSE CODE	COCA 100	MODE	Offline	LTPS	0-0-2-0	PRE-REQUISITE	COCA 100
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO5	To understand the concept and importance of the National Service Scheme. To develop leadership skills and teamwork abilities. To promote community engagement and social responsibility. To foster a sense of national integration and cultural diversity. To	4	PO4 + POS4

	encourage participants to actively contribute to social welfare projects.		
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Syllabus

Module 5	Introduction and basic components of NSS, NSS programmes and activities, Understanding youth, Community mobilization, Social harmony and national integration, Volunteerism and shramdan, Citizenship, constitution and human rights, Family and society, Importance and role of youth leadership, Life competencies, Youth development programmes, Health, hygiene and sanitation, Youth health, lifestyle, HIV AIDS and first aid, Youth and yoga , Vocational skill development, Issues related environment, Disaster management, Entrepreneurship development, Formulation of production oriented project, Documentation and data reporting, Resource mobilization, Additional life skills, Activities directed by the Central and State Government
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Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	10	
	Active Participation	90	
			100

Professional Core (PC)

Agriculture Heritage <(AH)>

COURSE CODE	23AGRO 101	MODE	Offline	LTPS	1-0-0-0	PRE-REQUISITE	Fundamental course
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To study and Learn Ancient Agricultural Practices & Its relevant to modern agriculture practices and Appreciate agriculture practiced throughout the world and Understand the rich agricultural heritage of India	2	PO1 PO6 ,PSO 1
CO2	To study and understand the Integrate judicious traditional agricultural practices with modern methods and Our Journey (Developments) in Agriculture and Vision for the Future	3	PO1, PO3, PSO 1
CO3	Plan on using agricultural resources	3	PO6, PO1, PSO 2
CO4	Comprehend agricultural issues	3	PO1,PO3, PSO 2

Syllabus

Module 1	Introduction to Indian agricultural heritage – Definition of heritage, agriculture heritage - Need to study agriculture heritage. Genesis of agriculture and its chronological arrangement - Homes of evolution of agriculture and “old and new” world - Early indigenous domestications. Status of farmers in society and specific role of women in ensuring food security Farming systems in ancient periods. Status of agriculture and advice by sages to kings on their duties towards farmers Importance of farmers - Ancient agricultural practices and scientific basis.
Module 2	Soil management in ancient, medieval, pre- modern India - Historical background Soil management and its relevance in pre-modern India and modern day sustainable agriculture - Use of amendments - Land management, Piercing, tillage, puddling and pre-plant submergence, mulching, fallowing. Soil concept - Ancient systems of soil classification - Ancient systems of soil management - Medieval and pre modern soil management. Heritage of crop and water management – Ancient and pre-historic period; Medieval period. Plant growth and development- Heritage of plant protection through, vrikshayurveda and traditional Knowledge
Module 3	Plant protection in ancient India - Plant disorders – Cause, symptoms, treatment materials. Traditional knowledge in crop production and water management. Heritage of medicinal plants and their relevance today. Seed health in ancient and medieval history and its relevance to present day agriculture-seed health in Hellenistic age – seed health in India - Materials recommended for seed treatments.
Module 4	Description of Indian civilization and agriculture by travellers from China, Europe and USA. Pre-historic cropping patterns. Our journey in agriculture-Green revolution and its impact and concerns. Vision for the future – Challenges ahead.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Ancient and Medieval History of Indian agriculture and its relevance to sustainable agriculture	Choudary S.L, Sharma, G.S, and Nene, Y.L (eds)	Rajasthan college of Agriculture	2000
2	Glimpses of Agricultural heritage of India	Nene, Y.L	ICRISAT	2007
3	Agricultural Heritage of Asia proceedings of the international conference	Nene, Y.L (Ed).	Asian-Agri history Foundation	2005

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
			5
In-Sem Summative	Mid Semester Exam	35	
			35
End-Sem Summative	End Semester Exam	60	
			60

Fundamentals Of Agronomy <FoA>

COURSE CODE	23AGRO 102	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	22 AGRO 102
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the principles of agronomy often involves a summoning of resources from related disciplines such as Botany, Soil Science, Irrigation, plant protection, Plant Genetics and Breeding, Agrometeorology etc	3	PO6, PO8 & PSO1, PSO2
CO2	Understand the various nutrients and their effects on plant health and Plan irrigation measures for plant growth and development	3	PO6, PO8, PO3 & PSO1, PSO2
CO3	illustrate the weeds in a field. Plan for sustainable agricultural production and apply scientific methods and tools in field preparation and for designing cropping.	4	PO6, PO8, PO3 & PSO1, PSO2
CO4	Illustrate the impact of the professional agricultural solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development	4	PO6, PO8, PO3 & PSO1, PSO2
CO5	Demonstrate and Identification and proper crop management practices with practical knowledge to produce food for humans.	4	PO6, PO8, PO3 & PSO1, PSO2

Syllabus

Module 1	Agriculture - Agronomy and its scope- Role of Agronomists in resource management for crop production. - Tillage and tilth - Objectives of tillage- Characteristics of ideal seed bed- Effect of tillage on soil properties - Types of tillage- Factors affecting tillage and seed bed preparation - After cultivation Puddling. - Concepts of tillage – Minimum tillage, zero tillage, strip tillage, conservation tillage and their advantages and limitations. - Seeds and sowing- Characteristics of good quality of seed, seed treatment, agronomic significance of seed purity and quality - Methods of sowing, importance of time and depth of sowing. - Crop density and geometry - Crop stand establishment, factors affecting optimum stand establishment. - Plant population – Competition, types of competition, intra and inter plant competition - Effect of plant population on growth and yield, optimum plant density and planting pattern. - Soil fertility and soil productivity – Soil organic matter and its importance - Loss of soil fertility and its maintenance.
Module 2	Crop nutrition – Essential plant nutrients- Primary, secondary and micro nutrients – Nutrient uptake – Nutrient use efficiency - Manures and fertilizers- Types of manures and fertilizers - Factors influencing methods and time of fertilizer application - Bio-fertilizers. - Irrigation - Importance of Irrigation - Objectives of irrigation - Methods of irrigation and water use efficiency - Crop growth and development - Factors affecting growth and development - Agronomic manipulation of crop growth and development. - Plant ideotypes – Concept, definition- Morphological and physiological characteristics of new plant types. - Cropping pattern, Cropping system (navadhanya concept) - Crop rotation – Principles of crop rotation - Mono cropping and its disadvantages – Types of cropping systems- Mixed, multiple, intercropping, relay and multistoried cropping - Crop adaptation and distribution in India and Andhra Pradesh - Factors influencing crop adaptation and distribution. - Common problems in crop production related to climate, soil, pest and disease incidence - Crop management technologies to overcome the problems identified.
Module 3	Dry farming, dryland farming and rainfed farming – Classification of climate – Problems of crop production in dry areas. - Soil moisture conservation and water harvesting measures – Watershed: Objectives and components – Watershed management - Weed – Definition – Importance- Harmful and beneficial effects of weeds – Aquatic weeds - Classification of weeds - Based on morphology, life cycle, habitat, origin, association and special features with examples - Propagation of weeds – Sexual – Asexual- Vegetative (Rhizomes, root stocks, runners, stolons, suckers, offsets, tubers, bulbs, bulbils, stems and roots) - Weed biology- Characteristic features of weeds, weed ecology – Persistence of weeds, climatic, edaphic and biotic factors. - Crop weed association – Factors affecting crop weed competition- Common weeds associated with major crops like rice, maize, wheat, sorghum, pulses, groundnut, sugarcane, cotton, and tobacco - Crop-weed-competition - Critical period of crop weed competition – Allelopathy.
Module 4	Methods of weed management - Prevention, control and eradication – Physical, mechanical and cultural methods - Chemical and biological methods of weed control – Integrated weed management - Herbicides- Definition, advantages and limitations of herbicide usage in India.- Bioherbicides - Classification of herbicides based on chemical nature, time and method of application - Herbicidal formulations – active ingredient- Acid equivalent- Nomenclature of herbicides. - Adjuvants and their use in herbicide application – Types of adjuvants with examples. - Mode of action of herbicides - Important biochemical modes of action of herbicides (especially interfering with photosynthesis and respiration). - Selectivity and resistance- Selectivity of herbicides - Fundamental principles of selectivity- Differences in morphology and growth habit of plants - Differential absorption and translocation of herbicides. - Harvesting and threshing of crops - Maturity symptoms of major crops - Time and methods of harvesting - Threshing and winnowing, drying and post harvesting storage of grains - Harvest index and BC ratio.

Module 5	Visit to college farm and identification of major crops and varieties. - Practice of primary tillage implements and puddling - Practice of secondary tillage implements - Practice of seeding equipment, inter cultivation implements - Seed germination and viability test - Study of sowing depth on germination and seedling vigour - Identification of manures, fertilizers and green manure crops/seeds. - Practice of manure and fertilizer application - Participation in ongoing field operations - Participation in ongoing field operations - Identification of weeds in field crops and other habitats - Study of weed flora in different weed management practices and calculation of herbicide efficiencies (WI & WCE) - Herbicide label information and computation of herbicide doses - Study of herbicide application equipment and calibration - Herbicide application and precautionary measures - Study of herbicide phytotoxicity symptoms in different crops - Identification of maturity symptoms of different crops
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Principles of Agronomy.	Reddy, S.R.	Kalyani Publishers, Ludhiana	2016
2	Principles of Agronomy.	Yellamanda Reddy, T. and Sankara Reddi, G. H.	Kalyani Publishers, Ludhiana	2016
3	Fundamentals of Agronomy.	Gopal Chandra D	Oxford & IBH Publishing Co. Pvt. Ltd. , New Delhi.	2012

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.6667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY> (BICM)

COURSE CODE	23 BICM 101	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23 BICM 101
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the knowledge on Carbohydrates, Lipids and Proteins	2	PO1
CO2	Understand the enzymes and nucleic acids functions	2	PO4, PO6
CO3	Apply the metabolic pathways to plants	3	PO2
CO4	Apply the plant biotechnology in crop improvement	3	PO5

CO5	Assess the qualitative tests for Carbohydrates, amino acids and Nucleic acids	4	PO4
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Syllabus

Module 1	Introduction – Historical aspects of Biochemistry– Scope, impact and importance of Biochemistry in plant sciences -Properties of water – PH – Buffers. Carbohydrates– Classification - Structures – Monosacharides – Structural aspects– muta rotation - Reducing and oxidizing properties. Oligosaccharides and polysaccharides–Funtions of carbohydrates. Lipids – Fatty acids – Structures and properties – Functions of lipids. Lipids - Classification – Storage lipids and membrane lipids – Saponification, hydrogenation, Iodine number and Acid value. Amino acids – Structures - Classification – Zwitterions – Titration. Peptides – Oligopeptides – Cyclic and acyclic peptides – Malformin, Glutathione, Gramicidin – Functions of peptides. Proteins –Importance - Classification - Properties of proteins –Isoelectric PH –Denaturation - Protein sequencing – Edman degradation method. Proteins – Structural organization – Primary, secondary, tertiary and quaternary structures and forces involved in stabilizing proteins.
Module 2	Enzymes – Characteristics of enzymes – Chemical nature, speed, specificity, active site - activation energy – Mechanism of enzyme action. Classification of enzymes - Isoenzymes – Multienzyme complex – Allosteric enzymes and coenzymes. Measurement of enzyme activity – Factors effecting enzyme activity – Enzyme Inhibition – MM & LB plots. Nucleic acids – Functions – Structures of nitrogen bases – Nucleosides –Nucleotides in RNA and DNA. Various types of DNA and RNA – Secondary structure of B-DNA and t-RNA.
Module 3	Metabolism – Anabolism and Catabolism – Stages of respiration – Overall metabolic view of carbohydrates, proteins and lipids. Metabolism of carbohydrates – Glycolysis – Aerobic and anaerobic. Tricarboxylic Acid (TCA) cycle— Glyoxalate cycle – Electron transport chain Metabolism of lipids –Biosynthesis of fatty acids and tri acyl glycerol. Catabolism of lipids α , β & γ oxidation of fatty acids in brief and α oxidation in detail. Protein Biosynthesis and post translational modifications. Secondary metabolites – Terpenoids – Alkaloids - Phenolics – Importance.
Module 4	Biotechnology – Major – Concepts and importance – Applications of plant biotechnology. Introduction to plant tissue culture – History – Scientists - Terminology – Steps in general tissue culture – Types of sterilization and nutrient media – Types of cultures– Organ cultures, cell suspension culture, callus culture, pollen culture and their applications. Micropropagation – Procedure techniques – Organogenesis and embryogenesis– Problems – Advantages – Limitations. Anther culture – embryo culture – Ovule culture – Somatic embryogenesis - Synthetic seeds and its applications. Protoplast isolation and fusion – Somatic hybridization – Cybrids – Somaclonal variations and applications in crop improvement – Cryo preservation, Recombinant DNA methods - Introduction to genetic engineering – Definitions –Gene cloning - Vectors. Gene transfer methods – Indirect methods (Agrobacterium) and direct methods (physical-gene gun method; chemical-PEG mediated and other methods) with case studies / examples. Transgenic plants – Present status - Applications in crop improvement –Limitations – biotechnology regulations. Polymerase chain reaction (PCR) – Procedure and applications. Markers - Morphological, biochemical and molecular markers – RFLP, RAPD and SSR – Marker assisted selection for crop improvement.
Module 5	Preparation of solutions, pH and buffers. Qualitative tests for carbohydrates. Qualitative tests amino acids. Estimation of amylose in rice. Estimation of reducing sugar/Total soluble sugars. Estimation of proteins by Lowrys method. Extraction of oil from oil seeds by soxhlet apparatus. Effect of PH, temperature and substrate concentration on enzyme action. Paper chromatography / TLC demonstration for separation of amino acids. Sterilization techniques. Composition of various tissues culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various

	explants. Micropropagation – Hardening and acclimatization. Demonstration of isolation of DNA and of gel electrophoresis technique. Demonstration of PCR Technique. Demonstration of DNA finger printing –RAPD and Restriction digestion.
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Principles of Biochemistry	David L. Nelson, Michael M.Cox; W.H. Freeman. Lehninger, 8th Edition	Macmillan Learning	2021
2	Biochemistry	S.N.Gupta	Rastogi Publications	2011
3	Biochemistry	Dr.U.Satyanarayana, Dr.U. Chakrapani	Elsevier	2020
4	Introduction to Plant Biotechnology, 3 rd edition	HS Chawla	Oxford & IBH Publishing Co. Pvt Ltd., New Delhi.	2020
5	Plant Biotechnology	B. D. Singh		2015

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

Fundamentals of Soil Sciencey > <FSS>

COURSE CODE	23SSAC121	MODE	Offline	LTPS	2-0-3-0	PRE-REQUISITE	23 SSAC 121
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Introduction - Spheres of the earth atmosphere, hydrosphere and lithosphere – Their characteristics – Origin of soil – Soil and soil components – Mineral matter, organic matter, and air – Definition of soil and various concepts of soil – Branches of soil science. Rocks – Classification of rocks based on mode of origin –Igneous rocks, sedimentary rocks and metamorphic rocks – Classification of rocks based on silica	2	PO1,PO4 & PSO1

	<p>content – Weatherability of rocks. Minerals – Primary, secondary, essential and accessory minerals – Primary minerals Quartz, feldspar, micas, pyroxenes, amphiboles and olivines – Weatherability of primary minerals. Non-silicate minerals – P, Ca, Mg, S and micronutrient containing minerals – Secondary silicate minerals – Basic structural units. Weathering – Types of weathering – Physical weathering of rocks – Agents of physical weathering and their role- Biological weathering – Role of flora and fauna in weathering process. Chemical weathering – Solution, hydration, hydrolysis, carbonation, oxidation and reduction. Parent material – Classification of parent materials based on their mode of transport by different agents - Soil formation – Soil forming factors – Classification and their role in soil formation – Catena – Definition. Pedogenic processes – Eluviation, illuviation, humification, calcification, laterization, podzolisation, melanisation, salinization and alkalization.</p>		
CO2	<p>Soil profile – Detailed description of a theoretical soil profile – Differences between surface soil and sub soil. Soil physical properties – Soil texture – Definition – Various inorganic components in soil and their properties – Various textural classes in soil and their properties. Particle size analysis – Stoke’s Law – Assumptions and limitations – significance of soil texture. Soil consistence – Consistence of wet and dry soils – Soil crusting – Soil plasticity – Atterberg’s plastic limits – Factors affecting plastic limits – Significance of soil consistence. Soil structure – Classification – Types, classes and grades of soil structure – Importance of soil structure and its management. Soil density – Bulk density and particle density – Factors affecting density parameters – Importance of bulk density of soil – Soil compaction – Its importance – Calculation of porosity. Soil strength and its importance – Soil colour – Components – Significance of soil colour. Soil water – Forces of soil water retention – pF concept – Soil moisture characteristic curves – Importance of soil water.</p>	2	PO4, PO1 & PSO2
CO3	<p>Soil water potential – Components of water potentials – Soil moisture constants – Field capacity, wilting coefficient, hygroscopic water and saturation – Available water and methods for determining soil moisture constants – Pressure plate and pressure membrane apparatus. Soil water content – Soil water movement – Darcy’s Law – Saturated, unsaturated and vapour flows – Infiltration, percolation and permeability – Distribution of water in profile in different soils – Soil drainage and its importance. Soil temperature – Sources of heat – Heat capacity and conductivity – factors influencing soil temperature – Modification of soil thermal regimes – Measurement of soil temperature – Importance of soil temperature on crop growth – Management of soil temperature and importance. Soil air – Compositions of atmospheric air and soil air – Gaseous exchange – Influence of soil air on plant growth, soil properties and nutrient availability – Measurement of oxygen diffusion rate – Measures to improve</p>	2	PO1, PO4 & PSO1

	<p>soil aeration. Soil reaction, pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability. Soil colloids – Definition – General properties – Shape, surface area, electrical charge, dsorption, flocculation, deflocculation, plasticity, cohesion, swelling, shrinkage, Tyndall effect and Brownian movement. Secondary silicate clay minerals of different types – Kaolinite, illite, montmorillonite and chlorite – Properties – Allophones. Origin of charge in organic and inorganic colloids – Negative and positive charges Differences between organic and inorganic soil colloids.</p>		
CO4	<p>Adsorption of ions – Types of ion exchange – Cation and anion exchange – Cation and anion exchange capacities of soil – Base saturation – Factors affecting ion exchange capacity of soils – Importance of Cation Exchange Capacity (CEC) of soils Calculation of base exchange capacity and exchangeable acidity. Soil biology – Biomass – Flora and fauna – Their important characteristics – Role of beneficial organisms – Organic matter decomposition, mineralization and immobilization. Nitrogen fixation, denitrification , solubilization of phosphorus and biological control of plant diseases – Promotion of plant growth promoting substances –Harmful activities of soil organisms. Soil organic matter – Various sources – Composition – Compounds in plant residues Their decomposability – Humus – Definition – Synthesis of humus. Soil organic matter and humus – Importance - Fractionation of soil humus – Carbon cycle – Carbon : nitrogen (C:N) ratio of commonly available organic residues – Significance of C:N ratio in soil fertility. Soil classification – Early system of soil classification – Diagnostic horizons. Soil taxonomy – Order, sub order, great group and family series – Nomenclature according to soil taxonomy. Soil groups of India – Alluvial soils, black soils, red soils, laterite soils and coastal sands.</p>	2	PO1,PO4 &PSO2
CO5	<p>Methods of chemical analysis, principles, techniques and calculations Study of soil sampling tools, collection of representative soil sample, its Processing and storage. Description of soil profile in the field. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of texture by feel method. Determination of mechanical composition of soil using Bouyoucos Hydrometer. Determination of bulk density and particle density of soil and porosity.Determination of soil moisture content by gravimetric method. Determination of infiltration rate. Determination of soil strength by cone penetrometer. Aggregate analysis by wet sieving method. Determination of soil pH & EC of soil. cation exchange capacity of soil. f soil colour & study of soil map. Estimation of organic matter content in soil.Determination of heat transfer in soils.</p>	3	PO4 &PSO2

Syllabus

Module 1	<p>Introduction - Spheres of the earth atmosphere, hydrosphere and lithosphere – Their characteristics – Origin of soil – Soil and soil components – Mineral matter, organic matter, water and air – Definition of soil and various concepts of soil – Branches of soil science. Rocks – Classification of rocks based on mode of origin –Igneous rocks, sedimentary rocks and metamorphic rocks – Classification of rocks based on silica content – Weatherability of rocks.</p> <p>Minerals – Primary, secondary, essential and accessory minerals – Primary minerals – Quartz, feldspar, micas, pyroxenes, amphiboles and olivines – Weatherability of primary minerals. Non-silicate minerals – P, Ca, Mg, S and micronutrient containing minerals –Secondary silicate minerals – Basic structural units. Minerals – Primary, secondary, essential and accessory minerals – Primary minerals – Quartz, feldspar, micas, pyroxenes, amphiboles and olivines – Weatherability of primary minerals. Non-silicate minerals – P, Ca, Mg, S and micronutrient containing minerals –Secondary silicate minerals – Basic structural units. Weathering – Types of weathering – Physical weathering of rocks – Agents of physical weathering and their role- Biological weathering – Role of flora and fauna in weathering process. Chemical weathering – Solution, hydration, hydrolysis, carbonation, oxidation and reduction. Parent material – Classification of parent materials based on their mode of transport by different agents - Soil formation – Soil forming factors – Classification and their role in soil formation – Catena – Definition. edogenic processes – Eluviation, illuviation, humification, calcification, laterization, podzolisation, melanisation, salinization and alkalization.</p>
Module 2	<p>Soil profile –Detailed description of a theoretical soil profile – Differences between surface soil and sub soil. Soil physical properties – Soil texture – Definition – Various inorganic components in soil and their properties – Various textural classes in soil and their properties. Particle size analysis –Stoke’s Law – Assumptions and limitations – significance of soil texture. Soil consistence – Consistence of wet and dry soils – Soil crusting – Soil plasticity – Atterberg’s plastic limits – Factors affecting plastic limits – Significance of soil consistence. Soil structure – Classification – Types, classes and grades of soil structure – Importance of soil structure and its management. Soil density – Bulk density and particle density – Factors affecting density parameters – Importance of bulk density of soil – Soil compaction –Its importance – Calculation of porosity. Soil strength and its importance – Soil colour – Components – Significance of soil colour. Soil water – Forces of soil water retention – pF concept – Soil moisture characteristic curves – Importance of soil water</p>
Module 3	<p>Soil water potential – Components of water potentials – Soil moisture constants – Field capacity, wilting coefficient, hygroscopic water and saturation – Available water and methods for determining soil moisture constants – Pressure plate and pressure membrane apparatus.</p> <p>Soil water content – Soil water movement Soil temperature – Sources of heat – Heat capacity and conductivity Soil air – Compositions of atmospheric air and soil air – Gaseous exchange –Influence of soil air on plant growth, soil properties and nutrient availability – Measurement of oxygen diffusion rate – Measures to improve soil aeration. Soil reaction, pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability. Soil colloids – Definition – General properties – Shape, surface area, electrical charge, adsorption, flocculation, deflocculation, plasticity, cohesion, swelling, shrinkage, Tyndall effect and Brownian movement. Secondary silicate clay minerals of different types – Kaolinite, illite, montmorillonite and chlorite – Properties – Allophones. Origin of charge in organic and inorganic colloids – Negative and positive charges – Differences between organic and inorganic</p>
Module 4	<p>Adsorption of ions – Types of ion exchange – Cation and anion exchange – Cation and anion exchange capacities of soil – Base saturation – Factors affecting ion</p>

	exchange capacity of soils – Importance of Cation Exchange Capacity (CEC) of soils Calculation of base exchange capacity and exchangeable acidity. Adsorption of ions – Types of ion exchange – Cation and anion exchange – Cation and anion exchange capacities of soil – Base saturation – Factors affecting ion exchange capacity of soils – Importance of Cation Exchange Capacity (CEC) of soils Calculation of base exchange capacity and exchangeable acidity. Soil organic matter and humus – Importance - Fractionation of soil humus – Carbon cycle – Carbon : nitrogen (C:N) ratio of commonly available organic residues – Significance of C:N ratio in soil fertility. Soil classification – Early system of soil classification – Diagnostic horizons. Soil taxonomy – Order, sub order, great group and family series – Nomenclature according to soil taxonomy. Soil groups of India – Alluvial soils, black soils, red soils, laterite soils and coastal sands.
Module 5	Methods of chemical analysis, principles, techniques and calculations Study of soil sampling tools, collection of representative soil sample, its Processing and storage. Description of soil profile in the field. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of texture by feel method. Determination of mechanical composition of soil using Bouyoucos Hydrometer. Determination of bulk density and particle density of soil and porosity. Determination of soil moisture content by gravimetric method. Determination of infiltration rate. Determination of soil strength by cone penetrometer. Aggregate analysis by wet sieving method. Determination of soil pH & EC of soil. Determination of cation exchange capacity of soil. Determination of soil colour & study of soil map. Estimation of organic matter content in soil. Determination of heat transfer in soils.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Fundamentals of Soil Science,	Indian Society of Soil Science.	IARI, New Delhi.	2012.
2	Introductory Soil Science, 4th Edition,	Das, D. K.	Kalyani Publishers, New Delhi	2015.
3	A Text Book of Pedology – Concepts and Applications,	Sehgal, J.	Kalyani Publishers, New Delhi.	2015.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	

			56.6666
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Fundamentals of Economics (AECO-FE)

COURSE CODE	AECO141	MODE	Offline	LTPS	3-0-0-0	PRE-REQUISITE	Fundamental Course
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	The students will be able to understand the nature, scope and subject matter of economics	2	PO1, PO7, PSO1
CO2	To apply the behaviour of consumer and producer in the market	3	PO1, PO8, PSO4
CO3	To apply different market forms, factor pricing and public finance.	3	PO1, PO10, PSO4
CO4	To apply the concepts associated with national income, population, banking and economic system.	3	PO1, PO5, PSO4

Syllabus

Module 1	Introduction to Economics. Meaning, definitions, its importance as a subject to science students. Subject matter of economics – Traditional approach – Consumption, production, exchange, distribution and public finance/ public policy - Modern Approach – Microeconomics and macroeconomics. Deduction and induction approaches, positive and normative analysis - Nature of economic theory - Rationality assumption, economic laws as generalization of human behaviour. goods and services - Characteristics and classification, scarcity, choice, decision making, wants, substitutes and complements - Utility – Cardinal and ordinal, forms, MU. Cost and price, value and wealth and their characteristics, capital, income, investment, welfare, efficiency, equilibrium and firm. Meaning, law of demand, demand schedule and demand curve characteristics, determinants, types of demand - Income demand, price demand, cross demand - Product demand, firm demand, market demand. Contraction and extension, increase and decrease in demand. Statement, assumptions of law, explanation, limitations of the law - Importance and applications. Meaning, assumptions, explanation of the law - Practical importance and applications, limitations. Meaning, assumptions, explanation with examples, difficulties in measuring, consumer's surplus - Importance and applications - Engels law of family expenditure. Indifference curves - Meaning, basic assumptions, properties and their importance in economics
Module 2	Budget line and its properties - Consumer's equilibrium - Graphical and algebraic expressions and its importance. Meaning, elastic and inelastic demand, measurement of elasticity of demand - Types of elasticity of demand - Price elasticity, income elasticity and cross elasticity of demand. Perfectly elastic, perfectly inelastic, relatively elastic, relatively inelastic, unitary elastic demand - Factors affecting elasticity of demand, practical importance of elasticity of demand. Meaning of production process, creation of utility, factors of production and input - output relationship and production function – Meaning. Increasing, decreasing and constant laws of returns - Meaning and explanation with examples. Seven production costs - Meaning and formulas, cost and output relationships - Short run and long run cost curves. Meaning, definition, law of supply, supply schedule and curve, properties, determinants of supply - Market dynamics due to changes/ shifts in supply and prices. Kinds of elasticity of supply – Perfectly elastic, perfectly inelastic, relatively elastic, relatively inelastic and unitary

	elastic - Factors affecting elasticity of supply. Meaning, classification of markets based on market structure - Competition and its meaning, basic features of perfectly competitive and imperfect competitive markets. Characteristics, structure, examples, features of Monopolistic market, Monopoly, Duopoly, Oligopoly. Characteristics, structure, examples, features of monopsony, duopsony and oligopsony. Price determination under perfect competition, Equilibrium analysis through Numerical and graphical explanation.
Module 3	Meaning, factor market - Concepts of rent - Meaning, types of rent - Ricardian theory of rent. Meaning, nominal and real wages, Labour participation rate, employment rate, unemployment rate - Interest- Meaning, interest rate - Profit and income - difference between income and profit. Features, Explanations of Modern theory of distribution. Meaning, role, importance of public finance - Functions of the government, Differences between public finance and private finance - Public revenue - Meaning, major, minor sources of public revenue. Meaning - Classification – Direct and indirect taxes, methods of taxation - Proportional, progressive, regressive and digressive taxation, agricultural taxation - VAT and GST. Adam Smith’s canons of taxation – Equality, economy, certainty and convenience – Other canons of taxation. Meaning, need for public expenditure - Principles of public expenditure – Budget – Meaning - Balanced budget and deficit budget - Fiscal policy - Meaning and its policy instruments. Meaning and importance, circular flow in the economy. Gross domestic product, gross national product, net national product, net domestic product- National income at factor cost, personal income, disposable income, per capita income. Product method, income method, expenditure method and value added method, difficulties in measurement. Indian economy in the globalized world economy. Malthusian theory, escaping from the Malthusian stagnation - Innovations, technological transition and economic growth.
Module 4	Meaning, evolution of money, functions of money, the money market - Types of demand and supply of money in the economy. Meaning of credit, borrowing and lending, investments and their role in the modern economy - Credit controls and credit policy. Role of banking in the modern economy, functions of central bank and commercial banks, monetary policy and its instruments. Meaning, causes of inflation - Demand pull and cost push inflation. Comprehensive and sporadic inflation – Suppressed and repressed inflation – Creeping, walking, running and galloping inflation – Mark up inflation. General price index, wholesale price index, consumer price index - Rate of inflation – Measurement. Remedial measures – Monetary and fiscal measures. Meaning, importance of study of economy in systems approach - Types of economic systems. Meaning and its characteristic features, socialism and its characteristic features - Mixed economies and their characteristic features. Meaning, importance of planning in management of resources and institutions in the economy, elements of economic planning. Brief history of planning system in India - Annual plans, five year plans. Role of planning commission of India and NITI Ayog

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Elementary Economic Theory	Dewett, K.K. and Varma, J.D	S. Chand and Co., New Delhi.	2003
2	Modern Economic Theory	Dewett, K.K and Chand, A.	S.Chand and Co., New Delhi	2009
3	Economics	Paul A. Samuelson and Nordhus	19th Edition, Tata-Mc Graw Hill Education, New Delhi	2010

4	Advanced Economic Theory	Jhingan, M.L.	Vikas Publishing House, New Delhi	1990
5	Modern Microeconomics.	Koutsoyiannis	Tata Mac-Graw Hill Publishers, New Delhi	2015

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Home Assignment and Textbook	15	
			20
In-Sem Summative	Mid Semester Exam	20	20
End-Sem Summative	End Semester exam	60	60

Fundamentals of Horticulture <(FH)>

COURSE CODE	23HORT181	MODE	OFFLINE	LTPS	1-0-2-0	PRE-REQUISITE	23HORT181
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understanding the scope and importance of horticulture, divisions of horticulture, classification of horticultural crops, climate and soil requirements	2	PO1,PO3&PSO1
CO2	Application of propagation methods and orchard establishment	3	PO3&PSO2
CO3	Apply knowledge of aspects of orchard management viz training, pruning, management of juvenility, flower bud differentiation and unfruitfulness problems in addition to vegetable and ornamental gardens.	4	PO3&PSO2
CO4	Apply knowledge of fertiliser and irrigation management schedules in addition to lawn making and use of growth regulators	3	PO3&PSO2
CO5	Implement basic plant propagation and irrigation methods	4	PO1,PO3&PSO4

Syllabus

Module 1	Horticulture-Its definition and branches, Importance and scope of horticulture, Horticultural and botanical classification, Climate and soil for horticultural crops
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Module 2	Plant propagation-methods (sexual & asexual), propagating structures; separation, division, grafting, budding, layering), High density planting; Use of rootstocks; Orchard establishment; (Principles & Layout)
Module 3	Principles and methods of training and pruning, Juvenility and flower bud differentiation; Unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy;
Module 4	Vegetable gardens & ornamental garden types and parts; Lawn making, Use of plant bio-regulators in horticulture, Irrigation methods in horticulture crops, Fertilizers application-methods.
Module 5	Identification of garden tools, Identification of horticultural crops, Preparation of seed bed/nursery bed, Practice of sexual and asexual methods of propagation, Layout and planting of orchard plants, Training and pruning of fruit trees, Transplanting and care of vegetable seedlings, Making of herbaceous and shrubby borders, Preparation of potting mixture, potting and repotting, Fertilizer application in different crops, Visits to commercial nurseries/orchard.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Handbook of Horticulture	Chadha, K.L	ICAR	2001
2	Basic Horticulture	Jitendra Singh	Kalyani Publishers	2012
3	Floriculture in India	Randhawa, G.S. and Mukhopadhyaya, A.	Allied Publishers Pvt. Ltd., New Delhi	1994
4	Introduction to Horticulture.	Kumar, N.	Rajyalakshmi Publications, Nagorcoil, Tamilnadu.	1997
5	Glaustas Horticulture	Muthukumar and Selvakumar	New Vishal Publications	2012

Tools used in Practical / Skill:

Sl No	Tool Name	Parent Industry	Open Source/ Commercial
1	Garden tools	Horticulture	Open source
2	Propagation tools	Horticulture	Open source

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation – Lab Exercise	20	25
	Attendance	5	

In-Sem Summative	Mid Semester Exam	20	20
End-Sem Summative	Lab End Semester Exam	25	55
	End Semester Exam	30	

Farm Management, Production and Resource Economics (AECOFM)

COURSE CODE	20AECO341	MODE	offline	LTPS	1-0-2-0	PRE-REQUISITE	23AECO141
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	To apply the concepts of farm management, production economics, types and systems of farming, production functions, factor-product relationship.	3	PO1,PO10, PSO1
CO2	To apply the conditions for optimum input and output, factor-factor relationship, product-product relationship and to know types of enterprises.	3	PO10,PO1, PSO2
CO3	To apply the concepts of cost, farm inventory, farm planning and budgeting and linear programming	3	PO1,PO10, PSO4
CO4	To analyse the concepts of risk and uncertainty situations in the production, economic and environmental linkages, environmental costs and to identify the important issues and management of natural resources.	4	PO7,PO10, PSO4
CO5	To analyse the problems of farm management, input-output relations in production economics and data on the natural resources	4	PO2,PO3,PO10, PSO4

Syllabus

Module 1	Meaning and concept of farm management, definitions, objectives and relationship with other sciences - Importance of study of farm management -Farm management problems in India. Meaning and definitions of types and systems of farming and their characteristics- Changing structure of land holdings in India - Characteristics of small, marginal and tenant farm holdings. Concept of production function and its types, use of production function in decision-Making on a farm - Seven principles of farm management. Factor - Product relationship – Law of variable proportions – Definition, graphical and arithmetical explanation with the help of an example.
Module 2	Determination of optimum input and optimum output and decision rules. Factor-Factor relationship, resources and types - Substitutes and complements, variable and fixed resources - Iso-quants - Iso-cost lines - Meaning and characteristics- Principle of least cost combination/ Principle of factor substitution - Explanation and decision rules. Product-Product relationship - Iso- product curves and Iso-revenue lines - Meaning and characteristics - Principle of optimum product combination - Law of equi-marginal returns/ principles of opportunity cost, decision rules. Types of enterprises and their characteristics - Principle of comparative advantage

Module 3	Meaning and concept of cost, cost function /cost-output relationship - Types of production costs and their interrelationship. Farm inventory. Farm planning and budgeting. Linear programming.
Module 4	Concepts of risk and uncertainty in agriculture production. Economy and environmental linkages. Environmental costs of economic growth. Important issues in economics and management of common property resources.
Module 5	Computation of depreciation cost of farm assets. Determination of most profitable level of inputs use in a farm production process. Application of Equi-marginal returns/ opportunity cost principle in allocation of farm resources. Determination of least cost combination of inputs. Selection of most profitable enterprise combination. Farm holding survey. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises. Farm business analysis, Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India. Seminar on selected topics.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Introduction to Agricultural Economic Analysis	Bishop, C.E. and W. D. Tousaint	John Wiley and Sons, London	1958
2	Economics of Agricultural Production and Resource Use	Heady, Earl O	Prentice Hall of India, Private Limited, New Delhi	1964
3	Fundamentals of Farm Business Management	S.S. Johl, J.R. Kapur.	Kalyani Publishers, New Delhi	2007
4	Economics of Farm Production and Management	Raju, V.T. and D.V.S. Rao.	Oxford & IBH Publishing Co. Pvt. Limited, New Delhi	2006
5	Agricultural Economics	Subbareddy, Raghuram, Sastry, Bhavani Devi	Oxford & IBH Publishing Co. Pvt. Limited, New Delhi	2016

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid-semester exam	20	20
	Lab End Semester Exam	25	

End-Sem Summative	End Semester Exam	30	
			55

Rural Sociology and Educational Psychology <AEXT>

COURSE CODE	23AEXT 190	MODE	Offline	LTPS	1-0-0-0	PRE-REQUISITE	23AEXT190
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	Realize the basic aspiration and understanding harmony in the human being. Understand the process of Self-exploration and able to differentiate between right and wrong	1	PO6 & PSO2
CO2	Realize how to achieve harmony in self, body and family. Understand the content of continuous happiness and prosperity (basic requirements and basic aspiration) and current scenario of happiness and prosperity.	1	PO6 & PSO1
CO3	Realize ways to attain harmony in society and in nature. Realize the root cause of the techno-genic maladies and able to identify the solution and understand harmony in the human being.	2	PO6 & PSO3
CO4	Analyze the profession and his role in this existence. Realize the co-relation between lack of human values and prevailing problems.	2	PO6 & PSO4

Syllabus

Module 1	Universal human aspirations, happiness and prosperity. Human values and ethics-concept, definition fundamental values-Right conduct, peace, truth, love, non-violence. Principles and philosophy-self exploration, self-awareness. Case study of ethical lives
Module 2	Positive spirit, body, mind and soul- attachment and detachment. Spirituality and spirituality quotient. Examinations. Ethics - Professional, environmental, ICT - Sensitization towards others particularly senior citizens, developmentally challenged and gender.
Module 3	Positive attitude and scientific temper. Team works and volunteering. Rights and responsibilities. Road safety.
Module 4	Human relations and family harmony, modern challenges and value conflict. Sensitization against drug abuse and other social evils. Developing personal code of conduct (SWOT/SWOC/SNAC Analysis). Management of anger and stress.

Reference Books:

Sl. No.	Title	Author(s)	Publisher	Year
1	A Foundation Course in Human Values and Professional Ethics.	Gaur RR, Sanga IR and Bagaria GP.	Excel Books. New Delhi	2011
2	Human Values and Education – Axiology, Incultation and Research.	Sharma RA.	R. Lall Book Depot	2011
3	Value Education and Professional Ethics.	Sharma RP and Sharma M.	Kanishka Publishers	2011
4	Human Values.	Tripathi A.N.	New Age International (P) Ltd Publishers.	2009
5	Human Values and Professional Ethics.	Srivastava S.	S K Kataria and Sons.	2011

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
			5
In-Sem Summative	Mid Semester Exam	35	
			35
End-Sem Summative	End Semester Exam	60	
			60

Vi. AGRICULTURAL MICROBIOLOGY (AM)

COURSE CODE	23AMBE101	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	Fundamental course
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	By the end of the course students will know the hidden world of microbiology, classification of microbes-Microorganisms and principles, History of microbiology, Pasteur- Robert Koch - Pure Culture Methods- Applied aspects of Microbiology- Agricultural microbiology, Bacteria, etc.	2	PO2, PSO1
CO2	Student will understand about the impact Microbial Nutrition- Autotrophy - Chemoautotrophy- Photo-autotrophy Heterotrophy – Metabolic pathways- Glycolysis-HMP-ED-TCA cycle. Growth of Microorganisms, Generation time- Growth rate- Growth yield-	3	PO2,PSO3

	Bacterial genetics- Genetic recombination- Transformation- Conjugation Transduction- Plasmids- Transposon.		
CO3	They will be able to apply the Role of microbes in fertility of soils and plant growth - Rhizosphere- Rhizoplane, Phyllosphere- Phylloplane - Microflora- Carbon cycle, Biological nitrogen fixation - Symbiotic- Associative- Asymbiotic- Nitrogen fixation In Azolla - Blue green algae - Actinorhizal symbiosis - Frankia, Phosphate solubilizing microorganisms, etc	4	PO2,PSO3
CO4	Students will be able to know the types of fermentations, Bio-fertilizers, Bio-pesticides, Bio-fuel production, Biodegradation, Bio-gas, Bio-manures and Composting Technologies.	3	PO2,PSO3
CO5	Practical study on various laboratory microbiological laboratory and its equipments, Microscope, Micrometry, Sterilization, Bacterial staining, Nutritional media, isolation, purification and maintenance of microbial cultures, etc.	4	PO3,PSO3

Syllabus

Module 1	To study about the hidden world of microbiology, Microorganisms and principles of microbiology, Brief history of microbiology, Protection against infection- Agricultural microbiology, etc
Module 2	To know about the Microbial Nutrition- Autotrophy- Chemoautotrophy- Photoautotrophy, Heterotrophy, Growth of Microorganisms, Bacterial genetics, etc.
Module 3	To understand the Role of microbes in fertility of soils and plant growth, Biological nitrogen fixation, PGPR Organisms - Bacillus – Pseudomonas – Azotobacter – Azospirillum - Rhizobium -Microbes in human welfare, etc
Module 4	To study about the Types of fermentations, Fermentation technology, Biofertilizers Biopesticides, Biofuel Production- Biodegradation - Biogas, Biomanures and Composting Technologies, etc.
Module 5	Practical study on various laboratory microbiological laboratory and its equipments, Microscope, Micrometry, Sterilization, Bacterial staining, Nutritional media, isolation, purification and maintenance of microbial cultures, etc.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Microbiology.	Pelczar, J.r., M.J.E.C.S.Chan and Krieg, N.R. (5th Ed.)	McGraw Hill Publishers, New York.	2015.
2	Microbiology.	Prescott, L.M., Harley, J.P. and Klein, D.A. (9th Ed.)	McGraw Hill Publishers, New York.	2014.

3	Soil Microbiology	Subba Rao, N.S. (4th Ed.)	Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.	2014.
4	Experiments in Microbiology, Plant Pathology and Biotechnology.	Aneja, K.R.	New Age International (P) Ltd., Publishers, New Delhi	2011
5	Microbiology A Laboratory Manual	: James, C and Natile, S. (10th Ed.)	Pearson India Education Services Pvt. Ltd., South Asia.	2014.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Complete Course Title> <(Course Short Name)>

COURSE CODE	23AGRO103	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23AGRO103
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply agrometeorology (definitions, aims, scope and importance) and to learn about the characteristics, behaviour of the atmosphere and agroclimatic zones.	3	PO1 &PSO1
CO2	To apply the roles of agrometeorology in agriculture and the changes of individual weather elements and their relation to crop production. Gain the information of weather and climate which are considered as basic input in agricultural planning	3	PO2&PSO2
CO3	To apply the importance of monsoon in agriculture and the management of weather hazards for improving crop productivity.	3	PO2 & PSO2
CO4	To apply Weather forecasting and impact of climate change on agriculture	4	PO2 & PSO2
CO5	To analyze the meteorological instruments and recording the observation from the agro meteorological observatory and also about the measurement and computation of different weather parameters.	4	PO8 &PSO4

Syllabus

Module 1	Introduction: The three spheres of the earth; Terminology and definitions: Meteorology, Climatology, Agrometeorology, Agroclimatology climate and weather - Scope and importance of agrometeorology. Agro climatic regions of India and Agroclimatic zones of Andhra Pradesh. Atmosphere -Composition of the atmosphere-Weather elements. Solar Radiation: Nature and properties of solar radiation - Conduction – Convection - Radiation - Solar Spectrum - Distribution of solar radiation within the crop canopiesPhysiological response of different bands of incident radiation - Definitions of solar constant, net radiation, albedo - Solar radiation and crops
Module 2	Temperature: Temperature and heat, definitions- Temperature inversion- Adiabatic lapse rate. Vertical profile of temperature- Energy balance of earth. Low air temperature and plant injury and high air temperature and plant injurySoil temperature- Factors affecting soil temperature- Temperature and crops. Humidity: Concept of saturation- Vapour pressure- Types of humidity- Humidity and crops- Atmospheric Pressure: Definitions of pressure, atmospheric pressure, standard atmospheric pressure. Wind: Types of wind; Planetary winds (trade winds, westerlies, polar easterlies, cyclones and anti-cyclone periodic winds and local winds (sea and land breezes.
Module 3	Precipitation: Process of precipitation, types of rainfall (orographic, convectonal and cyclonic)- Definition of cloud – WMO classification of clouds. Forms of precipitation (solid, liquid and mixed) and condensation (dew, fog, mist, frost, cloud) - Artificial rain making- Monsoon: Indian monsoons, SW monsoon & NE monsoon. Importance of monsoon in Indian agriculture- date of onset, significant features of Indian monsoon; length of growing season. Weather hazards: Drought-Floods-Cyclones-Heat and cold-waves and their management.
Module 4	Weather Forecasting: Importance-Types of weather forecast and their uses-Synoptic charts - Remote Sensing-Applications of remote sensing in agriculture - Agrometeorological Advisory services in India. Climate change- variability-Global processes and effects- - Precipitation changes on the earth- Changes in extreme events-Sea level raising- Tracking climate change- Impacts of climate change on agriculture-Climate neutral. Summary of evidence for climate change-- Modifications of crop microclimate - Examples of manipulation of climate- Climatic normal for crop and livestock production

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Introduction to Agriculture and Agrometeorology	S.R. Reddy	KalyaniPublishers, Ludhiana, Punjab.	2014
2	Basic Principles of Agricultural meteorology.	Radha Krishna Murthy, V.	B.S Publications, Koti, Hyderabad	2002
3	Principles and practices of agricultural disaster management.	Radha Krishna Murthy, V.	B.S Publications, Koti, Hyderabad	2016
4	Textbook of Agricultural Meteorology	Varshneya, M. C and Balakrishna Pillai.	ICAR, New Delhi	2006
5	An agro-climatological and agro-meteorological perspective.	Jeevananda Reddy	B S publications	2002

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25

In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Introduction to Forestry > <(IF)>

COURSE CODE	23AGRO104	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23AGRO101
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand various imparted basic information about various harvesting, transportation and processing systems used in the management of forest resources and production of forest products	3	PO1, & PSO1, PSO4
CO2	Discuss acquainted with the management plans with multiple objectives and constraints.	3	PO1 & PSO1, PSO4
CO3	Understand how to develop and apply silviculture prescriptions appropriate to the management objectives	3	PO11 & PSO1, PSO2
CO4	Illustrate and analyze the forest inventory information and project future forest stand and tree conditions	3	PO11 & PSO1, PSO2
CO5	Apply laboratory equipment, and procedures for the study about the tree species description And aware of the growing stock and the management practices of forest	4	PO1 & PSO1, PSO2

Syllabus

Module 1	Introduction – definitions of basic terms related to forestry, Indian forest, target area, productivity- Influence of forest on climate, soil, floods, erosion, human health and recreation.- Objectives of silviculture, forest classification, salient features of Indian forest policies.- Forest regeneration, Natural regeneration – natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers.
Module 2	Artificial regeneration – objectives, choice between natural and artificial regeneration, planting methods, essential preliminary considerations. Crown classification.- Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning.- Principles and practices of social forestry nurseries- types of nurseries - success in nursery production.- Afforestation in different sites - shifting sand dunes, saline soils, ravine lands, wet lands, lateritic soils, dry rocky soils, canal banks, road sides and watershed areas.
Module 3	Village wood lots, selection of species - measures for shortage of fuel wood- Properties of fuel wood- management and advantages of energy plantations- Suitable tree species- Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method;- Instrumental methods of height measurement - geometric and trigonometric

	principles, instruments used in height measurement;- Tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.
Module 4	Major and minor forest products- Agroforestry – definitions, importance, criteria of selection of trees in agroforestry- Different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens.- Cultivation practices of Subabul, Eucalyptus and Casuarina tree species.
Module 5	Identification of tree-species, diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees; Height measurement of standing trees by shadow method, single pole method and hypsometer; Volume measurement of logs using various formulae; Nursery lay out, seed sowing, vegetative propagation techniques; Forest plantations and their management, visits to nearby forest based industries

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Tree farming.	Singh, S.P.	Agrotech Publishing academy	2009
2	Favourite Agroforestry trees,	Singh, S.P.	Agrotech Publishing academy, Udaipur.	2010
3	Silviculture of Indian trees (Vol. II & III)	Troup, T.S.	International book distributor, DehraDun	1986
4	Dwivedi,A.P.1980.Forestry in India,	Dwivedi,A.P.	Jugal Kishore and Company, DehraDun	1980
5	Agroforestry hand book,.	Negi, S.S	International book distributor, DehraDun	1999

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Crop Improvement – I (Cereals, Millet, Pulses and Oilseeds) > <CI- I>

COURSE CODE	23 GPBR 311	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23 GPBR 111
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply origin, distribution, breeding objectives, breeding methods and hybrid seed production of Cereal crops like – Rice, Wheat, Barley and Millet crops like- Sorghum and pearl millet	3	PO1,PO2,PO3,PSO1, PSO2
CO2	To learn origin, distribution, breeding objectives, breeding methods and hybrid seed production of Millet crops like- Finger millet, Kodo millet, Proso millet and Pulses like chick pea, Pigeon pea, Urd bean and Mung bean	4	PO1,PO2,PO3,PO4,PSO1, PSO2
CO3	To learn origin, distribution, breeding objectives, breeding methods and hybrid seed production of Pulse crop like Soya bean, Cow pea, Horse Gram, Field pea and Lentil and Oil seed crops like Ground nut, Castor and Sesame	4	PO1,PO2,PO3,PSO1, PSO2
CO4	To apply origin, distribution, breeding objectives, breeding methods and hybrid seed production of Oil seed crops like Sunflower, Safflower, Linseed, Niger, Mustard, Rape seed, Coconut and Oil Palm	3	PO2,PO3,PO4,PO1, PSO1, PSO2
CO5	To analyze floral biology, Anthesis, Emasculation, Pollination, and hybridization techniques in Cereals, Millets, Pulses and Oil seed crops	4	PO3,PO4,PO5,PO9,PO11, PSO1, PSO2

Syllabus

Module 1	Introduction, Definition, objectives of plant breeding and Plant breeding, sexual and asexual reproduction. Origin, distribution, wild species, progenitors, breeding objectives, breeding methods, seed production and commercial varieties/ hybrids of rice, wheat, Bajra, sorghum and Pearl millet.
Module 2	Origin, distribution, wild species, progenitors, breeding objectives, breeding methods, seed production and commercial varieties/ hybrids of Finger millet, Kodo millet, Proso millet, Chick pea, Pigeon pea, Urd bean and mung bean.
Module 3	Origin, distribution, wild species, progenitors, breeding objectives, breeding methods, seed production and commercial varieties/ hybrids of Soya bean, Cow pea, Horse gram, Field pea, lentil, Ground nut, Castor and Sesame.
Module 4	Origin, distribution, wild species, progenitors, breeding objectives, breeding methods, seed production and commercial varieties/ hybrids of Sun flower, Safflower, Rape seed, Mustard, Linseed, Niger, Coconut and oil palm.

Module 5	Practical: Emasculation and hybridization techniques in different crop species; cereals, millets, pulses and oilseeds. Maintenance breeding of different crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Essentials of Plant Breeding	Phundan Singh	Kalyani Publishers, New Delhi	2014
2	Plant Breeding: Principles and Methods	B.D. Singh	Kalyani Publishers, New Delhi	2015
3	Plant Breeding Theory and Techniques	Gupta, S.K	Wiley India Pvt. Ltd. New Delhi.	2010
4	Principles and Practices of Plant Breeding	Sharma, J.R	Tata McGraw-Hill Publishing Co. Ltd., New Delhi.	1994
5	Principles of Plant Breeding	Allard, R.W	John Wiley & Sons, New York	1960

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

FUNDAMENTALS OF ENTOMOLOGY I (FE I)

COURSE CODE	23ENTO131	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	Fundamental Course
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To remember the history of entomology in India and contributory factors for abundance of insects and to understand classification of Phylum Arthropoda up to Classes, Structure and functions of body	2	PO1,PO3, PO11 &PSO2

	wall and moulting, Body segmentation of the insects, Abdomen, Antenna and mouth parts along with their modifications		
CO2	To understand insect legs, wings, types of larva and pupa, metamorphosis, digestive, circulatory, excretory and respiratory systems.	4	PO1,PO3, PO11 &PSO3
CO3	To understand the nervous, reproductory, endocrine systems and sensory organs in insects and classification of Orders viz., Orthoptera, Dictyoptera and Isoptera	4	PO1,PO3, PO11 &PSO3
CO4	To understand systematic arrangement of Hemiptera, Lepidopteta, Coleoptera, hymenoptera and Diptera	3	PO1,PO3, PO11 &PSO3
CO5	To understand the collection and preservation methods of insects, to observe external features of insects, study the mouthparts, antenna, legs, wing venation, wings, different types of larva and pupa, digestive system and reproductive system of insects by dissection and observation and identification of different insect orders along with some of their important families	4	PO1,PO3, PO11 &PSO3

Syllabus

Module 1	History of Entomology in India - Contributions of eminent entomologists - Locations and year of establishment of entomological institutions - Arthropoda – Mention of insects in scripts – Contributions of Aristotle, J.C. Fabricius, J.G. Koenig, Carolius Linnaeus, Cramer, Dury, Dr. Kerr, Rev Hope Rothney, Ronald Ross, L De Niceville, H.M Lefroy, T.B.Fletcher, E.P. Stebbing, T.V. Ramakrishna Ayyar, B.V. David, Y.Ramachandra Rao, M S Mani, S Pradhan, H.S. Pruthi, M.R.G.K. Nair and S. Pradhan; ML Roonwal, T.Kumara Swami, M R G K Nair,K.K. Nayar and N. Ananthakrishnan - Locations and year of establishment of Division of Entomology, IARI, Zoological Survey of India (ZSI), Directorate of Plant Protection, Quarantine and Storage (DPPQS), Indian Institute of Natural Resins and Gums (IINRG), National Bureau of Agricultural Insect Resources (NBAIR), National Institute of Plant Health Management (NIPHM), National Centre for Integrated Pest Management (NCIPM) and Forest Research Institute (FRI). Contributory factors for abundance of insects – Major structural characters, developmental characters and protective characters (Morphological, physiological, behavioural and construction of protected niches) of Insecta in Animal Kingdom. Classification of Phylum Arthropoda up to Classes – Different Classes of Arthropoda and comparison of characters of Class Insecta with Arachnida, Crustacea, Symphyla, Chilopoda, Diplopoda and Onychophora. Structure and functions of body wall and moulting – Different layers, chemical composition, functions of body wall and cuticular appendages – Cuticular processes and cuticular invaginations – Chaetotaxy – Moulting – Apolysis, ecdysis and sclerotization. Body segmentation of the insects – Head (Syncephalon) – Procephalon and gnathocephalon, types of head, sclerites and sutures of insect head - Thorax – Segments and appendages (wings and legs). Abdomen – Segments, pre and post genital appendages (Furcula, cornicles, tracheal gills and pseudo-ovipositor in Diptera - Propodeum, petiole and gaster in Hymenoptera) - Male and female genital organs - Epimorphic and anamorphic development in insects. Antenna – Structure of typical antenna and its modifications in different insects with examples. Mouthparts – Biting and chewing, sucking (Piercing and sucking, Rasping and sucking, Chewing and lapping, Sponging and Siphoning/ Simple sucking), mask and degenerate types with examples.
Module 2	Legs – Structure of a typical insect leg and modifications of insect legs with examples. Wings – Venation, margins and angles – Types of wings and wing coupling organs with examples. Types of Metamorphosis and diapause – Metamorphosis-AmetamorphosisIncomplete Metamorphosis or Direct or Simple Metamorphosis-Intermediate metamorphosis - Complete Metamorphosis or Complex or Indirect MetamorphosisHypermetamorphosis with examples - Diapause- Obligate and facultative

	<p>diapause – Stage of occurrence of diapause with examples. Types of larva and pupa – Differences between nymph and larva - Larva- ProtopodOligopod (Campodeiform and Scarabaeiform)- Polypod and Apodus with examples - Pupa- Obtect- Exarate- Coarctate- Chrysalis with examples. Digestive system – Alimentary canal – Structure of foregut, midgut and hindgut – histology, functions, filter chamber and peritrophic membrane – Process of digestion- Extra intestinal digestion. Circulatory system – Open and closed types – Organs of circulatory system – Dorsal blood vessel (diaphragms, sinuses and accessory pulsatile organs) – Process of circulation - Types of haemocytes –Properties and functions of haemolymph. Excretory system – Structure, functions and modifications of malpighian tubules – Structure and functions of other organs of excretion. Respiratory system – Tracheal system – Structure of spiracle and trachea – Classification based on functional spiracles and other means of respiration</p>
Module 3	<p>Nervous system – Neuron and its types (based on structure and function) – Synapse, ganglia, central nervous system, sympathetic nervous system and peripheral nervous system. Reproductive system – Structure of male and female reproductive systems – Structure and types of ovarioles and structure of follicle – Types - Special modes of reproduction in insects. Secretory (endocrine) system – Structure and functions of neurosecretory organs (neuro secretory cells of brain, corpora cardiaca, corpora allata, prothoracic glands and ring gland). Sense organs – Compound eyes – Structure of ommatidium – Ocelli – Dorsal ocelli and lateral ocelli - Types of images and auditory organs (auditory hairs, tympanum, Jhonston’s organ and pilifer organ) – Chemoreceptors. Taxonomy – Importance - History – Binomial nomenclature - Holotype, allotype and paratype – Suffixes of tribes, subfamily, family and superfamily – Law of priority – Synonyms and homonyms - Definitions of biotype - Subspecies - Species – Genus - Family and Order. Characters of Class Insecta - Economic classification of insects Classification upto Orders – Subclasses - Apterygota and Pterygota– Names of Orders of Apterygota and Pterygota with examples - Orthopteroid, Hemipteroid and Panarpooid group of orders. Orthoptera – General characters - Gryllidae, Acrididae, Tettigonidae and Gryllotalpidae – Characters with examples. Dictyoptera – General characters – Blattidae and Mantidae– Characters with examples - Odonata - General characters with examples. Isoptera – General characters –Termitidae –Characters with examples - Order – Thysanoptera – General characters –Thripidae –Characters with examples</p>
Module 4	<p>Hemiptera – General characters - Sub order Heteroptera – Characters - Cimicidae - Miridae, Pentatomidae, Lygaeidae, Coreidae, Pyrrhocoridae - Characters with examples. Hemiptera - Suborder Homoptera – Characters – Delphacidae, Cicadellidae, Aleurodidae, Aphididae, Coccidae, Pseudococcidae, Lopophidae- Characters with examples - Neuroptera – General characters - Chrysopidae- characters with examples. Lepidoptera- General characters - Differences between moths and butterflies - Noctuidae, Lymantriidae and Spingidae and Pieridae- Characters with examples. Lepidoptera- General characters - Pyralidae, Crambidae, Gelechiidae, Lycaenidae, Arctiidae, Papilionidae, Saturniidae and Bombycidae - Characters with examples. Coleoptera - General characters – Scarabaeidae, Coccinellidae, Chrysomelidae, - Characters with examples. Coleoptera - General characters – Cerambycidae, Bruchidae, Apionidae and Curculionidae - Characters with examples. Hymenoptera - General characters – Tenthredinidae, Ichneumonidae, Braconidae, Chalcididae, Trichogrammatidae, and Apidae- Characters with examples. Diptera -General characters - Culicidae, Cecidomyiidae, Muscidae, Tachinidae, Agromyzidae and Tephritidae - Characters with examples</p>
Module 5	<p>Methods of collection and preservation of insects including immature stages. External features of Grasshopper / Blister beetle. Study of types of mouthparts – Biting and chewing, piercing and sucking, rasping and sucking, chewing and lapping, sponging and siphoning. Study of different types of insect antennae and legs. Study of wing venation, types of wings and wing coupling mechanisms. Study of different types of insect larva and pupa. Dissection of digestive system in insects (Grasshopper). Dissection of female and</p>

	male reproductive systems in insects (Grasshopper). Study of characters of Orders - Orthoptera, Dictyoptera and their families and Odonata. Study of characters of Orders - Isoptera and Thysanoptera and their families. Study of characters of Orders -Hemiptera and its sub order Heteroptera and their families. Study of characters of Sub Order - Homoptera and its families. Study of characters of Order- Neuroptera and Lepidoptera and their families. Study of characters of Order- Coleoptera and its families. Study of characters of Order- Hymenoptera and its families. Study of characters of Order - Diptera and its families
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Insects: Structure and Function. Ed by Simpson, S. J. and Douglas, A. C.	Chapman, R. F	Cambridge Univ. Press, UK.	2013
2	Imm's General Text Book of Entomology (Vol. I and II).	Richards, O.W. and Davies, R.G	Chapman and Hall, London.	1977
3	Insect Physiology	Wigglesworth, V.B	Springer (Originally published by Chapman and Hall, London, 1974).	2013
4	Insect Physiology and Anatomy.	Pant, N.C. and Ghai, S.	ICAR, New Delhi.	1998
5	Theory and Practice of Animal Taxonomy.	Kapoor, V. C	Oxford and IBH Publishing, New Delhi.	2008

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

i. SOIL AND WATER CONSERVATION ENGINEERING (SWCE)

COURSE CODE	23 AENG 151	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	Fundamental course
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the concepts of soil, water, and wind erosion along with their various conservation practices.	3	PO1,PSO1
CO2	Comprehend about terraces, contours, and grasses waterways in order to prevent erosion at different grades of slopy land	4	PO2,PSO1
CO3	Characterize the concepts of irrigation water measurement and various irrigation methods - micro-irrigation, underground pipeline system	4	PO4,PSO2

CO4	Understand the water conservation structure, and the systems associated with wells to drive water out of them to irrigate the agricultural land	3	PO1,PSO2
CO5	Apply the solutions to real-life problems through laboratories' work	4	PO8,PSO2

Syllabus

Module 1	Introduction to soil and water conservation and causes of soil erosion. Definition and agents of soil erosion, water erosion - Forms of water erosion - Gully classification and control measures. Soil loss estimation by universal soil loss equation - Soil loss measurement techniques. Principles of erosion control - Introduction to contouring, strip cropping.
Module 2	Contour bund - Graded bund and bench terracing. Grassed water ways and their design. Wind erosion - Mechanics of wind erosion, types of soil movement - Principles of wind erosion control and its control measures. Introduction to irrigation - Classification of irrigation projects.
Module 3	Importance of irrigation water measurements - Volumetric, area velocity, discharge methods - Weirs, orifice, flumes. Open channel hydraulics - Discharge calculations. Types of wells - Water lifting devices - Classification of pumps, their capacity, power requirement, and discharge calculations.
Module 4	Functional components and working principle of underground pipeline systems. Functional components of micro irrigation systems and their design like drip, sprinkler irrigation systems etc. Water harvesting techniques - Lining of ponds, tanks and canal systems.
Module 5	Practicing survey - Principles and educating to use pacing technique for measurement. Area calculations through chain survey - GPS demo for tracking and area measurement. Estimation of soil loss and calculation of erosion index. Levelling concepts and practical utility in agriculture. Preparation of contour maps. Concept of vegetative waterways and design of grassed waterways. Construction of contour and graded bunds. Wind erosion and estimation process. Water discharge measurements lab exercises for computing discharge. Different irrigation pumps and their constructional differences. Farm pond construction and its design aspects. Farm pond and canal lining and its procedures. Visit to nearby farm pond.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Hydrology and Soil Conservation Engineering, including Watershed Management. Second edition	Ghanshyam Das	PHI Learning Private Limited, New Delhi	2012
2	Land and Water Management Engineering	Murthy, V. V.N	Kalayani Publishers, New Delhi	2004
3	Irrigation Theory and Practice. Second edition	Michael A.M	Vikas Publishing House Pvt. Ltd.	2007
4	Introduction to Soil and Water Conservation Engineering	Mal, B. C.	Kalayani Publishers, Rajinder Nagar, Ludhiana	1995
5	Land and Water Management	Suresh, R.	Standard Publishers Distributors, Delhi	2008

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Fundamental of Crop Physiology (FCP)

COURSE CODE	23CPHY162	MOD E	Offline	LTPS	2-0-2-0	PRE-REQUISITE	Fundamental course
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To understand the basic knowledge and history of crop physiology it's important in agriculture, cell overview, seed germination and metabolic changes during seed development and plant Growth and its Development. Impart an insight into the various plant water relations.	2	PO1,PO3
CO2	Take students to higher levels of learning about the Rate of transpiration and Water use efficiency in C3, C4 and CAM plants. Assimilation of mineral nutrients in crop plant and also about photosynthesis and its reaction centre in crop plant	4	PO7,PO5
CO3	Understand the mechanism of various metabolic processes in crop. The factor affecting photosynthesis, Respiration, Biosynthesis of fatty acids in plastids, Physiology of flowering, vernalizationin, Occurrence of auxin, transport of auxin, biosynthesis of auxin and its mode of action.	3	PO9
CO4	Acquire basic knowledge about growth and development in plants like Auxin, Gibberellins, Cytokinins, Abscisic acid and Ethylene. They learn aboutsenescence, abscission and post-harvest physiology	3	PO2,PO4
CO5	It is gaining knowledge and practical skills related to the physiological processes of crop plants, understanding the influence of environmental factors on crop growth and development, developing proficiency in conducting experiments to study crop physiology, and analyzing and interpreting data to make informed decisions regarding crop management practices.	4	PO6,PO8

Syllabus

Module 1	Introduction to Crop Physiology and its importance in Agriculture. Plant cell - The endomembrane system - Plasma membrane, endoplasmic reticulum, nuclear envelope, golgi apparatus, vacuole and endosomes - Structure and functional characteristics - Plastids, mitochondria, oil bodies, peroxisomes and glyoxysomes - Structure and functions. Metabolic changes during seed development - Seed viability and seed vigor - Tests of viability and vigor - Physiological maturity, harvestable maturity - Indices of physiological maturity in crops - Seed germination - Metabolic changes during seed germination. Growth and Development - Definition - Growth analysis - Growth parameters - Definitions and mathematical formulae. Absorption of water - Diffusion and osmosis - water potential and its components - Importance of water potential –
Module 2	Active and passive uptake of water – Stomatal complex – Transpiration – Water use efficiency – Water use efficiency of C3, C4 and CAM plants – Water requirement / Transpiration ratio – Factors affecting WUE. Mineral nutrition of plants – Essential mineral elements – Criteria of essentiality of mineral elements – Mengel’s classification of mineral nutrients - Nutrient uptake mechanisms - Functional roles of N, P, K, S Ca and Mg – Functional roles of Fe, Mn, Cu, Zn, B, Mo, Cl, Na, Co and Si –Deficiency symptoms of macro and micro nutrients. Assimilation of mineral nutrients – Nitrate assimilation – Ammonium assimilation in plants – Biological nitrogen fixation – Free-living and symbiotic bacteria – Nodule formation – Nitrogenase enzyme complex. Photosynthesis – Reactions of photosynthesis – Energy synthesis – Principle of light absorption by plants – Light reactions - Cyclic and non cyclic photophosphorylation
Module 3	CO2 fixation – C3 and C4 pathways – Significance of C4 pathway – CAM pathway and its significance – Photorespiration and its significance – Photosynthetic efficiency of C3, C4 and CAM plants - Factors affecting photosynthesis (light, CO2 , temp and water stress) - Relationship of photosynthesis and crop productivity. 20. Respiration – Energy balance – Significance of respiration – Oxidative Pentose Phosphate Pathway (OPPP) and its significance – Growth respiration and maintenance respiration – Alternate respiration – Salt respiration – Wound respiration. Lipid metabolism – Biosynthesis of fatty acids in plastids – Functions of lipids - Significance of lipids in plant metabolism. Physiology of flowering – Photoperiodism and flowering – Importance of photoperiodism – Classification of plants based on photoperiodic responses – Perception of photoperiodic stimulus – Biological clock – Phytochrome – Flowering hormones – Vernalization and flowering – importance of vernalization in agriculture. Plant growth regulators – Auxins – Occurrence, transport, biosynthesis, mode of action and physiological roles – Commercial uses.
Module 4	Gibberellins – occurrence, transport, biosynthesis, mode of action and physiological roles – Commercial uses – Cytokinins – Occurrence, transport, biosynthesis, mode of action and physiological roles – commercial uses – ABA – Occurrence, transport, biosynthesis, mode of action and physiological roles – Commercial uses – Ethylene – Occurrence, transport, biosynthesis, mode of action and physiological roles – Commercial uses. Senescence and abscission – Definition – Classification of senescence – Physiological and biochemical changes that occur during senescence - Prevention of leaf and flower senescence – Abscission and its relationship with senescence. Post harvest physiology – Dormancy – Types of dormancies – Advantages and disadvantages of dormancy - Causes of dormancy – Remedial measures for breaking seed dormancy - Fruit ripening - Climacteric and non-climacteric fruits – Metabolic changes during fruit ripening - Hormonal regulation of fruit ripening – Ripening induction and ripening inhibition – Use of hormones in increasing vase life of flowers.
Module 5	Solutions- Preparation, Estimation of Chlorophyll content. Seed vigor and viability tests, optimum conditions for seed germination, leaf area measurement, Growth analysis, Measurement of water status in plants, Measurement of water potential, Measurement of Stomatal frequency and index 113 photosynthetic pigments- Absorption spectrum, Leaf anatomy of C3 and C4 plants, Measurement of

	photosynthesis – Hill’s reaction, Measurement of photosynthesis by IRGA, Effect of plant growth regulators on plant growth. Diagnosis of nutrient deficiency symptoms in crops, Yield analysis
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Plant Physiology 5th edition	Taiz, L. and Zeiger, E.	Sinauer Associates, Sunderland, MA, USA.	2010
2	Physiology of Crop Plants.	Gardner, F.P., Pearce, R.B., and Mitchell, R.L.	Scientific Publishers, Jodhpur.	1985
3	Introductory Plant Physiology. 2nd Edition.	Noggle, G.R. and Fritz, G.J.,	Prentice Hall Publishers, New Jersey, USA.	1983.
4	Crop Physiology: Applications for Genetic Improvement and Agronomy"	Victor O. Sadras and Daniel Calderini	Academic Press.	2009
5	Physiology of Crop Production	H.P. Singh, S. Uma, and S. Bhaskar	CRC Press.	2006

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten (AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

i. FUNDAMENTALS OF PLANT PATHOLOGY I (FPI)

COURSE CODE	23PATH171	MODE	Offline	LTP S	2-0-2-0	PRE-REQUISITE	Fundamental course
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the basic knowledge on the introduction of plant pathology, objective of plant pathology, history of plant diseases, plant pathogens, plant diseases, symptoms and disorders. Important plant diseases caused by fungi, bacteria, virus, spiroplasm etc. general	3	PO1,PO3, PO11 &PSO2

	characteristic features of plant parasitic organisms its physiological and morphological traits, its taxonomical classification.		
CO2	Understand the major characteristic features of the Kingdom Fungi, Phylum Chytridiomycota, Phylum Zygomycota, Phylum Ascomycota, Phylum Basidiomycota, Kingdom Chromista, Protozoa.	4	PO1,PO3, PO11 &PSO3
CO3	Develop and understand the Phylum Basidiomycota, Subphylum, Kingdom Chromista, their classification, and different characteristic features.	4	PO1,PO3, PO11 &PSO3
CO4	Gain knowledge about characteristic features of Kingdom Protozoa, Characteristics features of (prokaryotes) plant pathogenic bacteria, classifications, and identification. Phylum Firmicutes, Virus and viroid, its important characteristic plant virus and viroid, classification, and taxonomy. To know about the Nematodes, importance in agriculture, general characteristics and diseases caused by plant parasitic nematodes.	3	PO1,PO3, PO11 &PSO3
CO5	Practical study on Microscopy, morphological identification of different fungi, disease symptoms caused by a pathogen. Phytopathogenic bacteria isolation and its characteristics, the transmission of plant virus and plant-parasitic nematodes.	4	PO1,PO3, PO11 &PSO3

Syllabus

Module 1	<p>Introduction to Plant Pathology - Definition of Plant Pathology, Plant Pathogen, Plant Disease, Symptom, Disorder. Importance of plant diseases- Brief mention of Important epidemics of international importance – Irish Famine (1845), Bengal Famine (1942), Coffee rust (1868), Wheat Rust (1940), Southern Corn Leaf blight in USA. Epidemics of local significance - Peanut Stem Necrosis Disease (Anantapur dt), Mung bean yellow mosaic virus (AP) etc. Brief mention of economic importance of micro organisms. Scope and objectives of Plant Pathology. Important plant pathogenic organisms with one or two examples of important plant diseases caused by them- fungi (rice blast, wheat rust), Chromista (Pythium damping off, late blight of potato protozoa (coffee phloem necrosis, club root of crucifers) bacteria (rice bacterial leaf blight (BLB), cotton black arm), fastidious 122 vascular bacteria (sugarcane ratoon stunt, citrus greening), Phytoplasma (sugarcane grassy shoot, sesamum phyllody), Spiroplasma (corn stunt), viruses (TMV, MYMV), viroids (potato spindle tuber viroid, coconut cadang cadang). Important plant pathogenic organisms with one or two examples of important plant diseases caused by them (contd)- algae (red rust), phanerogamic plant parasites (Cuscuta, Striga, Orabanche, Loranthus), nematodes (root knot and cyst nematode). Diseases and symptoms due to abiotic causes (khaira, cotton purple leaf, tomato blossom end rot, black heart of potato). General characteristics of fungi, fungus definition. Somatic structures - types of fungal thalli - plasmodium, unicellular and filamentous. Types of fungi based on reproductive structures - eucarpic, holocarpic. Types of fungi based on their physical presence on or in the host - ectophytic and endophytic (intercellular, intracellular and vascular). Septation in fungi – Primary, adventitious, perforated and dolipore septa. Fungal tissues - plectenchyma (prosenchyma and pseudoparenchyma). Modifications of mycelium (rhizomorphs, sclerotium, stroma, haustorium, rhizoids and appressorium). Ultra structure of fungal cell. Fungal nutrition - groups of fungi based on mode of nutrition - saprophytes (obligate saprophytes and facultative parasite), parasites (obligate parasites and facultative saprophytes) and symbionts (mycorrhizae</p>
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	<p>and lichens). Reproduction in fungi - asexual reproduction (mitospores)-fragmentation (arthrospores, oidia, chlamyospores), fission, budding (blastospores), and sporulation –Sporangium, sporangiole, merosporangium.Spores- Plano and Aplanospores. Planospores – flagellum structure, types of flagella-tinsel, whiplash, Monoflagellate, Biflagellate, Anisokont and Heterokont zoospores. Conidiophore and Conidiospores (conidia). Asexual fruiting bodies with examples. Sexual reproduction – Phases in sexual reproduction, (meiospores).Methods of plasmogamy-planogametic copulation, gametangial contact, gametangial copulation, spermatization and somatogamy.Various life cycle patterns displayed by fungi – haplobiontic haploid, haplobiontic haploid (modified), haplobiontic diploid and diplobiontic life cycles with examples. Parasexual cycle. Sexual spores in fungi. Taxonomy - Nomenclature, Binomial system of nomenclature, rules of nomenclature, Classification of fungi as per Kirk et al (2008)- Key to phylum, subphyla, classes, orders and families.</p>
Module 2	<p>Major characteristic features of Kingdom Fungi, Chromista and Protozoa. Characteristics of Phyla Chytridiomycota, Zygomycota, Ascomycota, Basidiomycota and Mitosporic fungi (Anamorphic fungi) in Kingdom Fungi. Kingdom Fungi – Phylum Chytridiomycota, Class Chytridiomycetes - important characteristics of Order Chytridiales – Family Synchytriaceae – disease caused by Synchytrium endobioticum (potato wart Phylum Zygomycota – Subphylum Mucoromycotina – Order Mucorales – Family Mucoraceae, Genus Rhizopus, Example of disease caused by Rhizopus arrhizus (Head rot of sunflower). Family Choanephoraceae, Genus Choanephora. Example of disease caused by Choanephora cucurbitarum (Choenophora blight of chillies). Phylum Ascomycota - important characteristics of the phylum. Different types of ascocarps. Stile structures in ascocarps. Ascospore development in Pyronema omphaloides. Morphology of asci. Types of asci based on structure of ascus wall , asci arrangement -fascicle, hymenium. Phylum Ascomycota, subphylum Taphrinomycotina (=Archiascomycetes) – Class Taphrinomycetes – Order Taphrinales, (i) Family Taphrinaceae - diseases caused by Taphrina deformans (peach leaf curl)andT. maculans(turmeric blotch). (ii) Family Protomycetaceae – Disease caused by Protomyces macrospores (stem gall of coriander). Phylum Ascomycota Subphylum Pezizomycotina – (i) Class Eurotiomycetes – Subclass Eurotiomycetidae Order Eurotiales – Genera Eurotium, Emericella (Aspergillus flavus – aflatoxins), Talaromyces (Penicillium italicum – citrus blue mold). (ii) Class Leotiomycetes Order Erysiphales Family Erysiphaceae - Erysiphe, Leveillula, Phyllactinia, Uncinula, Sphaerotheca, Podosphaera and Microsphaera (key for genera of Erysiphaceae based on position of fungus on/in the host, conidial stages, number of asci per cleistothecium and cleistothecial appendages) – Important diseases caused by each of the genera. Order Helotiales Family Sclerotiniaceae Genus Sclerotinia (Sclerotinia sclerotiorum – white mold of vegetables). Phylum Ascomycota, Subphylum Pezizomycotina –(iii) Class Sordariomycetes, Subclass Sardariomycetidae Order Diaporthales Family Cryphonectriaceae, Genus Cryphonectria (chestnut blight). Subclass Hypocreomycetidae Order Hypocreales - Family - Clavicipitaceae, Genus – Claviceps (ergot of sorghum and bajra).Family –Hypocreaceae – Genus – Hypocrea (Anamorph – Trichoderma,biocontrol agent).(iv) Class Dothidiomycetes Subclass – Dothidiomycetidae Order – Capnodiales – Family – Mycosphaerellaceae – Genus – Mycosphaerella (M. arachidicola (Groundnut early leaf spot), M. personata (Groundnut late leaf spot), M. pinodes (Ascochyta blight of chickpea). Order – Myriangiales – Family – Elsinoaceae – Genus – Elsinoe (E. ampelina – Grape anthracnose). Subclass – Pleosporomycetidae – Order – PleosporalesFamily – Venturiaceae – Genus – Venturia (V. inaequalis – Apple scab). Family– Pleosporaceae – Genus– Cochliobolus (C. miyabeanus – brown spot of rice). Phylum Basidiomycota – important characteristics – Primary, Secondary and Tertiary mycelium, dolipore septum, clamp connections. Development of basidium and basidiospores,parts of basidium, dispersal of basidiospores, structure of Agaricus bisporus basidiocarp .</p>

Module 3	<p>Phylum Basidiomycota-Subphylum Pucciniomycotina -Class Pucciniomycetes Order Pucciniales -Family –Pucciniaceae- Genera Puccinia (three rusts of wheat, 124 groundnut rust) Uromyces (rust of green gram and black gram). Family - Melampsoraceae -Genus Melampsora (M. ricini – castor rust). Incertae sedis (no family),Hemileia(H. vastatrix – coffee rust),Class Microbotryomycetes (Pucciniomycetous smuts)- Order -Microbotryales -Family Microbotryaceae - Genus -Sphacelotheca (Sorghum grain smut, loose smut and head smut of sorghum) Macrocytic, microcytic, demicytic rusts; Autoecious and Heteroecious rusts with examples. Life cycle of Puccinia graminis tritici . Phylum Basidiomycota – Subphylum. Ustilagomycotina Class Ustilaginomycetes Order Ustilaginales - Ustilago (loose smut of wheat, sugarcane whip smut)andTolyposporium(bajra smut). Order Urocystidales-Family - Urocystidaceae-Genus Urocystis (Onion smut).Class Exobasidiomycetes Order Tilletiales -Family -Tilletiaceae -Genera Tilletia (wheat bunts), Neovossia (Karnal bunt of wheat). Order Exobasidiales –Family-Exobasidiaceae –Genus Exobasidium (Tea blisterblight). Differences between rust and smut fungi. Differences between smuts and bunts Phylum Basidiomycota – Subphylum 3. Agaricomycotina Class Agaricomycetes - Incertae sedis (no sub class) Order Polyporales- Family Ganodermataceae -Genus Ganoderma (coconut root rot and wilt). Anamorphic Fungi (Mitosporic fungi = Fungi Imperfecti) Characteristics. Saccardoan spore group system. (1)Hyphomycetous anamorphic fungi: Identification features of Genera Alternaria (sunflower and sesamum leaf blight), Botrytis (castor grey mold), Helminthosporium (maize turcicum leaf blight), Bipolaris (rie brown spot), Cercospora (groundnut early leaf spot), Phaeoisariopsis (groundnut late leaf spot), Fusarium(cotton wilt), Pyricularia (rice blast), Verticillium (cotton wilt), Mycelia Sterilia – Rhizoctonia(rice sheath blight, dry root rot), Sclerotium (stem rot of groundnut). Acervular Imperfect Fungi – Colletotrichum (sugarcane red rot), Pestalotiopsis (coconut grey leaf spot), Pestalotia (guava leaf spot), Gloeosporium (grape anthracnose).Pycnidial Imperfect Fungi – Ascochyta (chickpea blight), Phoma (blackleg of crucifers), Phomopsis (brinjal fruit rot), Phyllosticta (ginger leaf spot), Macrophomina (dry root rot) Diplodia (rose dieback), Botryodiplodia (cirus stem end rot) , Septoria (leaf spot of tomato). Kingdom Chromista: Characteristics of Phylum Oomycota. Important characteristics of Class Oomycetes, Subclass-Peronosporomycetidae. Order Pythiales -Family -Pythiaceae –Genus-Pythium (damping off of nursery crops). Order Albuginales -Family -Albuginaceae -Genus -Albugo (white rust). Order Peronosporales- Family -Peronosporaceae - Genus -Phytophthora (late blight of potato). Downy mildew fungi Sclerospora (green ear of bajra), Peronospora (blue mold of tobacco), Peronosclerospora (sorghum downy mildew), Pseudoperonospora (cucurbit downy mildew), Plasmopara (grape downy mildew)and Bremia (lettuce downy mildew) Sporangiphore branching and sporangial characteristics of downy mildew genera.</p>
Module 4	<p>Characteristics of Class Plasmodiophorea in Kingdom Protozoa. Important characteristics of Order Plasmodiophorida, Family Plasmodiophoraceae - differences in the characteristics of Plasmodiophora (club root ofcabbage) and Spongospora (potato powdery scab). Prokaryotes – Characteristics of phytopathogenic bacteria, Classification (2nd Edition of Bergey’s Manual of Systematic Bacteriology, 2004). Identification of plant pathogenic bacteria based on morphological features. Domain Bacteria – Phyla Proteobacteria, Firmicutes and Actinobacteria Phylum Proteobacteria – Class Alphaproteobacteria- Order- Rhizobiales- Family -Rhizobiaceae -Genus -Agrobacterium (crown gall of stone fruits). Also Candidatus Liberobacter (citrus greening). Class Betaproteobacteria -Order -Burkholdariales -Family -Burkholdariaceae Genus Ralstonia (bacterial wilt of solanaceous crops). Gammaproteobacteria - Order -Xanthomonadales -Family -Xanthomonadaceae - Genera -Xanthomonas (BLB, BLS, citrus canker), Xylella (Pierce’s disease of grapes). Order Pseudomonadales -Family -Pseudomonadaceae -Genus -Pseudomonas (wild fire of tobacco). Order Enterobacteriales-Family- Enterobacteriaceae-Genera-Erwinia</p>

	(Apple fire blight), Pectobacterium (Soft rot of vegetables). Phylum Firmicutes. -Class Bacilli -Order -Bacillus -Family -Bacillaceae -Genus - Bacillus (Class Mollicutes Order Entomoplasmatales -Family -Spiroplasmataceae -Genus Spiroplasma (Corn stunt). Order –Acholeplasmatales- Family - Acholeplasmataceae -Genus -Candidatus Phytoplasma (Sesamum phyllody, Brinjal little leaf). Phylum Actinobacteria -Class - Actinobacteria -Order -Actinomycetales -Family -Microbacteriaceae -Genus - Clavibacter (Wheat yellow ear rot/tundu, sugarcane ratoon stunt).Family Streptomycetaceae Genus Streptomyces (Potato scab). Viruses and viroids - important characteristics of plant viruses and viroids - multiplication - classification of viruses based on nucleic acid (single stranded (ss) RNA, double stranded (ds) RNA, ssDNA and dsDNA). Taxonomy based on ICTV (2005). Important plant viral diseases - Tobacco Mosaic Virus (TMV) and Rice Tungro Virus (RTV). Methods of transmission of plant viruses with examples of vector transmitted virus diseases. Examples of important viroid diseases - potato spindle tuber viroid and coconut cadang cadang. Study of phanerogamic plant parasites with suitable examples – Cuscuta, Orabanche, Striga, Loranthus. Nematodes-Economic importance in agriculture - General characters of plant parasitic nematodes – classification. Nematodes- symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, Anguina, Ditylenchus, Tylenchorhynchus, Aphelenchoides etc.)
Module 5	Microscopy - study of the parts of microscope. Study of vegetative structures of fungi and their modifications. Study of reproductive (sexual and asexual) structures of fungi. Study of Zygomycetous fungus – Rhizopus, Choanephora. Study of downy mildew fungi – Sclerospora, Peronosclerospora, Pseudoperonospora, Peronospora, Plasmopara and Bremia. Study of Pythium, Phytophthora and Albugo. Study of powdery mildew fungi – Oidium, Oidiopsis, Ovulariopsis. Study of ascocarps of Erysiphe, Phyllactinia, Uncinula, Podosphaera and Microsphaera. Study of rust fungi – Puccinia (different stages), Uromyces, Hemileiaand Melampsora. Study of smut fungi – Sphacelotheca, Ustilago and Tolyposporium. Study of Ganoderma and Agaricus. Study of acervulous imperfect fungi – Colletotrichum and Pestalotiopsis. Study of pycnidial imperfect fungi – Septoria. Study of imperfect fungi – Aspergillus, Penicillium and Pyricularia, Helminthosporium, Alternaria. Study of imperfect fungi – Cercospora and Phaeoisariopsis, Fusarium, Rhizoctonia and Sclerotium. Isolation of phytopathogenic bacteria (locally available diseased plant material) and study of colony characteristics. Demonstration of mechanical transmission of plant viruses. Extraction of plant parasitic nematodes from soil. 16. Study of morphological features and identification of plant parasitic nematodes.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	An Introduction to Fungi.4th (Edition).	Dube, H. C.	Scientific Publishers, Jodhpur, India. (major text book)	2013
2	Introduction to fungi.	Webster, J.	Cambridge Univ. Press (for life cycles of Fungi)	1989
3	Principles of Plant Pathology.	Dasgupta, M. K.	Allied Publ. Pvt Ltd. p985. (for rust life cycles)	1987
4	Plant Pathology.	Agrios, G. N.	Elsevier Publishers, New Delhi.	2006

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	

			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

Production Technology of Fruits and Plantation Crops

COURSE CODE	21 HORT 182	MODE	Offline	LTPS	1-0-1-0	PRE-REQUISITE	21 HORT 182
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	understand the basics of the fruit and plantation crop industry	3	PO1,PO11
CO2	Apply principles of crop production of major fruit crops	3	PO3,PO1
CO3	Apply principles of crop production of minor fruit crops and plantation crops	3	PO1,PO11
CO4	Apply principles of crop production of cashew, tea, coffee and rubber	3	PO1,PO3
CO5	Hands on approach on identification of suitable crop varieties, pests and diseases in fruit crops	4	PO1,PO11

Syllabus

Module 1	To understand the importance and scope of fruit crops, To understand the Production technologies of Mango, BANANA,CITRUS To APPLY the Production technologies of Mango, BANANA and citrus
Module 2	To remember the Production technologies of grape, guava, litchi, papaya, apple pear peach To apply the Production technologies of grape, guava, litchi, papaya, apple pear peach
Module 3	To remember the Production aspects of minor fruits and plantation crops To understand the Production aspects of minor fruits and plantation crops To apply the Production aspects of minor fruits and plantation crops
Module 4	to remember production aspects of plantation crops to under stand production aspects of plantation crops to apply the production aspects of plantation crops

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Fruits – Tropical and Sub-tropical.	Bose, T.K. and Mitra, S.K.	Naya Prakashan, Calcutta.	1990
2	Horticulture at a Glance	Bijendra Singh.	Kalyani Publishers, Ludhiana	2012

3	Plantation Crops. Vol I and II.	Parthasarathy, V. A., P.K.Chattopadhyay and Bose, T.K.	ParthasankarbasuNayaUdyog, Kolkata.	2006
4	Introduction to Spices, Plantation crops, Medicinal and Aromatic Crops.	Kumar, N., Abdul Khader, J.B.M, Rangaswamy, P. and Irulappan, I	Oxford and IBH publishing Co, New Delhi	2004
5	Text Book on Pomology (Fundamentals of Fruit Growing).	Chattopadhyay, P. K.	Kalyani Publishers, Ludhiana.	2004

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Crop Production Technology - I (Cereals, Millets And Pulses) <(AGRO CPT-I)>

COURSE CODE	23AGRO 201	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23AGRO 101
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Course Outcomes

CO#	CO Description	BTL	PO/PSO Mapping
CO1	Illustrate about origin, geographical distribution, and economic importance of Kharif crops.	3	PO-6,8 PSO-1,2
CO2	Illustrate about Soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.	3	PO-3,6,8 PSO-1,2
CO3	Apply the constraints in production of oilseeds and pulses maybe identified through course content.	4	PO-3,6,8 PSO- 1,2
CO4	Apply the production technology of Kharif cereals and millets fulfil the need of human consumption and milch cattle. Analysis pf comparative benefits of the different kharif crops	3	PO- 3,6,8 PSO-12,4
CO5	Demonstrate on seed to seed of field management practices and also identification of growth stages critical stages, pest and disease	4	PO-3,6,8 PSO-2,4

	management etc. Which can be solved at field level. Also, complete awareness on crop cultivation practices of Kharif crops		
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Syllabus

Module 1	Cereals – Importance and special features of cereals - Rice- Origin - geographical distribution – nutritional value – area, production and productivity in India and Andhra Pradesh. Economic importance - soil and climatic requirements. Classification of rice plant types - growth Stages of rice -different types of rice ecosystems. Land Preparation –physico – chemical and biological changes under submerged soils. Crop establishment techniques in rice - Climate resilient technologies. Nutrient management with special emphasis on nitrogen dynamics, micro nutrients -INM. Water management in rice under different rice ecosystems. Weed management including weed management in rice nurseries – IWM
Module 2	Harvesting -Yield attributes - yield - post harvest operations - milling of rice. Value added products of rice – export potential - rice grain classification, cropping systems in rice. Wheat- Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance - soil and climatic requirements - zones of wheat cultivation - growth Stages - Classification. Land Preparation - seeds and sowing - nutrient management - water management - weed management - climate resilient technologies. Harvesting -yield attributes – yield - post harvest operations – wheat based cropping systems – value addition. Barley – Origin- geographical distribution - economic importance- classification - area, production and productivity in India and Andhra Pradesh - soil and climatic requirements –varieties - cultural practices - Harvesting -Yield attributes – yield. Maize- Origin- geographical distribution - economic importance - area, production and productivity in India and Andhra Pradesh- soil and climatic requirements - growth stages - Classification of maize. Land Preparation – zero tillage - seeds and sowing - nutrient management - water management - weed management - climate resilient technologie
Module 3	Harvesting - yield attributes – yield - post harvest operations - value addition - cropping systems. Millets- Economic importance - constraints and strategies for increasing the production of millets - climate resilient technologies. Jowar- Origin - geographical distribution - economic importance - area, production and productivity in India and Andhra Pradesh - soil and climatic requirements - zones of jowar cultivation - growth Stages - Land Preparation - seeds and sowing. Nutrient management - water management - weed management – harvesting- yield attributes – yield - post harvest operations - value addition- sorghum effect, mid season corrections - cropping systems. Pearl millet – Origin - geographical distribution - economic importance - area, production and productivity in India and Andhra Pradesh- soil and climatic requirements -growth Stages - land preparation - seeds and sowing - Nutrient management - sater management - weed management – harvesting- yield attributes – yield - post harvest operations - value addition - cropping systems. Finger millet- Origin - geographical distribution - economic importance - area, production and productivity in India and Andhra Pradesh- soil and climatic requirements, growth Stages - land preparation, seeds and sowing - nutrient management - water management - weed management – harvesting - yield attributes – yield - post harvest operations - value addition - cropping systems. Proso millet, Little millet and Kodo millet – Origin - geographical distribution - economic importance - adaptations, soil and climatic requirements - growth Stages - land preparation - seeds and sowing - nutrient management - water management - weed management – harvesting - yield attributes – yield - post harvest operations. Foxtail millet, Barnyard millet- Origin - geographical distribution- economic importance – Adaptations - soil and climatic requirements - growth Stages- land preparation- seeds and sowing- nutrient management - water management - weed management- harvesting - yield attributes – yield - post harvest operations

Module 4	Pulses- Economic importance - constraints for achieving higher productivity of pulses, strategies for improving the pulse production in India - climate resilient technologies . Pigeonpea- Origin - geographical distribution - economic importance- area, production and productivity in India and Andhra Pradesh - soil and climatic requirements - growth Stages - land Preparation - seeds and sowing – varieties - nutrient management - water management - weed management – harvesting- yield attributes – yield - post harvest operations - cropping systems. Greengram – Origin - geographical distribution - economic importance - area, production and productivity in India and Andhra Pradesh - soil and climatic requirements growth stages - land Preparation- seeds and sowing – varietiesnutrient management -water management- weed management- harvesting- yield attributes – yield - post harvest operations - cropping systems. Blackgram – Origin-geographical distribution,- economic importance - area, production and productivity in India and Andhra Pradesh - soil and climatic requirements - growth stages - land Preparation - seeds and sowing – varietiesnutrient management - water management-weed management - harvesting- yield attributes – yield - post harvest operations - cropping system. Bengalgram - Origin - geographical distribution- economic importance- area, production and productivity in India and Andhra Pradesh - soil and climatic requirements- growth stages -types of chick pea -land preparation - seeds and sowing- varieties- nutrient management- water management- weed managementharvesting- yield attributes – yield - post harvest operations - cropping systems. Lentil, peas- Origin- geographical distribution - economic importance- area, production and productivity in India and Andhra Pradesh - soil and climatic requirements- growth stages-types of lentil and peas - land Preparation - seeds and sowing – varieties- nutrient management- water management- weed management harvesting- yield attributes – yield - post harvest operations - cropping systems. Horsegram- Origin- geographical distribution - economic importance - area, production and productivity in India and Andhra Pradesh - soil and climatic requirements- growth stages - land Preparation- seeds and sowing – varietiesnutrient management- water management- weed management- harvesting- yield attributes – yield - post harvest operations - cropping systems. Cowpea- Origin - geographical distribution- economic importance - area, production and productivity in India and Andhra Pradesh - soil and climatic requirements - growth Stages - land preparation- seeds and sowing- varieties - nutrient management- water management- weed management-harvesting- yield attributes – yield - post harvest operations - cropping systems
Module 5	Rice nursery preparation, transplanting of rice, sowing of pigeonpea , greengram and maize, effect of seed size on germination and seedling vigour of cereal and pulse 20 crops, effect of sowing depth on germination of cereal and pulse crops, identification of weeds in cereal and pulse crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of cereal and pulse crops, study of crop varieties and important agronomic experiments at experimental farm, morphological description of cereal and pulse crops, visit to research centers of related crops

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text book of field crops production	Rajendra Prasad	Pusa, ICAR, New Delhi	2006
2	Agronomy of field crops	Reddy, S.R. and Reddi Ramu	Kalyani publishers, Ludhiana	2016
3	Scientific field crop production	Gururaj hunsigi and Krishna, K.R	Oxford &IBH Publishing Co.Pvt.LTD	2007

4	Principles and practices of rice Production	De Datta, S.K	John Wiley and Sons, New Yor	1981
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Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	
			16.667 %
In-Sem Summative	Mid Semester Exam	26.6664	26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666 %

FUNDAMENTALS OF PLANT BREEDING ><FPB>

COURSE CODE	23 GPBR 211	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23 GPBR 211
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply the definition of plant breeding, modes of reproduction, self and cross pollination, self-incompatibility, and male sterility in crops. Study about the plant introduction agencies in India and their role.	3	PO1,PO2, PSO1
CO2	To apply and explain different breeding methods for self-pollinated and cross-pollinated crops and concept of population genetics and manage the crops on field level and statistical analysis.	3	PO5,PO6,PO3, PSO1, PSO2
CO3	To apply and understand the genetic basis of heterosis, inbreeding depression to solve the agricultural problems and development of inbred lines, hybrids, composite and synthetic varieties. To be well versed with different methodologies for asexually propagated crops and wide hybridization area.	3	PO7,PO8, PSO2
CO4	To apply the knowledge about the polyploidy and mutation breeding concepts on the field level. To be able to help in Agricultural Research Systems in the areas of crop improvement through breeding for important biotic and abiotic stresses involving both conventional and biotechnological approaches and its adaptation both on field and lab level.	3	PO4,PO9, PO10, PSO1
CO5	To analyze and employ the germplasm maintenance in various crops, emasculation, and hybridization techniques in self and cross-pollinated crops. Study of male sterility systems, analyzing statistical parameters, design, heterosis, heritability estimation and prediction of hybrid performance on field level and work out the extent of natural out crossing in crops.	4	PO5, PO9,PO11,PO4, PSO2

Syllabus

Module 1	<p>Historical developments, concept, nature and role of plant breeding, major achievements and future prospects - Definition, aim, objectives, history and developments of plant breeding, scientific contributions of eminent scientists - Landmarks in plant breeding - Scope of plant breeding. Modes of reproduction and apomixis - Asexual reproduction (vegetative reproduction and apomixis) and sexual reproduction - Their classification and significance in plant breeding. Breeding methods in self-pollinated crops - Modes of selection - Selection - Natural and artificial selection - Basic principles of selection - Basic characteristics and requirements of selection - Selection intensity - Selection differential, heritability (narrow and broad sense) – Genetic advance as per cent of mean. Mass selection - Procedure for evolving a variety by mass selection - Modification of mass selection - Merits, demerits and achievements.</p>
Module 2	<p>Mass selection - Procedure for evolving a variety by mass selection - Modification of mass selection - Merits, demerits and achievements. Pure line selection - Johannsen's pure line theory and its concepts and significance - Origin of variation in pure lines - Characters of pure lines - Progeny test, genetic basis of pure line selection - General procedure for evolving a variety by pure line selection - Merits, demerits and achievements - Comparison between mass and pure line selection.</p> <p>Hybridization techniques - Hybridization - Aims and objectives - Types of hybridization - Pre-requisites for hybridization - Procedure / steps involved in hybridization. Handling of segregating population - Pedigree method - Procedure - Merits, demerits and achievements. Bulk method - Procedure - Merits, demerits and achievements - Comparison between pedigree and bulk methods - Single seed descent method - Merits and demerits. Backcross method of breeding - Its requirements and applications - Procedure for transfer of single dominant gene - Procedure for transfer of single recessive gene - Merits, demerits and achievements - comparison between pedigree and backcross method. Multiline concept - Definition - Characteristics of a good multiline - Development of multiline varieties - Achievements. Concepts of population genetics and Hardy-Weinberg Law - Hardy Weinberg Law - Factors affecting equilibrium frequencies in random mating populations - Selection without progeny testing - Selection with progeny testing - Merits and demerits of progeny selection - Line breeding achievements.</p>
Module 3	<p>Recurrent selection - Different types - Detailed procedure of simple recurrent selection and other recurrent selection methods - Conclusion on the efficiency of different selection schemes. Heterosis - Heterosis and hybrid vigour - Luxuriance - Heterobeltiosis - Brief history - heterosis in cross-pollinated and self-pollinated species, Manifestations of heterosis. Genetic basis of heterosis - Dominance, overdominance and epistasis hypotheses - Objections and their explanations - Comparison between dominance and overdominance hypotheses - Physiological basis of heterosis – Commercial utilization. Inbreeding depression - Brief history - Effects of inbreeding - Degrees of inbreeding depression - Procedure for development of inbred lines and their evaluation. Development of inbred lines and hybrids - Exploitation of heterosis - History of hybrid varieties - Important steps in production of single and double cross hybrids - Brief idea of hybrids in maize, pearl millet, sunflower and rice. Composite and synthetic varieties - Production procedures - Merits, demerits and achievements - Factors determining the performance of synthetic varieties - Comparison between synthetics and composites. Breeding methods in asexually propagated crops, clonal selection and hybridization - Characteristics of asexually propagated crops - Characteristics of clones - Clonal selection - Procedure – Advantages and disadvantages - Problems in breeding asexually propagated crops - Genetic variation within a clone - Clonal degeneration - Achievements - Comparison among clones, pure lines and inbreds - Breeding of annual asexually propagated species</p>

	through hybridization - Interspecific hybridization. Wide hybridization and pre breeding - History -Objectives - Barriers for the production of distant hybrids- Techniques for production of distant hybrids - applications of wide hybridization in cropimprovement- Sterility in distant hybrids -Limitations and achievements -use of gene pools to develop intermediate breeding material.
Module 4	<p>Polyploidy in relation to plant breeding -Polyploidy - Autopolyploids - Origin andproduction - Morphological and cytologicalfeatures- Applications in crop improvement -Limitations- Allopolyploidy - Morphological andcytological features- Applications in cropimprovement - Limitations. Mutation breeding- Methods and uses- Mutationbreeding - Procedure of mutation breeding -Applications - Advantages, limitations and achievements. Breeding for important biotic and abiotic stresses - Disease resistance - Mechanisms of diseaseresistance in plants (disease escape, tolerance,resistance, immunity and hypersensitivity) -Genetic basis of disease resistance - Gene for genehypothesis - sources of disease resistance -Breeding methods for disease resistance -Achievements. Insect resistance - Mechanism of insect resistancein plants (non preference, antibiosis, tolerance andavoidance)- Nature of insect resistance- Genetics ofinsect resistance - Horizontal and verticalresistance- Sources of insect resistance - breedingmethods for insect resistance - Problems inbreeding for insect resistance-Achievements.</p> <p>Drought resistance- Mechanisms of droughtresistance (drought escape, avoidance, tolerance,and resistance) - Features associated with drought resistance - Sources of drought resistance -Breeding methods for drought resistance -Limitations - achievements - Resistance to waterlogging - Effects of water logging - Mechanism of tolerance - Ideotype for flooded areas. Salt tolerance - Response of plants to salinity - Symptoms - Mechanisms of salt tolerance -Breeding methods for salt tolerance - Problems -Achievements. Cold tolerance - Chilling resistance- Effects of chilling stress on plants - Mechanismof chilling tolerance - Sources of chilling tolerance- Selection criteria. Biotechnological tools - DNA markers and markerassisted selection - Definition and classification ofDNA markers and applications. Participatory plant breeding - Definition - Goals -Methodology - Advantages and limitations.</p>
Module 5	Germplasm maintenance in various crops, emasculation, and hybridization techniques in self and cross- pollinated crops. Study of male sterility systems, analyzing statistical parameters, design, heterosis, heritability estimation and prediction of hybrid performance on field level and work out the extent of natural out crossing in crops.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Essentials in Plant Breeding	Phundan Singh	Kalyani Publishers, New Delhi	2014
2	Plant Breeding: Principles and Methods	Singh, B.D.	Kalyani Publishers, New Delhi.	2015
3	Plant Breeding Theory and Techniques	Gupta, S.K.	Wiley India Pvt.Ltd. New Delhi	2010
4	Principles of Plant Breeding	Allard, R.W.		2010

			John Wiley and Sons, New York.	
5	Principles and Practice of Plant Breeding	Sharma, J.R.	TataMcGraw Hill, Publishing Company Ltd., New Delhi.	1994

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

ii. FUNDAMENTALS OF ENTOMOLOGY II (FEII)

COURSE CODE	23ENTO231	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	Fundamental course
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand various abiotic and biotic factors of insect ecology	2	PO1,PO3, PO11 &PSO2
CO2	Acquainted with the concepts, components and tools of Integrated Pest Management	3	PO1,PO3, PO11 &PSO3
CO3	Acquainted with the mechanical, physical, biological and microbial control of insects	4	PO1,PO3, PO11 &PSO3
CO4	Awareness of recent formulations and application methods of chemical control of insects	3	PO1,PO3, PO11 &PSO3
CO5	Study of sampling techniques, calculations of insecticides doses, mass multiplication of biological agents and identification of non-insect pests	4	PO1,PO3, PO11 &PSO3

Syllabus

Module 1	<p>Insect Ecology- Introduction, Autecology and Synecology-Population-CommunityEcosystem-Agro-ecosystem -Environment and its components. Abiotic factors - Temperature-Its effect on the development, fecundity distribution, dispersal and movement of insects - Adaptations of insects to temperature - Thermal constantDay degrees. Moisture- Adaptation of insects to conserve moisture. - Humidity- Its effect on development, fecundity and colour of body - Rainfall - Its effect on emergence, movement and oviposition of insects. 2 Light – Phototaxis - photoperiodism - Its effect on growth, moulting activity or behaviour, oviposition and pigmentation - Use of light as a factor of insect control; Atmospheric pressure and its effect on behavior. Air currents - Effect on dispersal of insects – Edaphic factors. 3 Biotic factors – Food - Classification of insects according to nutritional requirements - Other organisms - Inter and Intra specific associations - Beneficial and harmful associations of parasitoids based on site of attack, stage of host, duration of attack, degree of parasitism and food habits. Effect of biotic factors - Competition, natural and environmental resistance 4 Concepts of Balance of life in nature- Biotic potential and environmental resistance. - Factors contributing to increase or decrease of population - Causes for outbreak of pests in agro-ecosystem.</p>
Module 2	<p>Practices, Scope and Limitations of IPM - IPM – Definitions, Concepts– Economic Threshold Level (ETL) – Economic Injury Level (EIL) and General Equilibrium Position (GEP) – Modified Equilibrium Position (MEP)- Components/tools of IPM 6 Pest surveillance and pest forecasting – Definition - Importance in IPM – Advantages - Components of pest surveillance, types of forecasting (short term and long term forecasting and their advantages) – Insect pests – Definitions of negligible, minor and major pests; Different categories of pests – Regular, occasional, seasonal, persistent, sporadic, epidemic and endemic pests with examples. 7 Host-plant resistance-Principles of host plant resistance – Ecological resistance – Phenological asynchrony, induced resistance and escape – Genetic resistance – Mono, oligo and polygenic resistance – Major gene resistance (vertical/specific/ qualitative) and minor gene resistance (horizontal/nonspecific/quantitative) – Host-plant selection process- host habitat finding, host finding, host recognition, host acceptance and host suitability- Mechanisms of Genetic resistance- Non-preference (antixenosis), antibiosis and tolerance – Transgenic plants. 8 Components/tools of IPM: Cultural control- Normal and special cultural practices which incidentally control the pests and agronomic practices recommended specifically against the pests with examples.</p>
Module 3	<p>Mechanical control- Different mechanical methods of pest control with examples. 10 Physical control – Use of inert carriers against stored product insects - steam sterilization – Solarization - Solar radiation - Light traps - Flame throwers etc.; Legislative measures - Importance of quarantine - Examples of exotic pests - Different legislative measures enforced in different countries including India. 11 Biological control - Types of biological control – Introduction, augmentation and conservation – Advantages and disadvantages of biological control. Parasite – Parasitoid - Parasitism - Grouping of parasites based on nature of host, stage of host, site of parasitisation, duration of attack, degree of parasitisation and food habits – Kinds of parasitism – qualities/attributes of an effective parasitoid. Predators – Predatism – qualities of insect predator – Differences between predator and parasite. 12 Microbial control - Important groups of micro organisms - Bacteria, viruses and fungi used in pest control and their mass multiplication techniques - Transgenic plant pathogens – Bacteria, fungi and viruses - Entomopathogenic nematodes – Important species - Mode of infectivity and examples.</p>
Module 4	<p>Chemical control - Importance and ideal properties of insecticide - Classification of insecticides based on origin, mode of entry, mode of action and toxicity with list of insecticides - Toxicity evaluation of insecticides - Acute or chronic toxicities, oral and dermal toxicities - LC50 (Median Lethal Concentration), LD50 (Median Lethal Dose), ED50 (Median Effective Dose), LT50 ((Median Lethal time), KD50 (Median</p>

	Knockdown Dose) and KT50 (Median Knock Down Time) – Bioassay methods. 14 Formulations of insecticides - Dusts, granules, wettable powders, water dispersible granules, solutions, emulsifiable concentrates, suspension concentrates, concentrated insecticide liquids, fumigants, aerosols, gels, micro encapsulations, tablets, baits and mixtures of active ingredients – Advantages and disadvantages of chemical control 15 Recent methods of pest control - Repellents (physical and chemical), Antifeedants - importance of antifeedants and limitations of their use – Attractants - Sex pheromones - List of synthetic sex pheromones resurgence and residues - Maximum Residue Limits (MRL) – Acceptable Daily Intake (ADI) – Safe waiting periods. nes - Use in IPM - Insect hormones – Gamma irradiation –Genetic control – Sterile male technique. 16 Application techniques of spray fluids- High volume, low and ultra low volume sprays - Compatibility of pesticides - Phytotoxic effects of insecticides - Safe use of pesticides - Symptoms of poisoning - First aid and antidotes for important groups of insecticides. Insecticide Act 1968-Important provisions - Insecticide resistance,
Module 5	Study of distribution patterns of insects in crop ecosystems - Sampling techniques for the estimation of insect population and damage - Pest surveillance through light traps, pheromone traps and forecasting of pest incidence - Calculation of doses/ concentrations of different insecticidal formulations - Acquaintance of insecticide formulations - Compatibility of pesticides with other agrochemicals and phytotoxicity of insecticides – Acquaintance of mass multiplication techniques of important predators :Cheilomenes, Chrysoperla and Cryptolaemus. Important parasitoids: Egg, larval and pupal parasitoids viz., Trichogramma, Apanteles and Tetrastichus. Important Entomopathogenic Fungi: Beauveria bassiana and Nucleo Polyhedro Virus (NPV) on Helicoverpa and Spodoptera. Study of insect pollinators, weed killers and scavengers - Identification of major non-insect pests viz., birds, rodents, crabs, snails, slugs and mammals. House hold and veterinary insect pests

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Elements of Economic Entomology,	Vasantharaj David, B. and Rama Murthy V.V.	Popular Book Depot, Coimbatore.	2016
2	Entomology and Pest Management.	Larry P Pedigo and Marlin E Rice.	Prentice Hall of India Private Ltd., New Delhi	2009
3	Biological Pest Suppression.	Gautam, R. D.	Westville publishing House New Delhi	2008
4	Entomology and Pest Management. Prentice Hall of India Private Ltd., New Delhi	Larry P Pedigo and Marlin E Rice.	Scientific publishers, Jodhpur	2009
5	Biological Pest Suppression	Gautam, R. D.	Westville publishing House New Delhi	2008

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	

			56.6666
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Agricultural Finance and Co-operation <AFC>

COURSE CODE	23AECO 241	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23AECO 241
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	Understand the importance of credit in agriculture and the criteria to avail credit	2	PO1 & PSO1
CO2	Apply the source of credit, crop loan system, and financial inclusion	3	PO2 & PSO3
CO3	Application of different schemes for financing weaker sections, also the higher financing agencies present in India and world along with crop insurance schemes	4	PO5 & PSO2
CO4	Application of agricultural project, cycle, cooperation, and history along with cooperative institutions in India	3	PO10 & PSO1
CO5	Analysing the progress of priority sector lending, working out different repayment plans and prepare balance sheet along with income statement	4	PO2 & PSO4

Syllabus

Module 1	Agricultural Finance - Meaning, definition, nature and scope - Significance – Micro and macro finance - Capital and credit problems, need and their importance in Agriculture. Credit - Meaning and definition - Classification of credit based on different criteria with examples. Credit analysis - Economic feasibility tests - 3 R's of credit analysis - Returns to investment- Repayment capacity - Meaning, causes of poor repayment capacity of farmers, suggestions to improve repayment capacity - Risk bearing ability - Meaning, sources of risk, means to strengthen RBA. Five Cs of credit – Character – Capacity – Capital - Condition and Common sense -Seven Ps of credit - Principle of Productive purpose - Principle of personality - Principle of productivity - Principle of phased disbursement - Principle of proper utilization - Principle of payment and Principle of protection.
Module 2	Social control and nationalization - Meaning, objectives and their importance- Privatization of commercial banks - Need for and importance of institutional sources and structure of agricultural lending from different sources. Lead bank scheme - Origin, objectives, functions -District credit plan – Regional Rural Banks (RRBs) - Origin, objectives, functions — RRBs in Andhra Pradesh. Crop loan system - Objectives, importance, features of crop loan system - Scale of finance - Meaning and estimation and role of district level consultative committee - Term loans – Objectives and meaning of unit costs, fixation of unit costs and NABARD guidelines. Financial inclusion - Meaning and importance - Micro finance - Meaning, importance, agencies providing microcredit banks, NBFCs, NGOs, and Govt. agencies - SHGs and their role in microfinance and bank linkages - Micro finance lending and control act in Andhra Pradesh - Objectives and important features.

Module 3	Schemes for financing weaker sections - Differential interest rate (DIR) – Integrated rural development programme (IRDP) – Swarna jayanti gram swarozgar yojana (SGSY) - Self-help groups (SHGs) etc., Srinidhi, MUDRA. Higher financing agencies -Reserve Bank of India (RBI) - Objectives and functions and role in agricultural development and finance. National Bank for Agricultural and Rural Development (NABARD) - Origin, functions, activities and role in agricultural development. World Bank (WB) - Objectives and functions -World Bank group institutions – role and functions of International Bank for Reconstruction and Development (IBRD)- International Development Agency (IDA) - International Finance Corporation (IFC), MIGA, ISID. Crop insurance - Meaning and its advantages and limitations in application - Agricultural insurance company of India - Objectives and functions - Indemnity - Meaning, premiums and claims - Prime Minister’s Fasal Bhima Yojana (PMFBY) - Salient features - Weather based crop insurance - Salient features and its importance.
Module 4	Agricultural project- Meaning, characteristics of agril. projects, project cycle and explanation of different phases of project cycle - Basic guidelines for preparation of project reports. Co-operation - Meaning, Scope, importance and definition - Principles – Objectives of co-operation, significance of cooperatives in Indian agriculture. Brief history of cooperative movement development in India - Recent developments in Indian cooperative movement - short comings of Indian co-operative movement and remedies. Agricultural Cooperative institutions in India - co-operative credit structure in India and Andhra Pradesh – Objectives and functions of state level (APCOB), district level (DCCB) and Village level (PACS) cooperative societies - Functions of marketing, consumer societies, multi-purpose cooperatives, farmers’ service cooperative societies, dairy cooperatives - Andhra Pradesh mutually aided Co-operative Societies Act (1995) - Role of International Cooperative Alliance (ICA), National cooperative Union of India (NCUI), National Cooperative Development Council (NCDC).
Module 5	Estimation of credit requirement of farm business – A case study. Estimation of scale of finance - Unit costs and KCC. Determination of most profitable level of capital use. Analysis of progress and performance of priority sector lending by commercial banks, Cooperatives, RRBs and non-institutional sources using published data. Working out different repayment plans with examples. Lump sum repayment /straight-end repayment - Variable or quasi variable repayment. Amortized decreasing repayment plan and amortized even repayment plan. Estimation of indemnity for crop insurance claims. Visit and study of a commercial bank to acquire first-hand knowledge of their management, schemes and procedures of lending and sanction of loans. Visit and study of a cooperative bank - PACS/ DCCB to acquire first-hand knowledge of their management, schemes and procedures of lending and sanction of loans. Visit and study of a cooperative society - dairy/ consumers to acquire first-hand knowledge of their management, schemes and activities. Preparation and analysis of balance sheet – A case study. Preparation and analysis of income statement – A case study. Appraisal of a loan proposal – A case study. Techno-economic parameters for preparation of projects - Preparation of bankable projects for various agricultural products and value-added products.

Reference Books:

S. No.	Title	Author(s)	Publisher	Year
1	Agricultural Finance and Management	Subba Reddy, S. and P. Raghuram.	Oxford & Publishing Company Private Ltd., New Delhi.	2005

2	Agricultural Economics	Subba Reddy, S., Raghu Ram., P., Sastry, T.V.N and Bhavani Devi, I.	Oxford & IBH Publishing Company Private Ltd., New Delhi.	2016
3	Essentials of Farm Financial Management.	Johil S.S. and C.V. Moore.	Today and Tomorrow Printers and Publishers, New Delhi.	1970
4	Financial Decision Making: Concepts, Problems and Cases, of India.	John, J. Hampton	New Delhi.	1983
5	Co-operatives in India.	Mamoria, C.B. and R.D. Saksena.	Kitab Mahal, Allahabad.	1973

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

ii. FARM MACHINERY AND POWER (FMP)

COURSE CODE	23 AENG 251	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	Fundamental course
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand and the familiarization of Farmpower, 4&2 Stroke engines of Petrol and Diesel Engines. Engine terminology, Fuel supply and cooling system of Diesel Engines	3	PO5, PSO1
CO2	Comprehend the Ignition system, power transmission, components in IC Engines, Lubrication system of Engines. Primary and secondary Tillage implements	4	PO5, PSO1
CO3	Characterizing, calibrating and functioning of Tillage implements, sowing equipments, transplanter and harvesters	3	PO5, PSO1
CO4	Maintenance and functioning of plant protection equipments, dusters, Tractor mounted equipment and Threshing equipment	4	PO5, PSO2
CO5	To have basic practical knowledge of engines, transmission of hydraulics of Tractors and primary and secondary tillage, plant protection and seedling equipment and introduction of harvesters	4	PO3, PO5, PSO2

Syllabus

Module 1	Farm power – Source of different farm power, advantages and disadvantages. Internal combustion engine - Different components and their functions - Working principle of four stroke and two stroke cycle engine - Comparison between diesel and petrol engine - Difference between four and two stroke engine. Terminology related to engine power - IHP, BHP, FHP, DBHP, compression ratio, stroke bore ratio, piston displacement, and mechanical efficiency - Numerical problems on calculation of IHP, BHP, C.R., stroke bore ratio, piston displacement volume. Fuel supply and cooling system of I.C. engine – Types, components and their functions, working principle of forced circulation cooling system.
Module 2	Ignition and power transmission system of I.C engine – Types, components and their functions, working principle of battery ignition system. Lubrication system of I.C. engine – Types, purpose, components and their functions, working principle of forced feed system - Tractors classification, types, points to be considered in selection of tractors, estimating the cost of operation of tractor power. Tillage - Primary and secondary tillage - M.B. plough – Functions, constructional features, operational adjustments and maintenance. Disc plough – Functions, constructional details, operational adjustments and maintenance.
Module 3	Numerical problems on M.B. plough and disc plough. Harrows – Types, functions, operation of disc harrows - Cultivators – Rigid and spring loaded tynes - Puddlers, cage wheel, rotovators - Intercultural implements – Hoes and weeders for dry and wetland cultivation. Sowing equipment - Seed cum fertilizer drills – Types, functions, types of metering mechanisms, functional components, calibration - Paddy transplanters. Harvesting equipment – Sickles, self propelled reaper, alignment and registration - Combines, functions of combines.
Module 4	Plant protection equipment – Types of sprayers, constructional features of knapsack sprayer, hand compression sprayer, foot sprayer, rocker sprayer and power sprayer, care and maintenance of sprayers. Dusters – Hand rotary and power operated dusters, care and maintenance of dusters. Tractor mounted equipment for land development and soil conservation – Functions of bund former, ridger, and leveling blade. Threshing equipment and principles of combine harvester.
Module 5	Showing the difference between EC engine and constructional details of IC engine. Dismantling the IC engine and explaining the functional aspects of components. Air cleaning and maintenance - Engine cooling and maintenance. Familiarizing with lubrication and fuel supply system of an engine. Familiarizing with clutch – Gearbox - Differential and final drive along with brake steering hydraulic control of tractor. Tractor driving. Power tiller operation. Attachment of an implement by using 3 point hitch system of a tractor. Familiarization with primary tillage implements like M. B. Plough, disc plough and its adjustments. Study of secondary tillage implements and its constructional details -Emphasis on disc harrow, spike tooth harrow, blade harrow, rotavator, power harrow. Familiarization with seed metering mechanism and its calibration. Study on planters and transplanters. Practicing with plant protection equipment, different sprayers and dusters. Familiarization with inter-cultural equipment and different types available in the market. Exposure on harvesting equipment and combine harvesters.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Elements of Agricultural Engineering	Jagadishwar Sahay		
2	Farm Machinery - Principles and Applications	Surendra Singh	ICAR Publication	
3	Farm Tractor – Maintenance and Repair	S.C.Jain and C.R.Rai	Standard Publishers, 1705-B, Nai Sarak, Delhi	

4	Principles of Agricultural Engineering. Vol. I	Ojha, T. P. and Michael, A.M.	Jain Brothers, 16/893, East Park Road, Karol Bagh, New Delhi	
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Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

INTRODUCTORY BIOLOGY (IB)

COURSE CODE	23CPHY16 1	MOD E	Offline	LTPS	1-0-2-0	PRE- REQUISITE	23CPHY161
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand Concepts of prokaryotes and eukaryotes	2	PO1, PO3, +PSO1
CO2	Understand Concepts of cell organelles	3	PO7, P8, PO5+PSO1
CO3	Understand Concepts of morphology of flowering plants	3	PO9+PSO2
CO4	Understand Concepts of systematics of flowering plants	4	PO2, PO4+PSO2
CO5	Developing fundamental laboratory skills, such as handling laboratory equipment, performing basic experiments, and following safety protocols. Gaining a practical understanding of key biological concepts, such as cell structure, genetics, metabolism, and biodiversity, through hands-on experimentation and observation.	4	PO6+PSO4

Syllabus

Module 1	<p>Introduction to living world - Properties of life or living things – Growth, development and reproduction, regulation and homeostasis - Diversity of Life – Major domains/ kingdoms of living beings – Bacteria (Eubacteria), Archaea (Archebacteria) and Eukarya (Protista, fungi, plantae, animalia) - Concepts of prokaryotes and eukaryotes, unicellular and multicellular organisms, plants and animals, sporophyte and gametophyte, monocots and dicots - Salient features, classification and alternation of generations of the plants of the following groups – Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms - Evolutionary relationships and differences among different kingdoms, viruses, viroids, prions and lichens and their special features.</p> <p>Origin of life – Theories of origin of life - Special creation, extra-terrestrial and spontaneous - Location of origin of life - Miller-Urey’s experiment, Path of evolution of chemical molecules of living beings, theories of origin of cells – Endosymbiotic theory, Bubble theory. Evolution and eugenics – Theories of evolution, eugenics - History, meanings and types. Nomenclature of living beings - Basics in biological classification, need for classification, importance of classification, nomenclature – Polynomial, binomial and trinomial systems of nomenclature - Rules of binomial nomenclature, hierarchy of classification.</p>
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Module 2	Cells – Cell structure and organization of plants and animals - Cell theory and cell as the basic unit of life - Overview of the cell. Prokaryotic cells, ultra structure of plant cell (structure in detail and functions in brief) - Cell membrane, cell wall, cell organelles - Morphology and function: Endoplasmic reticulum, mitochondria, plastids, ribosomes, golgi bodies, vacuoles, lysosomes, microbodies, centrosome and centriole, cilia, flagella, cytoskeleton and nucleus. Chromosomes -Number, structural organization -Nucleosome. Cell cycle, cell division - Somatic cell division or mitosis – Stages and phases - Reproductive cell division or meiosis – Stages and phases and significance. Morphology of flowering plants - Roots - Characters, types and modifications of roots, basic external and internal structural organization of root in monocots and dicots.
Module 3	Morphology of flowering plants - Stems - Characters, functions and modification of stems - Basic external and internal structural organization of stem in monocots and dicots. Morphology of flowering plants - Leaf - Parts, functions, types and modifications of leaves - Leaf venation and phyllotaxy. Morphology of flowering plants - Inflorescence - types of inflorescences, types of racemose inflorescence, types of cymose inflorescence - Special types of inflorescences. Morphology of flowering plants - Flower - Structure and parts of flower, types of flowers based on sex distribution, structural symmetry, position of gynoecium, aestivation - Description of types of calyx, corolla, stamens and ovary; Seed - Structure and organization of seed in monocots and dicots - Seed germination - Necessary conditions for germination.
Module 4	Plant systematics – Brassicaceae - Distribution, important plants, economic importance, vegetative and floral characters, pollination, fruit and seed characters. Plant systematics - Fabaceae - Distribution, important plants, economic importance, vegetative and floral characters, pollination, fruit and seed characters. Plant systematics - Poaceae - Distribution, important plants, economic importance, vegetative and floral characters, pollination, fruit and seed characters. Role of animals in agriculture–Animals of draught and milch, fur, wool, etc. - Different animal products used as manure.
Module 5	External morphology of monocot roots - Rice and maize. External morphology of dicot roots - Brassica and any legume. External morphology of monocot stem - Rice and maize. External morphology of dicot stem - Brassica and any legume. External morphology of monocot leaf - Rice and maize. External morphology of dicot leaf – Brassica and any legume. Structure and organization of plant cell. Study of different types of tissue systems - Parenchyma, collenchyma and sclerenchyma. Study of mitosis through onion root tip cells. Study of meiosis through onion anther cells. Internal anatomy of monocot stems and roots - Rice and maize. Internal anatomy of dicot stems and roots - Brassica and any legume. Internal anatomy of ovary of monocots and dicots - Any millet and legume. Description of Brassicaceae with live specimens. Description of Fabaceae with live specimens. Description of Poaceae with live specimens.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Biology –, 10th edition,.	Raven P, Mason Johnson G B, Losos J. B, Singer. S.S	McGraw Hill Publications.	2014
2	Plant systematics.	M.G. Simpson,	Elsevier Publications.	2006.

3	College Botany	H. C. Gangulee	SCIENTIFIC PUBLISHERS (INDIA)	1972
4	A class book of Botany Botany for Degree Students,	A. C. Dutta 1964	Oxford University Press, Calcutta.	1964
5	Agricultural Botany. 2nd edition.	N. T. Gill.	SPRINGER	1966.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	20	
	Atten (AG)	5	
			25
In-Sem Summative	Mid Semester Exam	20	
			25
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

23PATH 271 Fundamentals of Plant Pathology II (Plant Pathology Principles)

COURSE CODE	23PATH 271	MODE	OFFLINE	LTPS	1+0+2+0	PRE-REQUISITE	23 PATH171
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To explain the contributions of eminent scientists in Plant Pathogens world, Host-Plant Pathogen Interactions, Survival, Dispersal of Plant pathogens	3	PO1,PO2,PO3 &PSO1
CO2	To gain knowledge on the Infection process, Pathogenesis, Enzymes, Toxins, Defense Mechanisms in Crops	3	PO1,PO2,PO3,PO4&PSO3
CO3	To gain knowledge on the biology of different groups of Plant Pathogens of importance in agriculture	3	PO1,PO2,PO3,PO4&PSO3
CO4	To impart knowledge on the principles of Plant Pathology and role of Plant Pathogens and their control in improving agricultural production	3	PO1,PO2,PO3,PO4&PSO3
CO5	Explains the Use of basic laboratory equipments, apparatus and procedures for the study of Plant Pathogens and to isolate and recognize major groups of Plant Pathogens and their control	4	PO4, PO5 &PSO3

Syllabus

Module 1	History of Plant Pathology with special reference to Indian work- contributions of Anton de Bary, Woronin, Oscar Brefeld, Marshal Ward, Millardet, Butler, Mundkur, Stakman, Dastur, Mehta, Sadasivan. Terms and concepts used in plant Pathology - disease - disorder - pathogen - parasite - pathogenicity - pathogenesis - sign - symptom - syndrome - biotroph - hemibiotroph - perthotroph (necrotroph) - inoculum - inoculum potential - infection - incubation period - predisposition - hypersensitivity - epidemic - endemic and sporadic diseases. Survival of plant pathogens - kinds of inoculum - primary and secondary inoculum - pattern of survival - infected host (main host, alternate host and collateral host) - saprophytic survival outside the host (soil, root inhabitants and rhizosphere colonizers) dormant spores or structures (seed borne, soil borne and on infected plant parts). Dispersal of plant pathogens - active dispersal - seed, soil and plant parts, passive dispersal - air, water, members of animal kingdom (agents with examples), fungi and phanerogamic parasites.
Module 2	Phenomenon of infection - process of infection - pre-penetration, penetration and post-penetration. Pre-penetration in fungi (spore germination, germ tube growth, formation of specialized structures like appressorium and rhizomorphs), bacteria and virus. Penetration - indirect penetration through wounds or natural openings like stomata, hydathodes and lenticels - direct penetration through plant surface (cutinized and non cutinized surfaces) by chemical or mechanical methods. Post penetration - colonization of the host. Pathogenesis - role of enzymes, toxins, growth regulators and polysaccharides in plant diseases with examples. Enzymes - cutinases, pectinases, cellulases, lignases, proteases and lipases. Toxins - pathotoxins, phytotoxins and vivotoxins - selective (host specific) and non-selective (host non-specific) toxins. Growth regulators - growth promoting substances (auxins, gibberellins and cytokinins) and growth inhibiting substances and polysaccharides. Defense mechanisms in plants - pre-existing structural defense mechanisms - waxes, thick cuticle and epidermal cell wall - structure of natural openings, internal structural barriers – postinfectious structural defense - histological defense (cork layer, abscission layer, tyloses and gum deposition) and cellular defense (hyphal sheathing) structures.
Module 3	Biochemical defense mechanisms - pre-existing biochemical defense mechanisms - inhibitors released by the plant in its environment (protocatechuic acid and catechol) and inhibitors present in the plant cell (phenolic compounds - chlorogenic acid) – post infectious defense mechanisms - phytoalexins, hypersensitive reaction - defense through plantibodies. General principles of plant disease management - importance - general principles - avoidance of the pathogen (selection of pathogen free propagating material and seed, selection of field, choice of time of sowing and disease escaping varieties), - exclusion - plant quarantine and inspection, quarantine rules and regulations. Eradication - cultural methods of eradication (rouging, eradication of alternate and collateral host, crop rotation, manure and fertilizer management, mixed cropping, sanitation, summer ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage). Physical methods of eradication- solarization and hot water treatment; Biological methods - role of biological control - mechanisms - competition, antibiosis, hyperparasitism, Systemic Acquired Resistance (SAR) and Induced Systemic Resistance (ISR).
Module 4	. Important fungal and bacterial biocontrol agents (Trichoderma spp, Psuedomonas fluorescens, Bacillus subtilis and Ampelomyces quisqualis) - Plant Growth Promoting Rhizobacteria (PGPR) against phytopathogens. Contact and systemic fungicides against lower fungi, downy mildews, powdery mildews, rusts, smuts, coloured fungi, leaf spots and blights. Chemicals for soil drenching. Mode of action and Formulations of fungicides, Antibiotics and their formulations. Introduction to botanicals and other non-chemical preparations used in the disease management in organic and natural farming systems.

Module 5	1.Acquaintance with various laboratory equipment. 2. Preparation of culture media Potato Dextrose Agar (PDA) for fungi and Nutrient Agar (NA) for bacteria. 3. Isolation of fungal and bacterial pathogens. 4. Preservation of disease samples - dry and wet methods. 5. Demonstration of Koch's postulates for fungi. 6. Demonstration of Koch's postulates for bacteria. 7. Study of different groups of fungicides and antibiotics. 8. Preparation of fungicides - Bordeaux mixture, Bordeaux paste and cheshunt Compound. 9. Methods of application of fungicides - soil application. 10. Methods of application of fungicides - seed treatment. 11. Foliar application of fungicides - Calculation of fungicide spray concentrations. 12. Bioassay of fungicides - poisoned food technique, inhibition zone technique and slide germination technique. 13. Bio-control of plant pathogens - dual culture technique. 14. Incubation of Trichoderma in Farm yard manure for field application. 15. Pesticide equipment and their safe use. 16. Preparation of Panchagavya, Bijamrita, Panchapatra kashayam and other botanical extracts.
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Principles of Plant Pathology	Vidyasekharan, P	CBS Publishers and Distributors, New Delhi.	1993
2	Plant Pathology	Mehrotra, R.S	Tata McGraw-Hill Publishing Co. Ltd., New Delhi.	1980
3	Introduction to Principles of Plant Pathology	Singh, R.S.	Oxford & IBH Publ. Co.Pvt. Ltd., New Delhi	2002
4	Introductory Plant Pathology.	Chaube, H.S. and Ramji Singh.	International Book Distribution Co., Lucknow. 136	2001
5	Plant Pathology.	Agrios, G.N	Elsevier Academic Press	2005

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	ATTENDENCE	5	
	CONTINUOUS EVALUATION – Lab Exercise	20	
			25
In-Sem Summative	MID SEMESTER EXAMINATION	20	
			20
End-Sem Summative	LAB END SEMESTER EXAMINATION	25	
	END SEMESTER EXAMINATION	30	
			55

Production Technology for Vegetables and Spices (23HORT 281)

COURSE CODE	23 HORT 281	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23 HORT 281
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To study about importance of vegetables and spices in human nutrition and national economy , Classification of vegetables - 1) Botanical 2) Based on Hardiness 3) Parts Used 4)Method of culture 5) Season. Improved varieties, cultivation practices, Seed production, insect pest and diseases of Tomato, Brinjal, Chilli, Okra and Leafy vegetables.	3	PO1, PO2&PSO1
CO2	To study about Cucurbits – Flowering, sex expression, sex ratio. Cultivation practices, seed production, insect pest and disease control for Cucurbits (Gourds and Melons), Cole crops, peas and beans.	3	PO2, PO4, PO3&PSO1
CO3	To study about cultivation practices, propagation and insect pest as well as disease control of root, tuber and bulb crops and for perennial vegetables such as drumstick and curry leaves.	3	PO3, PO4&PSO2
CO4	To study about cultivation practices, propagation, processing, disease and insect pest control for spices such as Ginger, Turmeric, Black pepper, Cardamom, Cinnamon, Cumin & Fenugreek.	3	PO4, PO2&PSO2
CO5	Analysing vegetables and spices crops and their seed. Nursery raising of vegetable crops, transplanting. Analysing morphological characters of vegetables and spices, physiological disorders of vegetable crops, Intercultural operations in vegetable and spices, Seed extraction methods in vegetables and spices, Harvest indices and maturity standards of vegetable crops, preparation for market. Visit to vegetable farmer fields and vegetable markets to study marketing problems.	4	PO8, PO2, PO10 &PSO4

Syllabus

Module 1	Importance of vegetables & spices in human nutrition and national economy, Tomato- origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production Brinjal & Chilli, Okra & Leafy vegetables,
Module 2	Origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of Cucurbits – Cucumber & Melons , Gourds - Ridge gourd, Bitter gourd, Bottle Gourd, Snake gourd, Cole crops- Cabbage & Cauliflower, Peas & beans (Cluster bean, French bean. Dolichos),
Module 3	Origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of Root crops (carrot & radish), Tapioca & sweet potato, Perennial vegetables – drumstick & curry leaf, Bulb crops – onion & garlic,

Module 4	Origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of Black pepper, Cardamom, Ginger & turmeric, Coriander, Cumin & Fenugreek.
Module 5	Identification of vegetables & spices crops and their seeds. Nursery raising, Direct seed sowing and transplanting, Study of morphological characters of different vegetables & spices, Fertilizers applications, Raising of nursery of vegetables & spices, Vegetables & spices seed extraction, Harvesting & preparation for market, Economics of vegetables and spices cultivation.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Modern Technology in Vegetable Production.	Pranab Hazra, A. Chattopadhyay, K. Karmakar and S. Dutta. 2010	New India Publishing Agency, New Delhi..	2010
2	Basic Concepts of Vegetable Science.	Neeraj Pratap Singh,	International Book distributing Co. New Delhi. Academic Press, New Delhi.	2007
3	Vegetables Growing in India.	Prem Singh Arya and S. Prakash	Kalyani publishers, New Delhi	2002
4	Vegetable Crops Vol. II & III	Bose, T. K., Kabir, J., Maity T. K., Parthasarathy V. A., and Som M. G.,	Naya Prokash, Kolkata.	2002
5	Production Technology of Spices and Plantation Crops.	Shanmugavelu, K.G., N. Kumar and K.V. Peter	Agrobios (India), Jodhpur.	2005

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Fundamentals of Agricultural Extension > <FAE>

COURSE CODE	23AEXT2 91	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23AEXT2 91
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	Understanding the Fundamentals of extension education and agricultural extension. Extension programme planning, Extension systems in India. Extension efforts in pre-independence and post-independence era. Developmental activities launched by icar/govt. of India.	3	PO7, PO8 & PSO1
CO2	understanding the Agricultural developmental programs and new trends in Agricultural Extension, and community development and Rural Development in India	3	PO8, PO7 & PSO3
CO3	Application of the Panchayat Raj system, poverty allivation programs, women development programs, PRA, rural leadership and training and administration of extension in rural areas	4	PO7, PO8 & PSO2
CO4	Explaining about transfer of technology. Training of farmers, farmwomen and farm youth. Extension teaching methods, Communication models. Agricultural journalism. Diffusion and adoption of innovation. Innovation decision process. Adopter categories and their characteristics.	3	PO8, PO9 & PSO3
CO5	Practical study on various types of audio-visual aids. Group discussion, visit to village to study the rural and agricultural developments. Visit to KVK, FTC, DATTC, DRDA, DWMA, ATMA, JDA. Practice of PRA techniques, script writing for television and radio.	4	PO5 & PSO4

Syllabus

Module 1	Education: Meaning, Definition & Types - Formal, Non - Formal and Informal Education; Extension Education - meaning, definition, Concepts, Characteristics scope, and process; Objectives and principles of extension education. Extension programme planning– Meaning, process, principles. Extension programme planning– Steps in programme development. Extension systems in India. Extension efforts in pre-independence era – Sriniketan, Marthandam, Sevagram, Firka Development Scheme, Gurgaon Experiment, etc. Extension efforts in post-independence era - Etawah pilot project, Nilokheri experiment etc. Extension/Agriculture development programme launched by ICAR/Govt. of India – IADP, IAAP and HYVP.
Module 2	Extension / Agriculture development programme launched by ICAR / Govt. of India – SFDA, MFAL and T & V System. Extension / Agriculture development programme launched by ICAR / Govt. of India, KVK, ORP and ND. b)IVLP. Extension / Agriculture development programmes launched by ICAR / Govt. of India – NATP, ATMA, SREP, ATIC. b) NAIP. New trends in agriculture extension – Privatization extension and cyber extension /e-extension. New trends in agriculture extension –

	Market led extension, farmer-led extension, expert systems, etc. Community development –Meaning, definition, concept and principles - Philology of C.D. Rural development - Meaning, definitions, concept, characteristics, objectives, importance and problems in rural development. Rural development launched by Govt. of India – National Extension Service (NES), Panchayat Raj Systems/Democratic Decentralization and Panchayat Raj – Need.
Module 3	Rural development launched by Govt. of India – Three tiers of Panchayat Raj system – Powers, functions and organization setup -Mandal system in Andhra Pradesh. Social justice and poverty alleviation programmes – ITDA, IWDP and NERP. Social justice and poverty alleviation programmes – IRDP, JRY, SGRY, SGSY and MGNREGP. Women development programmes – ICDS, DWCRA, RMK, MSY, ANTWA and IKP. Participatory Rural Appraisal (PRA). Rural leadership - Meaning, definition and concept, types of leaders in rural context, roles of leaders and different methods in election of a leader. Training of leaders – Lay and professional leaders, advantages and limitations in using local leaders in Agricultural Extension. Extension administration - Meaning, definition and concept, principles and functions -Monitoring and evaluation.
Module 4	Transfer of technology -Concept and models and capacity building of extension personnel farmers – Training –Meaning, definition, and types of training – Pre-Service training -In-service, orientation, induction training, refresher training and training for professional qualification. Training of farmers, farmwomen and rural youth –Farmers’ Training Centre (FTC)- Objectives – Training organized - District Agricultural Advisory and Transfer of Technology Centre (DAATTC) –Objectives. Extension teaching methods -Meaning, classification, individual, group and mass contact methods, media mix strategies and communication -Meaning and definition. Functions of communication, models – Aristotle, Shannon, Weaver, Berlo, Schramm, J.P. Leagans, Rogers and Shoemaker, Litterer, Westley –Macleans and barriers to communication. Agriculture journalism –Meaning – Scope – Importance - Characteristics of News –Factors determining the News value – Types of News and sources of News. Diffusion and adoption of innovation - Meaning, definition, concepts and process and stages and Models of adoption process – Five (5) and Seven (7) stage models -Attributes of innovation –Relative advantage, compatibility, complexity, trialability – observability and predictability. Innovation – Decision process –Meaning – Stages (Knowledge, persuasion, decision, implementation and confirmation) Adopter categories and their characteristics - Factors influencing adoption process – Social, personal and situational
Module 5	Audio-visual aids – Meaning, importance and classification - Selection, planning, preparation, evaluation, presentation and use of audio-visual aids – Charts. Selection, planning, preparation, evaluation, presentation and use of audio-visual aids – Charts, posters, flip charts, flash cards, planel graphs. Selection, planning, preparation, evaluation, presentation and use of audio-visual aids – Power point slides. Planning and preparation of extension literature – Leaflet, folder, pamphlet, booklet, news stories and success stories. Handling and use of audio visual equipments such as public address equipment (PAE) system and still camera and digital camera and Liquid Crystal Display (LCD) Projector. Group discussion – Simulated exercise. Visit to a village to study on going rural development and agricultural developmental programmes. To study and familiarize university extension system. Visit to KVK. Visit to Farmers’ Training Centre (FTC). Visit to District Agricultural Advisory and Transfer

	of Technology Centre (DAATTC). Visit to study organization and functioning of DRDA, DWMA, ATMA, JDA Office and other development departments at district level. Visit to a village to exercise PRA techniques. Visit to community radio and television studio for understanding the process of programme production, Script writing. Developing script for radio. Developing script for television.
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Reference Books

Sl. No.	Title	Author(s)	Publisher	Year
1	Extension Education	Adivi Reddy, A	Sree Lakshmi Press, Bapatla.	2006
2	Extension Communication and Management	Ray, G.L.	Naya Prokash/Kalyani Publishers, Kalkatta/Ludhiana	2006
3	Communication	Rayudu, C.S.	Himalaya Publishing House, New Delhi.	1997
4	Diffusion of Innovation	Rogers, E.M.	Free Press, New Delhi.	2003
5	Journalism	Ray, G.L. and Mondal S.	Kalyani Publishers, Kalkatta/Ludhiana	2005

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

Crop Production Technology – II (Oilseeds, Fibre, Sugar, Tobacco and Fodder crops) > <(CPT-II)>

COURSE CODE	23AGRO202	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23AGRO101
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
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CO1	To gain knowledge about Oilseeds like groundnut, sesamum, soybean, rapeseed, mustard their sowing method, economic importance, nutrition, water, weed management.	3	PO1,PO4 & PSO1, PSO2
CO2	To gain the knowledge about mustard, sunflower, safflower, castor, linseed and niger, Fibre crops: cotton with their economic importance-method of sowing- varieties - nutrient management-water management, weed management - yield attributes –yield-harvesting – post harvest operations, quality considerations – cropping systems.	3	PO2,PO1 & PSO1, PSO2
CO3	To acquire knowledge about Fibre crops: jute, mesta; Sugar crops: sugarcane,sugarbeet, Tobacco. Nutrient, weed ,water management of jute and mesta. Ratoon cane management – factors affecting quality of sugarcane – arrowing–jaggery making of sugarcane. Quality characters-nicotine content, burning quality, aroma and sugar content -methods of curing -flue curing of Virginia tobacco.	3	PO1,PO4 & PSO1, PSO2
CO4	To acquire knowledge about Forage crops: sorghum, cowpea, cluster bean, napier, maize, lucerne, berseem and oat, Potato. preservation of fodder – hay and silage making, nutrient requirement- irrigation- weed management- harvesting –yield of forage crops and potato.	3	PO1,PO4 & PSO1, PSO2
CO5	To gain the practical knowledge Identification of weeds in oil seeds, fiber crops; Study of morphological characteristics of oil seeds, fiber crops ; Study of yield contributing characters of oil seeds, fiber crops; Yield and juice quality analysis of sugarcane; Study of important agronomic experiments of oil seeds, fiber crops at experimental farms, study of forage experiments, hay and silage; Oil extraction of medicinal crops, visit to research stations of related crops.	4	PO1,PO4 & PSO1, PSO2

Syllabus

Module 1	<p>Importance of oilseed crops- edible and non – edible oils – nutritional value importance in Indian economy- constraints in oilseed production.- Need for improvement of productivity and production of oilseeds -climate resilient technologies- Groundnut – Origin - geographical distribution -area, production and productivity in India and Andhra Pradesh- economic importance Soil and climatic requirements - types - growth stages - land Preparation -seeds and sowing- seed treatment-seed rate-spacing-season-time and method of sowing -varieties-nutrient management Water management -weed management- yield attributes –yield-harvesting, post harvest operations- quality considerations -cropping systems – value addition in groundnut. Soybean-Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- soil and climatic requirements- Land preparation - seeds and sowing-seed viability - seed treatment-seed ratespacing- season-time and method of sowing- varieties -nutrient management- water management- weed management yield attributes –yield- harvesting – shatteringpost harvest operations- quality considerations- cropping systems- Sunflower – Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- soil and climatic requirements- Land preparation - seeds and sowing-seed treatment-seed rate-spacing-season-time and method of sowing- varieties -nutrient management-water management-weed management - yield attributes –yield- harvesting– post harvest operations- quality considerations – seed production-seed setting problems and measures-cropping systems. Sesame – Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- soil and climatic requirements- Land preparation - seeds and sowing- seed treatment-seedrate-spacing-season-time and</p>
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	method of sowing- varieties - nutrient management- water management- weed management yield attributes –yield- Harvesting – post harvest operations- Quality considerations – cropping systems. Rapeseed and mustard – Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- soil and climatic requirements-Land preparation - seeds and sowing- seed treatment-seed rate spacing- season-time and method of sowing- varieties.
Module 2	Nutrient management- water management- weed management yield attributes – yield- Harvesting – post harvest operations- quality considerations – cropping systems. - Safflower – Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- soil and climatic requirements- Land preparation - seeds and sowing- seed treatment-seed rate-spacing-season time and method of sowing- varieties - nutrient management- water management weed management - yield attributes –yield- harvesting – post harvest operations quality considerations – cropping systems. - Castor – Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- soil and climatic requirements- Land preparation - seeds and sowing- seed treatment-seed rate-spacing-season time and method of sowing- varieties –nipping- nutrient management- water management- weed management - yield attributes –yield- harvesting – post harvest operations- quality considerations – cropping systems. Linseed– Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- soil and climatic requirements- Land preparation - seeds and sowing- seed treatment-seed rate-spacing-seasonpyra /utera, time and method of sowing- varieties – nutrient management- water management- weed management - yield attributes –yield- harvesting – post harvest operations- quality considerations – cropping systems. - Niger - Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- soil and climatic requirements- Land preparation - seeds and sowing- seed treatment-seed rate-spacing-season time and method of sowing- varieties - nutrient management- water management weed management - yield attributes –yield- harvesting – post harvest operations quality considerations – cropping systems. Fibre crops: Cotton, Jute and Mesta - Cotton- Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- classification- soil - climatic requirements- land preparation - seeds and sowing- seed treatment-seed rate spacing- season-time and method of sowing. - Varieties/Bt cotton - growth stages – branching- nutrient management - water management- weed Management- topping- bud and boll shedding - Yield attributes –yield- harvesting-defoliants-mechanized harvesting - quality considerations -cropping systems- climate resilient technologies
Module 3	Jute- Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- - soil - climatic requirements- types of jute- - land preparation - seeds and sowing- seed treatment-seed rate-spacingseason- time and method of sowing- varieties - nutrient management - water management- weed management-yield attributes - yield- harvesting – processing of jute- quality considerations- cropping systems. - Mesta – Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance- - soil - climatic requirements types of mesta - land preparation - seeds and sowing- seed treatment-seed rate spacing- season-time and method of sowing- varieties - nutrient management - water management- weed management-yield attributes –yield- harvesting–processing of mesta- quality considerations- cropping systems. Sugar crops- Sugarcane and Sugarbeet - Sugarcane – Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance - soil - climatic requirements– Influence of rainfall, temperature, light- land preparation – planting time in Coastal and Rayalseema regions of AP Planting material – setts – short crop – nursery crop – different methods of planting – growth stages -Nutrient Management – crop logging- trash mulching – wrapping and proppingwater management- weed management- criteria for judging maturity- climate resilient

	technologies - Ratoon cane management – factors affecting quality of sugarcane – arrowing– jaggery making – clarification. - Sugarbeet – Origin - geographical distribution - area, production and productivity in India - economic importance- soil - climatic requirements - Land preparation - seeds and sowing- seed treatment-seed rate-spacing-season-time and - nutrient management - water management- weed management- yield attributes –yieldharvesting - quality considerations- cropping systems - Tobacco –Origin - geographical distribution - area, production and productivity in India and Andhra Pradesh - economic importance - soil - climatic requirements– types of tobacco-Land preparation
Module 4	Nursery management-seeds and sowing for different types- seed treatment-seed rate-spacing-season-time and method of sowing -Varieties - nutrient management – topping and desuckering-water management weed management- yield attributes –yield-harvesting –priming-curing - Quality characters-nicotine content, burning quality, aroma and sugar content - methods of curing -flue curing of <i>Virginia</i> tobacco - cropping systems - Forage crops- Importance- terminology in forage production-classification of fodders-sorghum and maize importance-seeds and sowing - nutrient requirement irrigation- weed management- harvesting –yield- quality of fodder.-Cowpea, clusterbean - napier grass - importance- seeds and sowing -nutrient requirement-irrigation- weed management- harvesting –yield- quality of fodder. - Lucerne, berseem, oat – importance- seeds and sowing -nutrient requirement irrigation- weed management-harvesting –yield quality of fodder. - Forage crops- Quality considerations- preservation of fodder – hay and silage making Other crops: Potato - Potato - Origin - geographical distribution - area, production and productivity in India - economic importance- - soil - climatic requirements – varieties – soil - climatic requirements - land preparation - seeds and sowing- seed treatment-seed ratespacing- season-time and - nutrient management - water management- weed management- yield attributes –yield- harvesting - quality considerations- cropping systems
Module 5	Sowing methods of sugarcane, sowing of soybean, cotton, groundnut, jute, mesta; Identification of weeds in oil seeds, fiber crops; Study of morphological characteristics of oil seeds, fiber crops ; Study of yield contributing characters of oil seeds, fiber crops; Yield and juice quality analysis of sugarcane; Study of important agronomic experiments of oil seeds, fiber crops at experimental farms, study of forage experiments, hay and silage; Oil extraction of medicinal crops, visit to research stations of related crops.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Agronomy of field crops.	Reddy, S.R. and Reddi Ramu. 5th edition,	Kalyani publishers, Ludhiana	2016
2	Modern techniques of raising field crops.	Chidda Singh, Singh, P and Singh, R.	Oxford & IBH Publishing house	2003
3	Text book of field crops production. Commercial crops, volume-II ,	Rajendra Prasad	Technical Editor, ICAR, New Delhi	2004
4	Agronomy of fodder and forage crops,.	Panda S.C	Kalyani publishers, Ludhiana	2014

Evaluation Components:

Evaluation	Component	Weightage	Total
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In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

Farming Systems and Sustainable Agriculture <(FSSA)>

COURSE CODE	23 AGRO 203	MODE	Offline	LTPS	1-0-0-0	PRE-REQUISITE	23 AGRO 101
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply farming system, types of farming system, related terminology and allied enterprises	3	PO1, PO2, PSO 2
CO2	Applying knowledge about poultry farming, sericulture, tools for determining production and their adverse effects of modern agriculture	3	PO7, PO2, PSO 2
CO3	To apply and identify problems related to soil. conservative agriculture, techniques for sustainability and integrated farming systems	3	PO2, PO7, PSO 4
CO4	To apply site specific developments of IFS models, resource use efficiency, resource cycling and to visit IFS models	3	PO4, PO7, PSO 4

Syllabus

Module 1	Farming System – introduction – scope of farming system – importance – concept – principles of farming system. Types of farming systems – advantages and limitations - suitability – factors affecting the farming system. Farming systems – system and systems approach - determinants of farming system – cropping systems (navadhanya concept) and related terminology. Allied enterprises – significance of integrating crop and livestock enterprises – components and maintenance- dairying and sheep and goat rearing – breeds – housing – feed and fodder requirements – biogas plant
Module 2	Allied enterprises – poultry farming – breeds – housing – feed and fodder requirements – apiculture – species and management. Allied enterprises – sericulture – moriculture and silkworm rearing – agro-forestry systems suitable for dryland farming. Tools for determining production and efficiencies in different farming and cropping systems. Adverse effects of modern agriculture - sustainable agriculture – definition – concept – goals – elements

Module 3	Problems related to soil, water and environment - adaptation and mitigation strategies - indicators of sustainability. Conservation agriculture – concept – need - management of natural resources -land, water and vegetation. Techniques for sustainability - Low External Input Agriculture (LEIA) and Low External Inputs for Sustainable Agriculture (LEISA) and HEIA (High External Input Agriculture). Integrated farming system- historical background, objectives and characteristics advantages
Module 4	Site specific development of IFS models for different agro climatic zones of India and A.P. Resource use efficiency – optimization of resource use by different methods in an IFS (Annapurna model). Resource cycling - flow of energy in different farming systems. Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	A hand book of organic farming	Arun K. Sharma	Agribios (India) Jodhpur	2006
2	Farming systems principles and practice	Jayanthi C, Devasenapathy P and Vinnila, C.	Satish serial publishing house, Delhi	2008
3	Cropping and farming systems	Panda.S.C.	Agrobios (India) Jodhpur	2011
4	Farming systems in the tropics	Ruthenburg, H.	Oxford university press	1980

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	5
In-Sem Summative	Mid Semester Exam	35	35
End-Sem Summative	End Semester Exam	60	60

IRRIGATION WATER MANAGEMENT > <IWM>

COURSE CODE	23 AGRO 204	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23 AGRO 102
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
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CO1	To study and understand the knowledge of irrigation water management to maximizing crop yield and quality by developing irrigation and water management techniques can help growers demonstrate best practice to retailers and consumers.	2	PO6,PO8
CO2	Understand the ways for growers to improve crop performance by evaluating the different types of irrigation and water managements systems available	2	PO4
CO3	Understand the knowledge of various irrigation methods which are more efficient to minimize the water loss and improve the water use efficiency of crop and water requirements of the crops	2	PO4
CO4	Understand the knowledge on Water requirements of crops, soil-plant- relationship, Irrigation requirements, duty and delta, Irrigation efficiencies, methods of irrigation, Quality of irrigation water.	2	PO4
CO5	Demonstrate on increasing need for efficient and effective irrigation and water management to maximize crop yield and quality whilst making best use of the water available.	4	PO4

Syllabus

Module 1	water resources of world. Surface and ground water resources in India and Andhra Pradesh–important major irrigation projects, plant-water relationships – rooting characteristics – effective root zone depth – moisture extraction pattern – moisture sensitive periods of crops – Soil Plant Atmospheric Continuum (SPAC).
Module 2	Evapotranspiration – evaporation – transpiration – factors influencing evapotranspiration – Reference crop evapotranspiration (ET _o), Crop water requirement – irrigation requirement – net and gross irrigation requirement – irrigation interval – irrigation period – seasonal water requirement
Module 3	Methods of irrigation - surface methods, Scheduling of irrigation – different criteria – soil moisture regime approach – feel and appearance method
Module 4	Drip irrigation (surface and sub surface) – merits and demerits – system components and layout – suitable crops - fertigation and maintenance of micro irrigation systems, micro irrigation systems - sprinkler irrigation – merits and demerits – system components and layout – suitable crops – rain guns.
Module 5	Determination of bulk density, Determination of soil moisture content, and measuring of irrigation water, Scheduling of irrigation by IW / CPE ratio method, Calculation of irrigation water requirements Lay out of surface irrigation methods, Water management practices in rice, wheat and maize. Water management practices in groundnut, sunflower and sugarcane.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Irrigation – Theory and Practice	Michael, A.M.	Vikas Publishing House Pvt. Ltd., New Delhi	2006
2	Irrigation Agronomy 3 rd Edition	Reddy, S.R.	Kalyani Publishers, Ludhiana.	2016
3	.Efficient Use of Irrigation Water	Sankara Reddi, G.H. and Yellamanda Reddy	Kalyani Publishers, Ludhiana.	2006

4	Irrigation water management	Majumdar, D.K.	PHI learning Pvt Ltd, Delhi-92	2013
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Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Statistical Methods

COURSE CODE	23SMCA201	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	Not required
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	Acquaint the knowledge on basic concepts of statistics and various methods of descriptive data collection and analysis	3	PO2, PO3 & PSO2
CO2	Construct the probability distribution of a discrete and continuous random variables based on a real-world problem	3	PO2 & PSO1
CO3	Apply statistical tests for large and small sample to test the hypothesis.	4	PO3 & PSO3
CO4	Generation of random numbers for the selection of samples in data analysis	3	PO2, PO3 & PSO1
CO5	Analyze the data using various descriptive and inferential statistics using R/Excel	4	PO2 & PSO4

Syllabus

Module 1	Introduction to Statistics and its Applications in Agriculture - Graphical Representation of Data. Measures of Central Tendency - Dispersion - Skewness and Kurtosis.
Module 2	Definition of Probability - Addition and Multiplication Theorem - Simple Problems Based on Probability Theory. Binomial - Poisson - Normal Distributions and their Properties. Definition of Correlation - Scatter Diagram - Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

Module 3	Introduction to Test of Significance - One sample -Two Sample Test for Means. Chi-Square Test of Goodness of fit - Chi-Square Test of Independence of Attributes in 2 x 2 contingency table.
Module 4	Introduction to Analysis of Variance - Analysis of One Way and Two Way Classification. Introduction to Sampling Methods -Sampling versus Complete Enumeration-Simple Random Sampling with and without replacement-Use of Random Number Tables for selection of Simple Random Sample.
Module 5	the data using various descriptive and inferential statistics using R /Excel

Reference Books:

S. No.	Title	Author(s)	Publisher	Year
1.	Statistics for Agricultural Sciences	Nageswara Rao, G	B S Publications,	2007
2.	A Text Book of Agricultural Statistics.	Rangaswamy, R	New Age International (P) Limited, Hyderabad.	1995

Global Certifications:

Mapped Global Certifications:						
Sl No	Title	Certification Provider	Proctored (Y/N)	Format of the Exam	Exam Provider	URL of the Certification
1	Applied statistics Certificate: Methods & Applications	PCB	YES	MCQs	Harvard Catalyst	https://catalyst.harvard.edu/courses/biostatscertificate/
2	Ag Data Science	NSU	YES	MCQs	NSU	https://cals.ncsu.edu/psi/ag-data-science-certificate/

Tools used in Practical / Skill:

Sl No	Tool Name	Parent Industry	Open Source/ Commercial
1	R programming	IT	Open Source
2	Matlab	IT	Commercial

Evaluation Components:

Evaluation	Component	Weight age	Total
In-Sem Formative	Attendance	5	5
In-Sem Formative	Continuous Evaluation - Lab Exercise	20	20
In-Sem Summative	Mid Semester Exam	20	20

End-Sem Summative	End Semester Exam	30	30
	Lab End Semester Exam	25	25

MANURES, FERTILIZERS AND SOIL FERTILITY MANAGEMENT (MFSFM)

COURSE CODE	23SSAC221	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23SSAC121
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply the knowledge of Scientists responsible for the essentiality of nutrients and to know about Essential nutrients, Deficiency symptoms of nutrients due to Nitrogen, Leaching losses of nitrate nitrogen, Phosphorus and Potassium.	3	PO1,PO2, PSO1
CO2	To apply the concept of Calcium, Sulphur, Micronutrient (Zn, Mn, Fe, Cu, Boron, Molybdenum and Chlorine) on nutrient uptake and Soil fertility Evaluation	3	PO4,PO2, PSO2
CO3	To apply the concepts of Plant analysis, Soil test based fertilizers recommendation on Nutrient use efficiency. Methods of application of nutrients under rainfed and irrigated conditions, importance of organic manures, Bulky organic manures, Compost and composting and Methods of preparation of rural and urban compost.	3	PO2,PO4, PSO2
CO4	To analyse the concepts of Green manures, penning, sewage, sewerage, sullage, poudrette, Activated compost process. Chemical fertilizers, Phosphatic fertilizers, Secondary and micronutrient fertilizers, Amendments, Mixed fertilizers, Fertilizer Control Order (FCO).	4	PO2,PO4, PSO1
CO5	To analyse the analytical instruments and recording the observations from the soil samples and plant samples and also about the estimation and identification of different nutrients. Acquaint with the analytical instruments and recording the observations from the soil samples and plant samples and also about the estimation and identification of different nutrients.	4	PO8,PO1,PO2,PO4, PSO4

Syllabus

Module 1	Introduction, History of soil fertility and plant nutrition, Concepts of soil fertility, soil productivity, Navadhanya and Annapurna concepts in relation to soil fertility Soil as a source of plant nutrients, Nutrient Elements, Arnon's criteria of essentiality, Essential, functional and beneficial elements. Scientists responsible for the essentiality of nutrients, Ionic forms of plant nutrients in soil, Mechanism of nutrient transport, Movement of ions from soils to roots, Mass flow, diffusion, root interception and contact exchange. Essential nutrients, Classification and their functions in plants. Deficiency symptoms of nutrients - Corrective measures – Toxicity symptoms of different nutrients. Nitrogen - Occurrence, content and distribution - Factors influencing the content of nitrogen in soil. Forms of soil nitrogen - Nitrogen Cycle – Transformations in soils – Mineralization (amination and ammonification) - Fate of released ammonia – Factors affecting ammonium fixation - Nitrification – Factors affecting nitrification – Fate of released nitrate nitrogen. Leaching losses of nitrate nitrogen – Nitrification inhibitors-
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	Denitrification – Immobilization, Nitrogen fixation - Different types – Biological fixation of nitrogen – Symbiotic and non symbiotic – Nitrogen balance sheet – Gains and losses. Phosphorus - P – Cycle – Content in soils – Forms of phosphorus in soil - Inorganic and organic phosphorus compounds – Phosphorus fixation – Mechanisms of phosphate fixation -Factors affecting phosphate fixation in soil - Quantity and intensity parameters. Potassium - Content in soil – Source – Forms of soil potassium - Potassium fixation - Factors affecting potassium fixation – Quantity and Intensity parameters – Luxury consumption.
Module 2	Calcium - Sources and content – Forms of calcium in soil, factors affecting the availability of calcium in soil –Magnesium - Sources – Content – Forms of magnesium in soils - Factors affecting availability of magnesium - Functions. Sulphur - S – Cycle – Occurrence – Forms of Sulphur in soil - Sulphur transformation in soils – Mineralization and immobilization - Sulphur Oxidation – Factors affecting oxidation in soils - Sulphide injury – Causes, symptoms and remedial measures.Micronutrient - Sources – Forms in soil solution – Pools of micronutrients – Predisposing factors for occurrence of micronutrient deficiencies in soil and plants. Zn and Mn - Content – Forms in soils – Critical limits in soils and plants - Factors affecting their availability. Fe and Cu - Content – Forms in soils – Critical limits in soils and plants. Factors affecting their availability. Boron and Molybdenum - Content – Forms in soil - Critical limits in soils and plants. Factors affecting their availability. Chlorine - Content – Forms in soils – Critical limits in soils and plants. Factors affecting its availability – Beneficial Elements- Sodium, Cobalt, Vanadium and Silicon. Soil fertility Evaluation: - Approaches – Soil testing – Objectives of soil testing – Chemical methods for estimating available nutrients.
Module 3	Plant analysis – Rapid tissue tests – Indicator plants - Biological methods of soil fertility evaluation, A- value – Microbiological methods – Sackett and Stewart techniques – Mehlich technique – Cunninghamella plaque method – Mulder’s <i>Aspergillus niger</i> technique – Mistcherlich’s pot culture method. Soil test based fertilizers recommendation:- Critical nutrient concept (Cate and Nelson) – Critical levels of nutrients in soils - General recommendations Use of empirical equations for scheduling fertilizer doses - Targeted yield approach. Nutrient use efficiency:- Soil, plant and management factors influencing Nutrient use efficiency in respect of N, P, K, S, Fe and Zn fertilizers – Foliar application – Fertigation – Liquid fertilizers. Methods of application of nutrients under rainfed and irrigated conditions. Introduction and importance of organic manures - Definition and difference between manures and fertilizers-Classification of manures (Bulky & Concentrated) with suitable examples. Importance of manures in soil fertility management. Bulky organic manures – Preparation of FYM – Methods of collection and storage. Losses of nutrients from FYM during collection and storage -Ways to minimize these losses. Compost and composting – Different methods of composting including the starters and raw materials. Methods of preparation of rural and urban compost. Mechanical compost plants – Their advantages over conventional composting –Vermi-composting.
Module 4	Green manures – Classification with examples. Advantages and limitations of green manuring and green leaf manuring. Biogas plant – Principles of operation and its advantages. Definitions of penning, sewage, sewerage, sullage, poudrette, Activated compost process. Concentrated organic manures – Oil cakes, blood meal, bone meal, horn meal, fish meal, meat meal and guano. Chemical fertilizers – Classification with examples – Nitrogenous fertilizers – composition and properties of major nitrogenous fertilizers viz., Ammonium sulphate, urea and calcium ammonium nitrate. Phosphatic fertilizers – Composition of Rock phosphate – Occurrence, types and properties-properties of SSP, TSP and basic slag – Potassic fertilizers –MOP, SOP properties. Secondary and micronutrient fertilizers – Different sources of these nutrients and their contents - Conditions leading to their deficiency - Methods of application and mode of action of NPK fertilizers in soils. Amendments – Role of important organic and

	inorganic amendments and synthetic conditioners as amendments - Complex fertilizers – Types, composition of DAP, MAP, UAP, important nitrophosphates. Mixed fertilizers – Advantages and disadvantages over straight fertilizers - Nanofertilizers- Fertilizer grade – Fertilizer ratio – unit value of fertilizers – Problems - INM - Components - Advantages. Fertilizer Control Order (FCO) – Its importance and regulations - Specifications for important fertilizers - Fertilizer storage – Specifications - Problems during storage.
Module 5	Introduction to analytical instruments and principles-spectrometry and flame photometry. Estimation of available N in soils. Estimation of available P in soils. Estimation of available K in soils. Estimation of available S in soils. Estimation of available Ca and Mg in soils. Estimation of available Zn in soils. Basics of Plant analysis and estimation of N in plant samples. Estimation of P in plant samples. Estimation of K & S in plant samples. Identification acid radicals in fertilizers /salts. Identification of basic radicals in fertilizer /salt. Estimation of N in Ammonium sulphate. Estimation of N in Urea and FYM. Estimation of water soluble P ₂ O ₅ in SSP. Estimation of K in Muriate of potash or Sulphate of potash by using Flame photo meter

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Fundamentals of Soil Science	Indian Society of Soil Science	IARI, New Delhi	2012
2	Manures and Fertilisers	Yawalkar K.S, Agarwal, T.P and Bokde, S	Agril. Publishing House, Nagpur	1995
3	Soil Fertility and Fertilizers: An Introduction to Nutrient Management	Samuel Tisdale, Nelson Werner L, Beaton James D and Havlin John L.	Macmillian Publishing Co., New York	2005
4	Introductory Soil Science	D. K .Das	Kalyani Publishers, New Delhi	2014
5				

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

AGRICULTURAL MARKETING, TRADE AND PRICES <AMTP>

COURSE CODE	23AECO242	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23AECO 242
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	Understand the concept of market and its types, demand-supply of farm products, exchange functions, facilitating functions and market functionaries	3	PO9 & PSO2
CO2	Understanding the marketing channels, supply chain, marketing mix, product life cycle, pricing, market promotion, segmentation, and integration	3	PO10 7 PSO1
CO3	Explain the marketing costs, margins, and price spread, regulated markets, APMC, cooperative marketing, types of risk in marketing, future trading and commodity exchanges	4	PO9 & PSO4
CO4	Describe the agricultural product price, CACP, MSP, international trade, WTO and its agreements, TRIPS and IPR in Indian agriculture	3	PO7 & PSO3
CO5	Analyse elasticities and plot demand supply curve for agricultural commodities, study market arrival, prices, and comparative advantage, compute marketable and marketed surplus, construct index numbers, estimate costs, margins and price spread	4	PO11 & PSO4

Syllabus

Module 1	Agricultural Marketing - Concepts and definitions of market, marketing, agricultural marketing - Components of market, dynamics of market structure. Classification and characteristics of each type of agricultural markets. Demand and supply of agri-commodities, factors affecting the demand and supply of farm products, producer's surplus - Meaning and types and producer's surplus of agri-commodities in India. Meaning of marketable surplus and marketed surplus, importance and their measurement. Marketable surplus and marketed surplus of agri-commodities in India, factors affecting them. Marketing process and functions -Marketing process - Concentration, dispersion and equalization - Thompson's classification. Exchange functions- Buying and selling, methods - Physical functions – Storage, transportation and processing. Facilitating functions – Packing and packaging, branding, grading, standardization, FAQs for major crop produce, quality control and labeling - AGMARK, HACCP, FSSAI, CODEX - Need for codex certification and relevance. Market functionaries - Types and importance of agencies involved in agricultural marketing and their role - Producers, middlemen (merchant middlemen, agent middlemen, speculative middlemen, processors, facilitative middlemen).
Module 2	Meaning and definition of marketing channels and supply chain management and their importance. Marketing mix - Meaning, 4Ps of marketing - Product, price, place and promotion – Their importance and characteristics in agriculture. Meaning and stages in PLC (Product Life Cycle) - Characteristics of PLC –Strategies in different stages of PLC. Pricing and promotion strategies - Pricing considerations and approaches –Cost based and competition-based pricing. Market promotion – Advertising, personal selling, sales promotion and publicity – Their meaning and merits and demerits. Market segmentation-Meaning and its importance, types of market segmentation and benefits. Market Integration - Meaning, definition - Marketing efficiency - Meaning, definition, measurement of marketing efficiency - Types of market integration and marketing efficiency. Marketing costs, margins, and price spread - Meaning and measurement,

	factors affecting cost of marketing -Reasons for higher marketing costs of farm commodities-Ways of reducing marketing costs.
Module 3	Regulated markets-Definition - Important features of regulated markets - Functions, progress and defects. Model regulated market act, objectives and features - APMC Act in Andhra Pradesh-Objectives and features and functions Govt. interventions in agricultural marketing, their need, importance, and role Important market acts -Public sector institutions - CWC, SWC, FCI, & DMI – Objectives and functions. Cooperative marketing -Meaning and its need and importance, cooperative marketing agencies in India - NAFED, MARKFED –Objectives and functions and activities. Risk in marketing - Types of risk in marketing - Measures to minimize risks, speculation and hedging - Meaning, differences between speculation & hedging, advantages, disadvantages and process of speculation and hedging. An overview of futures trading in agricultural commodities -Forward/future markets-Meaning, advantages and disadvantages of forward markets. Commodity exchanges –Role and importance -Commodity exchanges in India -MCX, NCDX, NCMX, ACX, Safal - Role of regulatory bodies in futures markets - SEBI, etc., Contract farming - Meaning, procedures and advantages - Contract farming act in Andhra Pradesh.
Module 4	Meaning and functions of price - Characteristics of agricultural product prices - Agricultural price stabilization - Need for agricultural price policy - Role of Commission for Agricultural Costs and Prices (CACP)- Meaning of administered prices - Minimum support price, procurement price and issue price, levy price. Concept of International Trade and its importance in globalised world economies - Free trade and protectionism - Meaning, pros and cons of free trade and protectionism. Theory of absolute and comparative advantage and their importance international trade. Trends, present status and prospects of Indian agri-commodities trade in international trade. WTO - Genesis, objectives, functions and principles of multilateral trade. WTO agreements -Agreement on Agriculture (AoA) - Market access, Aggregate Measures of Support (AMS), export subsidies, sanitary and Phyto sanitary measures (SPS) and their implications and impact on Indian agriculture. TRIPS and intellectual property rights and their implications to Indian agriculture - Meaning of patents, copy rights, trademarks, geographical indications, industrial designs, trade secrets, integrated circuits, and plant varieties protection.
Module 5	Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions –, SWC, CWC, FCI, cooperative marketing society —DCMS, etc. to study their objectives, role, organization and functioning; Application of principles of comparative advantage of international trade. Seminar on selected topics

Reference Books:

S. No.	Title	Author(s)	Publisher	Year
1	Agricultural Marketing in India.	S S Acharya and N L Agarwal	Oxford & IBH Publications Co. Pvt. Ltd., New Delhi.	2012
2	Agricultural Price: Analysis and Policy.	S S Acharya and N L Agarwal.	Oxford & IBH Publications Co. Pvt Ltd., New Delhi.	2014

3	Agricultural Economics.	Subba Reddy, S., P.Raghu Ram., Sastry, T.V.N and Bhavani Devi, I.	Oxford & IBH Publishing Company Private Ltd., New Delhi	2016
4	Agricultural Price Policy in India.	Kahlon, A.S and Tyagi. D S.	Allied Publishers Pvt. Ltd., New Delhi.	1983
5	Marketing Management: A South Asian Perspective.	Philip Kotler, Kevin Lane Keller, Abraham Koshy and Mithileswar Jha	International 13th edition. Pearson Prentice Hall	2009

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

RENEWABLE ENERGY AND GREEN TECHNOLOGY (REGT)

COURSE CODE	23 AENG 252	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23 AENG 251
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Course Outcomes

CO#	CO Description	BT L	PO Mapping
CO1	To study and understand the classification of various energy sources, importance of renewable energy sources, its advantages and disadvantages. Also, biomass, its importance, Principles of combustion, pyrolysis and gasification of biomass will be taught. The focus will be given on the production of biogas from biogas plants, types of biogas plants and constructional details of biogas plants.	3	PO6,PO7,PO10,PSO1
CO2	Learning about types of gasifiers, production of producer gas and its utilization. Understanding the concept of briquettes, briquetting machinery, types and uses of briquettes and shredders. Also, study of solar energy, its applications, methods of heat transfer like conduction, convection and radiation, solar appliances-flat plate collectors, focusing type collectors and solar air heater will be covered.	4	PO4,PO7,PO11,PSO4

CO3	To study the solar space heating and cooling systems, solar energy gadgets like solar cookers, solar water heating systems and understanding about the principle of solar grain dryers, solar refrigeration systems and solar ponds. Also, solar photovoltaic systems along with applications like solar lantern, solar street lights, solar fencing, solar water pumping system will be covered. Wind energy, its advantages, disadvantages, wind mills and its types will be dealt	4	PO4,PO7,PO11,P SO4
CO4	To study the constructional details of wind mills and its applications. Understanding the concept of biofuels, its parameters, calorific values, biodiesel production, applications, extraction from jatropha and production of ethanol from agricultural produce i.e., sugarcane and corn	3	PO4,PO6,PO7,P SO1
CO5	Analysing the availability and uses of non-conventional energy sources in agriculture sector, biofuel production from biomass, its application. Biogas production and biogas plants capacity, design calculations, running of gasifiers, production details of producer gas, briquettes and study of briquetting machinery. Experimenting with solar gadgets like solar-cooker,solar water heater and estimating their performance. Also, performance evaluation of solar photovoltaic system and field visits	4	PO1,PO5,PO8,P SO4

Syllabus

Module 1	Introduction – Renewable energy sources, classification, advantages and disadvantages. Biomass – Importance of biomass, classification of energy production – Principles of combustion, pyrolysis and gasification. Biogas- Principles of biogas production, advantages, disadvantages, utilization. Biogas plants – Classification, types of biogas plants, constructional details of biogas plants
Module 2	Types of gasifiers –Producer gas and its utilization. Briquettes, briquetting machinery – Types and uses of briquettes -Shredders. Solar Energy – Application of solar energy, methods of heat transfer, conduction, convection and radiation. Solar appliances- Flat plate collectors, focusing type collectors, solar air heater
Module 3	Solar space heating and cooling – Solar energy gadgets, solar cookers, solar water heating systems. Solar graindryers, solar refrigeration system, solar ponds. Solar photovoltaic system – Solar lantern, solar streetlights, solar fencing, solar water pumping system. Wind energy – Advantages, disadvantages, wind mills and types
Module 4	Constructional details of wind mills, applications of wind mills. Biofuels – Characteristics of various biofuels, different parameters and calorific values. Bio diesel production – Applications, extraction from jatropha. Ethanol from agricultural produce (Sugarcane and corn)
Module 5	Availability and uses of non-conventional energy sources in agricultural sector. Biofuel production from biomass and its application. Practical approach to biogas production and biogas plants capacity and design calculations. Running gasifiers and production details of producer gas. Production details of briquettes from briquetting machinery. Experimenting with solar gadgets like solar cooker and solar water heater for their performance. Performance of solar photovoltaic system and observing various factors influencing efficiency of the photo-voltaic system. Evaluation of solar pump for agriculture. Study of solar drying system. Study of solar distillation and solar pond. Steps adopted for erecting solar fence. Visit to solar wind farm. Visit to solar photovoltaic farm.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
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1	Non-conventional Energy Sources	Rai, G. D.	Khanna Publishers, New Delhi.	2004
2	Non-Conventional Energy Sources	Rajput, R. K.	S. Chand Publishers.	2012
3	Principles of Agricultural Engineering. Vol.I	Ojha, T.P. and Michael,A.M.	Jain Brothers, New Delhi.	1996
4	Alternate Sources of Energy	Rathore, N.S., Mathur,A.N. and Kothari, S.	ICAR Publication	
5	Biotechnology and other alternative technologies for utilization of biomass-AgriculturalWastes. 1st edition,	Chakravarty, A. and AmalenduChakraverty	Oxford and IBH. Publishers, New Delhi.	1989

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Production Technology for Ornamental Crops, Medicinal and aromatic Plants and Landscaping

COURSE CODE	20 HORT 282	MODE	Offline	LTPS	1-0-1-0	PRE-REQUISITE	20 HORT 282
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the importance and scope of ornamental crops and landscaping	3	PO1,PO11 &PSO1
CO2	Apply the production practices of commercial flowers in protected cultivation.	3	PO4,PO3 &PSO2
CO3	Apply the scope, importance and future prospectus in cultivation of medicinal and aromatic plants.	3	PO1,PO11 &PSO2
CO4	Apply the techniques of processing and value addition in ornamental crops and MAPs produce	3	PO1,PO2 &PSO2
CO5	Apply nursery techniques viz. bed preparation, seed sowing, training and pruning, harvesting and post- harvest handling of cut and loose flowers.	4	PO4 &PSO4

Syllabus

Module 1	Importance and scope of ornamental crops and landscaping -Landscape uses of trees, shrubs and climbers, Principles of landscaping – Initial approach – Axis –Focal Point – Mass effect –Unity – Space– Divisional Lines –Proportion. Production technology of cut flowers under protected conditions –Rose and Gerbera
Module 2	Carnation -Introduction- Origin and distribution-Classification-Species and varieties-Climate and soil requirements-Propagation Liliium and Orchids -Introduction- Origin and distribution-Classification-Species and varieties-Climate and soil requirements-Propagation Production technology of cut flowers under open conditions – Gladiolus and Tuberose and Chrysanthmum
Module 3	Loose flowers -Marigold and Jasmine under open conditions -Introduction- Origin and distribution-Species and varieties-F1 hybrids Medicinal plants –Scope and Importance –Production technology of Asparagus, Aloe, Costus – Botanical name – Family -Origin – Economic part Periwinkle, Isabgol -Botanical name –Family - Origin -Economic part -Introduction – Climate – Soil -Varieties
Module 4	Aromatic plants –Importance –Essential oil industry in India – Properties of essential oils –Production technology of Mint and Ocimum Identification of ornamental plants. Identification of Medicinal and Aromatic Plants, Nursery bed preparation and flower seed sowing, Training and pruning of roses. Planning and layout of ornamental garden, Bed preparation and planting of Medicinal and Aromatic Plants, Intercultural operations in flowers crops. Geranium and Vettiver – Botanical name – Family -Origin – Economic part - Processing and value addition in ornamental crops and MAPs produce – Dry flower making - Extraction methods of essential oils

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Floriculture and Landscaping	Bose, T.K	Naya Prakash, Kolkatta	1999
2	Commercial Flowers.	Bose, T.K. and Yadav, L.P.	Naya Prakash, Kolkatta	1992
3	Floriculture in India.	Randhawa, G.S. and Mukhopadhyaya, A.	Allied Publishers Pvt. Ltd New Delhi.	1994
4	Commercial Floriculture.	Chattopadhyay, S.K.	Gene-Tech Books, New Delhi	2007
5	Introduction to Spices, Plantation Crops, Medicinal and Aromatic Crops.	Kumar, N., Abdul Khader, J.B.M, Rangaswamy, P and Irulappan, I.	Oxford and IBH publishing Co, New Delhi.	2004

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25

In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS COMMUNICATION > <AEXT>

COURSE CODE	23 AEXT 292	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23 AEXT 292
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	Understanding the scope and importance of entrepreneurship, its different types and concept, and management levels. Study EDP deeply, its objectives, and all phases	3	PO1 & PSO3
CO2	Application of new ideas, research, and innovative ideas for commercialization	3	PO1, PO2 & PSO1
CO3	Knowledge of venture capitals ,MSME's ,industry , farm and some projects for entrepreneur	3	PO3 & PSO2 & PSO4
CO4	Application and management of new Govt. policies, supply chain management and system marketing management	4	PO3 & PSO2
CO5	Concept of entrepreneur, entrepreneurship, Characteristics of entrepreneurs, Agri – entrepreneurship, Entrepreneurship development program (EDPs), SWOT Analysis, Overview of agricultural input industry, Project planning	4	PO1,PO3 & PSO4

Syllabus

Module 1	Concept of Entrepreneur, Entrepreneurship, Distinction between an Entrepreneur and a Manager ; Management – Levels & Functions of Management - planningOrganizing - Directing – motivation – ordering – leading – supervision-Communication and control; Characteristics of Entrepreneurs; Opportunities for entrepreneurship and rural entrepreneurship. Types of Entrepreneurs, Functions of Entrepreneurship, Agri – Entrepreneurship - Concept, Need and Scope. Assessing overall business environment in Indian economy; Globalization and the emerging business entrepreneurial environment: Entrepreneurship Development Programmes (EDPs) – Objectives, Phases, Problems of EDPs, Entrepreneurial behavior and Role of Achievement Motivation, Factors Affecting Entrepreneurship Development
Module 2	Generation, Incubation and Commercialization of Business Ideas. Environment scanning and opportunity identification, Researching / Managing Competition - Ways to define possible Competitors; Globalization and the emerging business entrepreneurial environment; Role of ED in economic development of a country. SWOT Analysis - Concept, Meaning and Advantages. Government Policies, Incentives, Programmes and Schemes for Entrepreneurship Development; Export and Import Policies relevant to

	Indian Agriculture Sector. Institutional Support - Financial Institutions and other agencies in entrepreneurship development.
Module 3	Venture capital (VC), contract farming (CF) and joint ventures (JV), Public-private partnerships (PPP); Overview of agricultural Input industry – Seed, Fertilizer, Pesticides, Farm Machinery, Agricultural 164 Food Processing Industry; Steps in establishment of MSME Enterprise - Planning of an enterprise, Project identification, Selection of the product / services, selection of form of ownership; registration, selection of site, capital sources, acquisition of manufacturing know how, packaging and distribution;
Module 4	Project Planning, Formulation and Project Report - Meaning - Importance - Components and Preparation; Supply Chain Management - Meaning, Advantages, Stages and Process and Total quality Management; Definition of business; Stakeholders in business; Business Communication for Public Relation , Advertisement and crisis communication. Social responsibility of business. Morals and ethics in enterprise management Assessment of Entrepreneurship skills, Business Leadership Skills; Communication Skills for entrepreneurship development, Developing organizational skill, Managerial skills, Problem solving skill and Time management skills.
Module 5	Field Visits to study any one Agri - based industries / business – Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, Constraints in setting up of agro based industries; Formulation of project feasibility reports; industrial and agribusiness houses; Characteristics of Successful Entrepreneurs, Characteristics of Successful Agripreneurs, any one of the Local Financial Institutions to study the MSME Policies, Visit to Entrepreneurial Development Institute to study the Process of Entrepreneurship Development, Local Public - Private Enterprises to study the Enterprise Establishment and Management Process as well as Assessing entrepreneurial potential problem solving ability, managerial skills and achievement motivation, exercise in Creativity, time audit, preparation of business plan and proposal writing; Carrying out the SWOT Analysis of nearby Successful Enterprises. Visit to nearest Agri - Clinic and Agri - Business Centre's,

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Entrepreneurship Development.	Anil Kumar, S., Poornima, S. C., Mini, K., Abraham and Jayashree, K.	New Age International Publishers, New Delhi	2003.
2	Entrepreneurship Development & Management.	Bhaskaran, S.	Aman Publishing House, Meerut	2014.
3	Management: Theory and Practice.	Gupta, C.B.	Sultan Chand and Sons, New Delhi	2001.
4	Handbook on Empowerment and Entrepreneurship.	Indu Grover	Agrotech Publishing Academy, Udaipur	2008.
5	Entrepreneurship Development.	Khanka, S.S.	S. Chand and Co., New Delhi	1999.

Evaluation Components:

Evaluation	Component	Weightage	Total
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In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Geo Informatics and Nano technology for Precision Farming <(GINTPF)>

COURSE CODE	23AGRO301	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23AGRO301
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	This CO provides the information about the concept of precision farming and techniques involved in precision farming. This course detailly explains about the issues and concerns in precision farming and also the techniques involved in precision farming. Students also learn about the tools and techniques involves in geoinformatics and how it is used for crop discrimination and estimating the yield.	2	PO5 & PSO1
CO2	This CO informs the students regarding geodesy principles how the global positioning system helps in agriculture. This course helps the student to understand the applications of nanotechnology in tillage operation, seed sowing, fertilizer application, plat protection management. This course detailed the nanoparticles properties, occurrence importance of nanoparticles and synthesis of nano particles.	2	PO5 & PSO2
CO3	This CO enables the students to understand cartography techniques and units, scale, symbols used in various maps. This course helps to understand the techniques involve in soil mapping. It allows the student to learn about remote sensing practical application in the field of agriculture and allied fields including drones. We are identifying the spatial variability in soil fertility and recommendation based on geospatial technologies.	2	PO5 & PSO4
CO4	This CO about the using image processing and interpretating the data in this course. Geo referencing those data and classify the supervised and unsupervised data of RS images. Site specific Nutrient Management approach for precision farming helps to use the fertilizers efficiently. This course explains about nanotechnology definition, concepts and techniques and structural	2	PO5 & PSO4

	characterization of nanoparticles and nano sensors. This course helps to understand the importance, advantages		
CO5	This CO will learn about the GIS software, spatial data creation and editing, various processing software to deal with visual and digital interpretation of remote sensing images. Students gets practical knowledge about generation of spectral profiles of different objects and soil mapping using remote sensing technologies. This course also helps to understand about fertilizer recommendation based on Variable rate technology and soil test-based crop response techniques.	3	PO5 & PSO3

Syllabus

Module 1	Precision agriculture: concepts and techniques-Issues and concerns for Indian agriculture. AGRO Principles and practices of precision agriculture. AGRO Geo-informatics- definition, concepts, tools and techniques and their use in Precision Agriculture. AGRO Crop discrimination and Yield monitoring techniques
Module 2	Geodesy and its basic principles. AGRO Spatial data and their management in GIS. Global positioning system (GPS) –Components and its application in agriculture. Application of nanotechnology in agriculture - tillage, seed, water, fertilizers, plant protection for scaling-up farm productivity
Module 3	Cartography, units of cartography, map scale, various symbols used in cartography, Soil mapping techniques. Remote sensing- concepts, Spectral reflectance of various earth features, atmospheric windows. SSAC Applications of remote sensing techniques in the field of agriculture and allied sciences including drones. Spatial variability of soil fertility, its determination, fertilizer recommendation using geospatial technologies in precision farming
Module 4	Image processing and interpretation - geo referencing - supervised and unsupervised classification of RS images. STCR approach for precision agriculture - principles and computations. Nanotechnology, definition, concepts and techniques – Nano scale – definition – Nano-particles, materials - occurrence – properties. Characterization of nano-materials - structural characterization - Nanosensors. Nano-fertilizers, nano-pesticides - importance and advantages –synthesis – strategies

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text book of Remote sensing and Geographical Information Systems	Anji Reddy	B.S. Publications, Hyderabad.	2006
2	Understanding Nanoscience and Nanotechnology	Pradeep. T	Tata McGraw-Hill Publishing Company Limited, New Delhi	2007
3	Remote sensing and image interpretation	Lillesand, T.M. and Kiefer, R. W	(3rd edition), John Wiley and Sons.	1994

Evaluation Components:

Evaluation	Component	Weightage	Total
	Attendance	5	

In-Sem Formative	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Practical Crop Production > <(PCP)>

COURSE CODE	23AGRO302	MODE	Offline	LTPS	0-0-2-0	PRE-REQUISITE	23AGRO101
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-
CO5	To know cultivation technology of different crops in respect to different situations and understand crop cycle, environmental requirements, agronomic management and economics of crop production.	4	PO8 & PSO1

Syllabus

Module 1	-
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Module 2	-
Module 3	-
Module 4	-
Module 5	Crop planning, raising field crops in multiple cropping systems, field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying, winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies, preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text book of field crops production. Commercial crops, volume-II	Rajendra Prasad	,Technical Editor, ICAR, New Delhi.	2004
2	Agronomy of fodder and forage crops,	Panda S.C.	Kalyani publishers, Ludhiana	2014
3	Scientific field crop production.	Gururaj hunsigi and Krishna, K.R	Oxford &IBH Publishing Co.Pvt.LTD.	2007
4	Principles and practices of rice Production	De Datta, S.K.	John Wiley and Sons, New York	1981

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	45	
			50
In-Sem Summative			
End-Sem Summative	Lab End Semester Exam	50	
			50

PRINCIPLES OF FOOD SCIENCE AND NUTRITION (PFSN)

COURSE CODE	23BICM300	MODE	Offline	LTPS	2-0-0-0	PRE-REQUISITE	23BICM101
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply the basic concepts of food science including physical properties, chemical composition such as water, carbohydrates, proteins, fats & oils, vitamins and minerals.	3	PO1,PO11+POS1
CO2	To apply the basic concepts of natural emulsifiers, organic acids, oxidants, antioxidants; concepts of enzymes and basic concepts of food microbiology including yeast, algae, protozoa, viruses, microbial spoilage of food and production of fermented foods such as beer using good bacteria.	3	PO1,PO4+POS2
CO3	To apply the basic principles of preservation of food using heat treatment and heat treatment methods, principles of preserving food sing low temperature and low temperature methods, preservation using chemicals, irradiation, fermentation and	3	PO1,PO3+PO2

	drying, and history of diet around the world especially European diet		
CO4	To apply the basic concepts of malnutrition, nutritional disorders, energy metabolism and disorders of carbohydrates, fat and proteins, and concepts of balanced or modified diet, menu planning and new trends in food science and nutrition	4	PO5,PO1+POS4

Syllabus

Module 1	Concepts of food science - Definitions of food, specific nutrients in foods and their functions - Physical characteristics of foods, Importance - Food physical characteristics - Density - Phase change, pH, osmosis, surface tension, colloidal systems - Food composition - Food chemistry - Water, solutions, water balances in body, clinical signs of water depletion, excessive water intake, recommended requirements - Carbohydrates - Structure, properties of sugars, starches, cellulose and hemicelluloses, pectin, gums - Proteins - Structure, amino-acids, properties - Fats and oils - Structure, functional aspects - Vitamins - Retinol, vitamin D, vitamin E, vitamin K, ascorbic acid, B-complex group - Minerals, pigments, colours, flavours
Module 2	Natural emulsifiers - Organic acids - Oxidants and antioxidants - Enzymes - Food microbiology- Morphology and fine structure of bacteria - Cultivation of bacteria, nutritional requirements -Nutritional classification of bacteria - Introduction to yeast, algae and protozoa and virus, general characteristics - Microbial spoilage of foods - Factors affecting kinds, numbers, growth and survival of microorganisms in foods - Production of fermented foods - Production, purification and estimation of beer/ ethanol.
Module 3	Preservation by heat treatment - Principle and equipment for blanching - Preservation by heat treatment - Canning, pasteurization, sterilization - Preservation by use of low temperature - Principle, methods, equipment - Preservation by chemicals - Antioxidants, mould inhibitors, antibodies, acidulants, etc - Preservation by irradiation - Principle, methods, equipment - Preservation by fermentation - Principles, methods, equipments - Preservation by drying, dehydration and concentration - Principle, methods, equipment - Food and nutrition - History of diet around the world - European diet.
Module 4	Malnutrition (over and under nutrition), body cell, digestion and absorption, energy and calories, obesity and weight control - Nutritional disorders that can compromise health - Energy metabolism - Carbohydrates, individual sugars, sugars and diabetes mellitus, glycemic response, dietary carbohydrates - Energy metabolism - Fat, synthesis, control, biosynthesis, cellular degradation, peroxidation - Energy metabolism - Proteins, synthesis, catabolism, ammonia and urea - Balanced/modified diets, diet selection - Menu planning - New trends in food science and nutrition.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Food Science, 2 nd edition	Sumati R. Mudambi, Shalini M. Rao, M.V. Rajagopal	New Age International (P) Limited	2006

2	Principles of Human Nutrition	Martin Eastwood	Blackwell Science Limited, Oxford	2003
3	Microbiology, 5 th edition	Michael J. Pelczar Jr, E.C.S. Chan, Noel R. Krieg	Tata McGraw-Hill Education	1998
4	Industrial Microbiology	L.E. Casida	New Age International (P) Limited	1968
5	Physical Principles of Food Preservation	Marcus Karel, Daryl B. Lund	Marcek Dekker	2003

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Home assignment and textbook	15	
			20
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	End Semester Exam	60	
			60

Crop Improvement – I (Cereals, Millet, Pulses and Oilseeds) > <CI- I>

COURSE CODE	23 GPBR 311	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23 GPBR 111
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply origin, distribution, breeding objectives, breeding methods and hybrid seed production of Cereal crops like – Rice, Wheat, Barley and Millet crops like- Sorghum and pearl millet	3	PO1,PO2,PO3,PSO1, PSO2
CO2	To learn origin, distribution, breeding objectives, breeding methods and hybrid seed production of Millet crops like- Finger millet, Kodo millet, Proso millet and Pulses like chick pea, Pigeon pea, Urd bean and Mung bean	4	PO1,PO2,PO3,PO4,PSO1, PSO2
CO3	To learn origin, distribution, breeding objectives, breeding methods and hybrid seed production of Pulse crop like Soya bean, Cow pea, Horse Gram, Field pea and Lentil and Oil seed crops like Ground nut, Castor and Sesame	4	PO1,PO2,PO3,PSO1, PSO2
CO4	To apply origin, distribution, breeding objectives, breeding methods and hybrid seed production of Oil seed crops like Sunflower, Safflower, Linseed, Niger, Mustard, Rape seed, Coconut and Oil Palm	3	PO2,PO3,PO4,PO1, PSO1, PSO2

CO5	To analyze floral biology, Anthesis, Emasculation, Pollination, and hybridization techniques in Cereals, Millets, Pulses and Oil seed crops	4	PO3,PO4,PO5,PO9,PO11, PSO1, PSO2
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Syllabus

Module 1	Introduction, Definition, objectives of plant breeding and Plant breeding, sexual and asexual reproduction. Origin, distribution, wild species, progenitors, breeding objectives, breeding methods, seed production and commercial varieties/ hybrids of rice, wheat, Bajra, sorghum and Pearl millet.
Module 2	Origin, distribution, wild species, progenitors, breeding objectives, breeding methods, seed production and commercial varieties/ hybrids of Finger millet, Kodo millet, Proso millet, Chick pea, Pigeon pea, Urd bean and mung bean.
Module 3	Origin, distribution, wild species, progenitors, breeding objectives, breeding methods, seed production and commercial varieties/ hybrids of Soya bean, Cow pea, Horse gram, Field pea, lentil, Ground nut, Castor and Sesame.
Module 4	Origin, distribution, wild species, progenitors, breeding objectives, breeding methods, seed production and commercial varieties/ hybrids of Sun flower, Safflower, Rape seed, Mustard, Linseed, Niger, Coconut and oil palm.
Module 5	Practical: Emasculation and hybridization techniques in different crop species; cereals, millets, pulses and oilseeds. Maintenance breeding of different crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Essentials of Plant Breeding	Phundan Singh	Kalyani Publishers, New Delhi	2014
2	Plant Breeding: Principles and Methods	B.D. Singh	Kalyani Publishers, New Delhi	2015
3	Plant Breeding Theory and Techniques	Gupta, S.K	Wiley India Pvt. Ltd. New Delhi.	2010
4	Principles and Practices of Plant Breeding	Sharma, J.R	Tata McGraw-Hill Publishing Co. Ltd., New Delhi.	1994
5	Principles of Plant Breeding	Allard, R.W	John Wiley & Sons, New York	1960

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	

			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

INTELLECTUAL PROPERTY RIGHTS (23GPBR313)

COURSE CODE	23GPBR313	MODE	OFFLINE	LTPS	1-0-0-0	PRE-REQUISITE	
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Introduction and meaning of intellectual property; brief introduction to GATT, WTO, TRIPs and WIPO; Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.;Types of Intellectual Property and legislations covering IPR in India: Patents, Copyrights,Trademark.	3	PO5
CO2	Industrial design, Geographical indications, Integrated circuits, Trade secrets; Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.	3	PO8
CO3	Origin and history including a brief introduction to UPOV for protection of plant varieties; Protection of plant varieties under UPOV and PPV&FR Act of India; Plant breeders rights; Registration of plant varieties under PPV&FR Act 2001; breeders, researcher and farmers rights.	3	PO10
CO4	Traditional knowledge-meaning and rights of TK holders;Convention on Biological Diversity; International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.	3	PO5,PO9

Syllabus

Module 1	Introduction and meaning of intellectual property; brief introduction to GATT, WTO, TRIPs and WIPO; Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.;Types of Intellectual Property and legislations covering IPR in India: Patents, Copyrights,Trademark.
Module 2	Industrial design, Geographical indications, Integrated circuits, Trade secrets; Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Module 3	Origin and history including a brief introduction to UPOV for protection of plant varieties; Protection of plant varieties under UPOV and PPV&FR Act of India; Plant breeders rights; Registration of plant varieties under PPV&FR Act 2001; breeders, researcher and farmers rights.
Module 4	Traditional knowledge-meaning and rights of TK holders;Convention on Biological Diversity; International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Text book of Intellectual Property Rights.	Acharya, N.K.	Asia Law House, Hyderabad.	2014
2	Intellectual Property Rights.	Loganathan, E.T.	New Century Publications, New Delhi.	2012
3	Intellectual Property Rights.	Rosedar, S.R.A.	Lexis Nexis (2nd Ed.), Nagpur.	2016
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Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	ATTENDANCE	5	
			5
In-Sem Summative	MID SEMESTER EXAM	35	
			50
End-Sem Summative	END SEMESTER EXAM	60	
			100

Problematic Soils and their Management (PSM)

COURSE CODE	23SSAC321	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23 SSAC 221
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply the problematic soils, definition, distribution in India and Andhra Pradesh. Saline and sodic soils visual symptoms, characteristic features, Effect of salinity and sodicity on plant growth and development, reclamation measures and management practices	3	PO1,PO4 & PSO1
CO2	To apply the acid, acid sulphate soils area, distribution in India and Andhra Pradesh. Land degradation problems and sources of polluted soils	3	PO7,PO4 & PSO2
CO3	To apply the soil pollution management practices, Bio remediation problems and Land capability and land suitability classification	3	PO1,PO7 3 & PSO2
CO4	To apply the Remote sensing and GIS techniques, Soil health and Quality, Irrigation water quality standards, Guidelines for judging the water quality.	4	PO1,PO4 3 & PSO3
CO5	To analyze the problematic soils identification, determination of infiltration rate, PH, EC, ESP,GR,LR, CaCO ₃ , Ca and Mg, CO ₃ and HCO ₃ , Na and K, RSC and SAR	4	PO1,PO4 4 & PSO4

Syllabus

Module 1	Problem soils –Definition – Different types of problematic soils – Extent and distribution of problematic and wastelands soils in different agro-eco systems and in Andhra Pradesh. Salt affected soils – Origin and formation - Distribution of salt affected soils in India and Andhra Pradesh - sCharacteristic features of saline, sodic and saline – sodic soils – Diagnostic criteria based on properties. Saline soils – Visual symptoms for identification of saline soils – Build up of salinity - Effect of salinity on plant growth and nutrient availability - Reclamation and management. Sodic soils - Visual symptoms for identification of sodic soils - Effect of sodicity on plant growth and nutrient availability - Reclamation and management.
Module 2	Acid soils – Extent of area in India and Andhra Pradesh – Formation - Characteristics of acid soils – Sources of soil acidity – nutrient limitations and toxicity - Reclamation of acid soils - Different liming materials used for reclamation – Benefits of liming – Harmful effects of over liming. Acid sulphate soils – Origin – Types – Characterization - Constraints and management. Land degradation - Eroded, compacted, flooded and water logged soils – Biologically sick soils – Effects on plant growth – Management. Polluted soils – Definition – Sources of pollution – Bio solid wastes –Industrial effluents (distillery, paper mill, tannery, textiles industrial effluents) – Mechanism of interaction of wastes with soil.
Module 3	Soil pollution - Potentially toxic elements - Excessive use of fertilizers, pesticides and weedicides – Heavy metal contamination – ManagementBio-remediation of problem soils through Multi Purpose Tree Species. Taxonomic classification of soils - Land Capability Classification. Land suitability classification - Index – Criteria - Different approaches – Land suitability for different crops.
Module 4	Remote Sensing and GIS techniques in diagnosis, mapping and management of degraded and problematic soils. Soil health and quality – Definition - Concepts – Soil resilience – Factors affecting soil quality (Physical, chemical and biological) – Assessment of soil quality - Management and improvement of soil qualityIrrigation water – Quality and standard parameters - Classification based on ICAR, CSSRI and USDA criteria. Guidelines for judging quality of water - Utilization of saline water in agriculture.
Module 5	Field identification of problematic soils and visit to degraded lands. Determination of infiltration rates of light soils. Determination of infiltration rates of heavy soil . Determination of aggregate stability of sodic soils. Determination of pH, ECe of acid,

	saline and sodic soils. Determination of ESP of sodic soils. Determination of GR of sodic soils. Determination of LR of acid soils. Determination of lime content (CaCO ₃ of calcareous soil. Determination of pH and EC of saline, sodic and good quality irrigation water. Determination of CO ₃ and HCO in irrigation water. Determination of chlorides in irrigation water. Determination of Ca and Mg content in irrigation water. Determination of Na and K content in irrigation water. Computation of quality class, RSC and SAR of irrigation water. Evaluation and interpretation of analytical data of problematic soils and suggesting ameliorating practices.
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Fundamentals of Soil Science,	Indian Society of Soil Science.	IARI, New Delhi.	2012.
2	Introductory Soil Science, 4th Edition,	Das, D. K.	Kalyani Publishers, New Delhi	2015.
3	A Text Book of Pedology – Concepts and Applications,	Sehgal, J.	Kalyani Publishers, New Delhi.	2015.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

PESTS OF FIELD CROPS & STORED GRAIN AND THEIR MANAGEMENT (PFSGM)

COURSE CODE	23 ENTO 331	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23ENTO 131
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply the identification of the pests, symptoms of damage and management of rice, wheat, Sorghum and other millets	3	PO3, PSO3
CO2	To apply the identification of the pests, symptoms of damage and management of fiber crops	3	PO3, PSO3

CO3	To apply the identification of the pests, symptoms of damage and management of oil seeds and pulse crops	3	PO3,PSO3
CO4	To apply the identification of the pests, symptoms of damage and management of stored grain pests and non- insect pests	4	PO3,PSO3
CO5	To analyze the diagnosis and recommending the management practices of field crop pests and stored grain pests	4	PO3,PSO3

Syllabus

Module 1	Introduction of Economic Entomology and Economic Classification of Insect Pests. Rice-Yellow stem borer and other borers, gall midge, brown - planthopper, green leafhopper, hispa, leaf folder, ear head bug, grasshoppers, root weevil, swarming caterpillar, climbing cutworm, case worm, whorl maggot, leaf mite and panicle mite- IPM practices. Sorghum and other millets- Sorghum shoot fly, stem borer, pink borer, sorghum midge, ear head bug, red hairy caterpillar, deccan wingless grasshopper, aphids, maize shoot bug, flea beetle, blister beetles, ragi cutworm, ragi root aphid and army worm- IPM practices. Wheat- Ghujia weevil, ragi pink borer and termites- IPM practices.
Module 2	Sugarcane- Early shoot borer, internode borer, top shoot borer, scales, leafhoppers, white grub, mealybugs, termites, whiteflies, woolly aphid and yellow mite- IPM Practices. Cotton- Spotted bollworm, American bollworm, pink bollworm, tobacco caterpillar, leafhopper, whiteflies, aphid, mites, thrips, red cotton bug, dusky cotton bug, leaf roller, stem weevil, grasshoppers, and mealybug - IPM Practices. Jute- Semilooper, stem weevil, stem girdler and Bihar hairy caterpillar. Mesta- Hairy caterpillars, stem weevil, mealybugs, leafhopper and aphid. Sunhemp- Hairy caterpillars, stem borer and flea beetle. IPM Practices.
Module 3	Pulses- Gram caterpillar, plume moth, pod fly, stem fly, spotted pod borer, cowpea aphid, cowbug, pod bug, leafhopper, stink bug, green pod boring caterpillar, blue butterflies, leaf webber/borer and redgram mite. Soyabean- Stem fly, stem girdler, ragi cutworm, leaf miner and whitefly- IPM Practices. Pea- pea leaf miner and pea stem fly. Castor-Semilooper, shoot and capsule borer, tobacco caterpillar, leafhopper, butterfly, whitefly, thrips, castor slug and mite- IPM Practices. Groundnut - White grub, leaf miner, red hairy caterpillar, tobacco caterpillar, leafhopper, thrips, aphid, pod bug, bud borer, wire worms and jewel beetle- IPM Practices. Sesamum-Leaf and pod borer, gall fly and sphinx caterpillar. Safflower- Aphids and leaf eating caterpillars- IPM Practices. Mustard- Aphid, sawfly, diamondback moth and painted bug. Sunflower- Helicoverpa and Spodoptera, leafhopper, Bihar hairy caterpillar and thrips - IPM Practices. Stored grains Pests- Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.
Module 4	Stored grain Insect pests - Rice weevil, lesser grain borer, khapra beetle, pulse beetle, groundnut bruchid, flour beetles, saw-toothed beetle, cigarette beetle, angoumois grain moth and rice moth. Stored grains - Non insect Pests- Mites, rodents, birds and microorganisms associated with stored grain - Storage structures and methods of grain storage and fundamental principles of grain store management. Locusts- Locusts and their management. Mites- Economically important phytophagous mites of field crops and their management. Nematodes-White tip nematode of rice, cyst and gall nematode of wheat, and their management. Rodents- Rodents damaging field crops and stored grains - Keys for identification of rodents and their management. Birds- Various birds infesting crops and their management.

Module 5	Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking different crops and their produce: (a) Field Crops; Identification of mites, birds and rodent pests of crops. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides. Pesticide application techniques. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage, Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI/CWC godowns.
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Elements of Economic Entomology.	Vasantharaj David, B. and Rama Murthy V.V.	Popular Book Depot, Coimbatore.	2016
2	General and Applied Entomology.	Vasantharaj David, B and Aanathakrishnan, T.N.	Tata McGraw-Hill Publishing House, New Delhi.	2006
3	Insects and Mites of crops in India.	Nair MRGK.	Indian Council of Agricultural Research New Delhi.	1986
4	Handbook of Economic Entomology for South India.	Ramakrishna Ayyar, T.V.	Government Press, Madras	1963
5	Agricultural Insect Pests of tropics and their control	Dennis S Hill	Cambridge Universtiy Press , New York	1987

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

PROTECTED CULTIVATION AND POST-HARVEST TECHNOLOGIES (PCPHT)

COURSE CODE	23 AENG 351	MOD E	Offline	LTP S	1-0-2-0	PRE-REQUISITE	23 AENG 251
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
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CO1	This section covers the introduction about greenhouses, its history, definition, greenhouse effect, advantages and disadvantages. Also, a brief description about the types of greenhouses will be given. Plant response to greenhouse environment will be taught. Various equipments required for controlling the greenhouse environment will be dealt in detail.	3	PO1,PO5, PSO1
CO2	Planning of greenhouse facility i.e. site selection and orientation, structural design and covering materials of greenhouse will be discussed. Also, materials used for the construction of greenhouse i.e. wood, galvanized iron, glass, polyethylene film, poly vinyl chloride, Tefzel film, fiberglass reinforced plastic and acrylic panel will be taught. Along with that design criteria, constructional details of greenhouses and greenhouse heat distribution systems will be briefed.	3	PO4,PO1,PSO2
CO3	Various irrigation systems used in greenhouses like overhead sprinklers, boom watering, drip irrigation systems will be discussed in detail. Important engineering properties such as physical, thermal and aero-dynamic properties of cereals, pulses and oil seeds will be taught. Design of various post-harvest equipments such as winnowers, decorticators, their working principle, care and maintenance will be dealt.	4	PO1,PO4,PO5,PSO2
CO4	To study the drying theory, moisture measurement, EMC of various grains. To understand the concept of various commercial grain dryers i.e. deep bed, flat bed, tray, fluidized bed, recirculatory and solar dryers. Material handling equipments such as bucket elevator, screw conveyor and belt conveyor will be discussed. Also, primary processing of cereals, pulses and oil seeds will be taught.	4	PO1,PO4,PO5,PSO2
CO5	To study different types of greenhouses based on shape and computing the air exchange rate in active summer and winter cooling systems. To study the drying behaviour of agricultural products inside a greenhouse dryer and also determination of moisture content of various grains, their size, shape, bulk density and porosity will be carried out. Visit to rice mill, Dhal mill, Oil seed processing plant, cold storage will be arranged.	4	PO3,PO4,PO5,PO1,PSO2

Syllabus

Module 1	Introduction to greenhouses – History, definition, greenhouse effect, advantages of green houses. Brief description of types of greenhouses – Greenhouses based on shape, utility, construction, covering materials and cost, shade nets. Plant response to greenhouse environments – Light, temperature, relative humidity, ventilation and carbon dioxide and environmental requirement of agriculture and horticulture crops inside green houses. Equipment required for controlling greenhouse environment – summer cooling and winter cooling, natural ventilation, forced ventilation and computers
Module 2	Planning of greenhouse facility – site selection and orientation, structural design and covering materials. Materials for construction of greenhouses – wood, galvanized iron, glass, polyethylene film, poly vinyl chloride film, Tefzel T2 film, fiberglass reinforced plastic rigid panel and acrylic and polycarbonate rigid panel. Design criteria and constructional details of greenhouses – construction of pipe framed greenhouses,

	material requirement, preparation of materials and procedure of erection. Greenhouse heating and distribution systems – greenhouse utilization – off-season drying of agricultural produce – Economic analysis of greenhouse production – capital requirement, economics of production and conditions influencing returns.
Module 3	Irrigation system used in greenhouses – Rules of watering, hand watering, perimeter watering, overhead sprinklers, boom watering and drip irrigation. Important engineering properties such as physical, thermal and aero-dynamic properties of cereals, pulses and oil-seeds. Designing post-harvest equipment based on physical and thermal properties. Winnowing – Manual and power operated winnowers, care and maintenance – Groundnut decorticators – Hand and power operated decorticators, principle of working, care and maintenance
Module 4	Moisture measurement – Equilibrium moisture content (EMC) – importance – Drying theory – Drying and dehydration. Commercial grain dryers – Deep bed, flat bed, tray, fluidized bed, recirculated and solar dryers. Material handling equipment – Bucket elevator and screw conveyer and their selection. Primary processing of cereals, pulses and oil seeds – Cleaning, grading and packaging
Module 5	Study of different types of greenhouses based on shape etc. Computing the air exchange rate in active summer and winter cooling systems. Feasibility study on drying of agricultural products inside a greenhouse and its calculation. Visit to post harvest technology units and laboratories. Determination of moisture content of various grains by oven drying and infrared methods. Determination of size, space, porosity, bulk density etc. of grains. Determination of aerodynamic properties of grains. Cleaning and grading of grains, pulses and oil seeds. Drying and dehydration of vegetables (cauliflower). Visit to rice mill. Study of LSU dryer. Study of bucket elevator and screw conveyor. Visit to dhal mill, oil seed processing plant, cold storage.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Greenhouse technology and management, 2nd Edition,	Radha Manohar, K and Igathinathane. C.	BS Publications	
2	Greenhouse technology for Controlled Environment.	Tiwari, G.N.	Narosa Publishing house Pvt. Ltd	
3	Advances in protected cultivation,	Singh Brahma and Balraj Singh.,	New India publishing company	2014
4	Unit operations of agricultural processing.	Sahay, K.M. and Singh, K. K.	Vikas publishing house pvt. Ltd. New Delhi.	1994
5	Post-harvest technology of cereals, pulses, and oil seeds	Chakravarty, A.	Oxford and IBH publishing Co. Ltd., New Delhi	

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	20

End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Environmental Studies and Disaster Management (ESDS)

COURSE CODE	23CPHY36 1	MOD E	Offline	LTPS	1-0-2-0	PRE- REQUISITE	environmental studies and disaster management
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Gain knowledge on Environment, its structure, climate change, sustainable development, disaster management, different type of diseases and public health management.	2	PO1,
CO2	The learner develop understanding on the Environment, ecosystem, biogeochemical cycle, environmental pollution and capability to identify relevant environmental issues, analyse the various underlying causes, evaluate the practices and policies, and develop framework to make informed decisions.	3	PO7,PO5,PO3
CO3	Develop an objective view on population ecology, population growth and controls, climate change and sustainable development goals.	4	PO9,PO8
CO4	Learner lay foundation on the concept of disaster management, vulnerability, assessment and risk analysis, institutional framework, preparedness measures and survival skills.	3	PO2,PO4
CO5	Analyze critical issues in public health management. Gain insight into historical, contemporary perceptive on communicable and non-communicable disease, life style management, transmission of epidemic- pandemic diseases and its prevention. Learner will enable to understand the role of different public sectors in managing health disaster.	4	PO6

Syllabus

Module 1	Environmental studies - Definition – Scope and importance, need for public awareness, people and institutions in environment. Natural resources – Renewable and non-renewable resources – Forest resources –Functions of forests – Causes and consequences of deforestation. Water resources – Sources, uses and over utilization of surface and groundwater - Dams – Benefits and problems – Sustainable management of water. Food resources – Food sources, world food problems and food security.
Module 2	Energy resources – Renewable and non-renewable energy sources and their impact on environment. Land resources – Land degradation, desertification and land use planning – Role of an individual in conservation of natural resources. Biodiversity – Definition – Types of biodiversity – Bio-geographical classification in India – Methods of measuring biodiversity – Biodiversity Act – Functions of National Biodiversity Board. Threats to biodiversity – Habitat loss – Poaching of wild life – Man-wild life conflicts – Conservation of biodiversity – In situ and ex situ–
Module 3	Environmental pollution – Causes, effects and control measures of air and water pollution – Tolerable limits for toxic gases in air. Causes, effects and control measures of soil pollution – Bioremediation – Tolerable limits for heavy metals in soil. Causes, effects and control measures of thermal, marine and noise pollution, nuclear hazards. Solid waste management – Need of waste management – Types of solid waste – Management processing technologies.
Module 4	Disaster management - Natural Disasters – Meaning and nature of natural disasters, types and effects - Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, heat and cold waves - Man-made disasters – Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents. – International strategy for disaster reduction - Concept of disaster management - National disaster management framework - Financial arrangements - Role of NGOs, community based organizations and media, Central, state, district and local administration, Armed forces, police and other organizations in disaster response. Social issues and the environment – Unsustainable to sustainable development – The Environment Protection Act – The air (prevention and control of pollution) act - The water (prevention and control of pollution) act – The wildlife protection act - Forest conservation act. Woman and child welfare – Human immune-deficiency virus (HIV)/ Acquired Immunodeficiency Syndrome (AIDS) – Role of information technology on environment and human health.
Module 5	Collection, processing and storage of effluent samples. Determination of chemical oxygen demand in waste water sample. Estimation of dissolved oxygen in waste water sample. Determination of total dissolved solids in waste water sample. Analysis of temporary hardness of waste water sample by titration. Analysis of total hardness of waste water sample by titration. Preparation of sludge / waste water sample for analysis of heavy metals. Estimation of heavy metals in sludge / waste water by Atomic Adsorption Spectrophotometer (AAS). Determination of sound level by using sound level meter. Estimation of species abundance of plants. Estimation of repairable and non – repairable dust in air by using dust sampler. Study of transpiration and water balance in plant. Assessment of chlorophyll content in plants. Visit to in-situ or ex-situ conservation centre / Social Service Organization / Environmental Education Centre. Information and Communication Technology (ICT) in Environmental Science. Visit to a local polluted site – observations and remedial measures.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	INTRODUCTION TO ENVIRONMENTAL SCIENCE	Anjaneyulu, Y.	BS Publications	2004.

2	Text book of Environmental Studies for undergraduate courses. University Grants Commission, New Delhi.	Bharucha, E.	Orient Blackswan Pvt Ltd	2021.
3	Text book of Disaster Management P/B	Srivastava, A. K.	SCIENTIFIC PUBLISHERS (INDIA)	2021.
4	Disaster Management Future Challenges And Opportunities 2020	Jagbir Singh	Wiley India	2020.
5	Environment& Disaster Management: Ecology, Climate Change & Bio-diversity	Khullar, D. R. & Rao, A. C. S.	McGraw Hill Education India Private Limited; 3rd Edition	2021.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	20	
	Atten (AG)	5	
			25
In-Sem Summative	Mid Semester Exam	20	
			25
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Diseases of Field and Horticultural Crops and their Management - I (Field Crops)> <(DIFCM)>

COURSE CODE	23PATH371	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23PATH 171
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Course Outcomes

CO#	CO Description	BTL	PO & PSO's Mapping
CO1	To apply management practices for rice, wheat and sorghum diseases	3	PO3,PO4 & PSO3
CO2	To apply management practices for Sorghum, Maize, Bajra, Ragi, Cotton and Sugarcane diseases	3	PO4,PO3& PSO3
CO3	To apply management practices for Sugarcane, Tobacco, Groundnut, Sesamum, Castor and Sunflower diseases in field	3	PO3,PO4& PSO3
CO4	To apply management practices of Safflower, Mustard, Red gram, Bengal gram, Black gram, Green gram, Soybean and Cowpea diseases in field conditions	3	PO3,PO4& PSO3
CO5	To analyze the diseases of field crops	4	PO1,PO3,PO4& PSO3

Syllabus

Module 1	Rice diseases – blast, brown spot, Sheath rot, Stem rot, narrow brown leaf spot, sheath blight, False smut, Bacterial leaf blight, Bacterial leaf streak, Rice Tungro Disease, Khaira disease. Wheat diseases – Black or stem rust, orange rust, yellow rust, loose smut, Karnal bunt, Powdery mildew, alternaria blight, Tundu disease. Sorghum diseases – Anthracnose, rust, ergot, headmold, leaf blight
Module 2	Sorghum diseases - smuts, charcoal rot, downy mildew, Striga, Maize diseases - Turcicum leaf blight, post flowering stalk rots, charcoal rot, Banded leaf and sheath blight, downy mildew. Bajra diseases – Downy mildew/green ear, rust, ergot, smut. Ragi/Finger millet diseases- blast, smut, mosaic. Cotton diseases– Bacterial blight, Fusarium wilt, Verticillium wilt, root rot. grey mildew, anthracnose, Alternaria leaf spot, Cercospora leaf spot, Helminthosporium leaf spot, rust. Sugarcane diseases – red rot, whip smut, wilt, ring spot
Module 3	Sugarcane diseases – Grassy shoot, mosaic, ratoon stunting, rust, Pokah Boeng. Tobacco diseases –black shank, Damping off, Frog eye spot, brown spot, black root rot, Mosaic, leaf curl, Orobanch. Groundnut diseases – Collar rot, Tikka leaf spots, rust, pepper leaf spot, stem rot, Bud necrosis, Peanut stem necrosis disease, Kalahasti malady. Sesamum diseases – Phyllody, Alternaria leaf spot, powdery mildew, charcoal rot, bacterial leaf spot. Castor diseases – wilt, root rot, grey mold, bacterial leaf spot, seedling blight, rust. Sunflower diseases – leaf blight, rust, powdery mildew, head rot, collar rot, downy mildew, mosaic, sunflower necrosis virus.
Module 4	Safflower diseases – Alternaria leaf blight, wilt, rust, mosaic Mustard diseases – White rust, downy mildew, powdery mildew, Alternaria leaf spot, Sclerotinia stem rot. Red gram diseases – Phytophthora blight, wilt, sterility mosaic and, bacterial leaf spot and stem canker. Bengal gram diseases – wilt, rust, Ascochyta blight, stem and root rot, grey mold Black gram and Green gram diseases – Powdery mildew, rust, Cercospora leaf spot, Corynespora leaf spot, Angular black spot, Dry root rot, web blight. Blackgram and Greengram diseases – Bacterial leaf spot, Yellow Mosaic virus, Leaf crinkle, Cuscuta. Soybean diseases – Rhizoctonia blight, seed and seedling rot, rust, Soybean mosaic, Bacterial pustule; Pea diseases - downy mildew, powdery mildew and rust. Cowpea diseases – Cowpea mosaic virus disease.; Lentil diseases - rust and wilt
Module 5	Study of the symptoms, identification of rice diseases .Study of the symptoms and identification of wheat and sorghum diseases. Study of the symptoms and identification of Maize and Finger millet diseases. Field Visit.Study of the symptoms, identification of Sugarcane diseases. Study of the symptoms, identification of Tobacco diseases. Study of the symptoms, identification of Groundnut diseases. Field Visit.Study of the symptoms, identification of Sunflower and Safflower diseases. Study of the symptoms, identification of Castor and sesamum diseases. Study of the symptoms, identification of Mustard diseases.Field Visit.Study of the symptoms, identification of Cotton diseases. Study of the symptoms, identification of Redgram, greengram and blackgram diseases.Study of the symptoms, identification of Bengalgram, cowpea and soybean diseases. Field Visit.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Diseases of crop plants in India.	Rangaswami, G. and Mahadevan A	PHI Learning Pvt. Ltd.	1998
2	Plant diseases.	Singh, R.S.,	Oxford and IBH Publishing	2018.
3	Diseases of field crops and their management.	Parthasarathy, S., Thiribhuvanamala, G. and Prabakar, K.,	CRC Press	2020

Evaluation Components:

Evaluation	Component	Weightage	Total
	Attendance	3.3334	

In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

PRINCIPLES OF INTEGRATED PEST AND DISEASE MANAGEMENT (PIPDM)

COURSE CODE	23 PATH 373	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23PATH 171
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand the insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.	2,3	PO2, PSO3
CO2	Understand the methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.	2,3	PO2, PSO3
CO3	To apply economic importance of insect pests, Pest risk analysis, Methods of detection and diagnosis of insect pests, Ecological management of crop environment and Introduction to conventional and botanical pesticides	3	PO2, PO3, PSO3
CO4	To apply Survey & surveillance and forecasting of Insect pests, Implementation and impact of IPM, Political, social and legal implication of IPM and Safety issues in pesticide uses.	4	PO2, PO3, PSO3
CO5	To analyse methods of diagnosis and detection of various insect pests, Agro Eco System Analysis in major field crops Ecological engineering for rice, methods of assessment of insect pests population, damage and crop yield losses and calculation of cost benefit ratios (paddy/cotton), Planning and assessment of insect pest preventive strategies and decision making and Awareness campaign at farmer's fields.	4	PO2, PO3, PSO3

Syllabus

Module 1	To study about the Integrated disease management, its strategies, integration practices, etc.
Module 2	To know the impact of the Diseases, Disease incidence, disease severity scale, AUDPC, etc.

Module 3	Economic importance of insect pests. Pest risk analysis - Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of detection and diagnosis of insect pests – types of insect damage on crop plants based on the types of mouth parts (biting and chewing, piercing and sucking, lacerating and sucking, siphoning and degenerate types). Ecological management of crop environment - Ecological principles – importance of ecosystem concept – ecological niche – Agro ecosystem components and services in management of crop environment. Introduction to conventional and botanical pesticides for the insect pests and disease management.
Module 4	Survey & surveillance and forecasting of Insect pests, Case histories of IPM programmes – success stories. Development and validation of IPM modules for major crops – problem identification – Research and development of IPMs – Modules for major Agricultural and horticultural crops and validation. Implementation and impact of IPM (IPM module for Insect pest) - IPM modules for major field crops (paddy, sugarcane, cotton, pulses and ground nut) major vegetables (brinjal, tomato, okra, cabbage and cauliflower), mango and coconut – Impact studies of IPM modules and constraints in implementation. Political, social and legal implication of IPM - Safety issues in pesticide uses – legislative measures – Awareness about IPM, Farmers participation – Government support. Safety issues in pesticide uses – Pesticide risk assessment, management and communication, use in agriculture. Environmental impact – health effects – residues, resurgence and resistance – effect on non target organisms – Strengths and weaknesses of pesticides.
Module 5	Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of Trichoderma, 136 Pseudomonas, Trichogramma, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agro-ecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases . Awareness campaign at farmers fields.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Integrated pest management: Concepts and approaches,	Dhaliwal, G. S. and Ramesh Arora	Kalyani Publishers Ludhiana.	2001.
2	Introduction to Principles of Plant Pathology.	Singh, R.S.	Oxford & IBH Publ.	2002
3	Integrated pest management: Concepts and approaches.	Dhaliwal, G. S. and Ramesh Arora	Kalyani Publishers Ludhiana.	2001.
4	Introduction to insect pest management.	Metcalf, R. L .and Luckman, W. H.	Wiley inter science publishing, New York.	1982.
5	Entomology and pest management.	Larry P Pedigo	Prentice Hall of India Private Ltd., New Delhi.	1991.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Rain Fed Agriculture And Watershed Management > <(AGRO RAWM)>

COURSE CODE	23AGRO303	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23AGRO 101

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understand about rainfed agriculture and its introduction, problem and prospects in India.	3	PO2 & PSO2
CO2	Describe different tillage practices for rainfed crops, losses due to erosion, management of rainfed crops	3	PO2& PSO2
CO3	To discuss different harvesting structures, conservation measures, using of fertilizers in rainfed areas and the different cropping systems in rainfed regions	3	PO2 & PSO4
CO4	To Explain about contingent crop planning, evapotranspiration and land capability classification	4	PO2 & PO2, PSO4
CO5	Acquaint practical knowledge on cropping pattern of dryland areas, cultural practices in dryland areas, soil moisture conservation measures, watershed and rainfall analysis	4	PO2, PO3 & PSO4

Syllabus

Module 1	Rainfed agriculture – introduction and definition – dimensions of the problem – area and production from dry lands in India and Andhra Pradesh –History of rainfed agriculture and watersheds in India. Problems and prospects of rainfed agriculture in India – climate – rainfall pattern – distribution – variabilities of rainfall – short rainy season – high intensity rainfall. Problems and prospects of rainfed agriculture in India - soil characteristics – soil fertility status –soil moisture storage and retention capacity – heavy weed infestation-soil crust and their effect on crop growth and soils-its management. Drought – definition – types of drought – effect of water deficits on physiomorphological characteristics of the plants- mechanism of crop adaptation under moisture deficit condition - management strategies for drought.
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Module 2	Tillage for rainfed crops – off-season tillage – primary tillage –secondary tillage – year round tillage – sub soiling – setline cultivation – modern concepts of tillage- minimum tillage and zero tillage. Soil erosion – definition – losses due to erosion – types of water and wind erosion – nature and extent of wind and water erosion – factors affecting erosion – universal soil loss equation. Management of crops in rainfed areas - Agronomic measures of soil and water conservation – choice of crop – crop geometry – tillage – contour cultivation – strip cropping – cover cropping – mulching – cropping systems and weed control - Mechanical measures of soil and water management. Watershed – definition – concept— objectives and principles of water shed management components of watershed development programme – factors affecting watershed management.
Module 3	Water harvesting – importance, its techniques- Water harvesting structures – arid region – runoff farming – water spreading – micro catchments – semi arid region – farm ponds, check dams – percolation tank – dug wells – life saving irrigation. In-situ moisture conservation measures – bund forming – bunding, ridge and furrow system – conservation furrows- inter plot water harvesting, mulching – Broad Bed and Furrow (BBF) and leveling. Fertilizer use in rainfed areas – use of organic manures – introduction of legumes in crop rotation– organic recycling and bio-fertilizer use in rainfed agriculture – time and method of fertilizer application. Efficient crops and varieties – cropping systems in rainfed areas – intercropping – advantages – efficient inter cropping systems in different rainfed regions of Andhra Pradesh.
Module 4	Contingent crop planning for aberrant weather conditions in red and black soils. Evapotranspiration – measures to reduce evapotranspiration – weeding, use of mulches, chemicals, windbreaks and shelterbelts. Land capability classification – alternate land use system. Efficient utilization of water through soil and crop management practices - agronomic measures - mechanical measures for soil and water conservation – gully control – bench terraces – contour terracing – graded bund
Module 5	Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different dry land areas in the country and demarcation of dry land area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible 35 drought period in the country, effective rainfall and its calculation. Studies on cultural practices viz; mulching, plant density, depth of sowing, thinning and leaf removal for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Dryland Agriculture	Reddy, S. R. and Prabhakar Reddy, G	Kalyani Publishers	2015
2	Crop Production in Dry Regions (Vol.I)	Arnon,I.	Leonard Hill Pub. Co, London.	1972
3	Watershed Management in India	Dhruva Narayana, V.V., Sastry, G.S. and Patnaiak, V.S	ICAR, New Delhi.	1999
4	Dryland Agriculture in India: An agro-climatological and agro-meteorological perspective	Jeevananda Reddy,S	B S publications	2002

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	20	
	Attendance	5	
			25
In-Sem Summative	Mid Semester Exam	20	20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Principles of Organic Farming > <(POF)>

COURSE CODE	23AGRO304	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23AGRO101
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Discuss the concept and principles of organic production technology and Role of organic farming in National economy.	3	PO1, & PSO1, PSO2
CO2	To Explain the method of composting and nutrient management in organic farming	3	PO6 & PSO1, PSO2
CO3	To understand the Selection of crops and varieties cereals and commercial for organic farming and increase production of organic products by managing pests, diseases and by using botanicals	3	PO6 & PSO1, PSO2
CO4	To evaluate Quality analysis of organic inputs and products, Relative economics of organic production programmes Socio-economic impacts, certification process and standard of organic produce	3	PO6 & PSO1, PSO2

CO5	To demonstrate Indigenous technology knowledge (ITK), Vermicompost and other organic manures production methodology and their application	4	PO8& PSO1, PSO2
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Syllabus

Module 1	Organic farming – definition – need – scope – principles – characteristics - relevance to modern agriculture.- Different eco friendly farming systems- biological farming, natural farming, regenerative agriculture – permaculture - biodynamic farming. - Relevance of organic farming to A.P, India, and global agriculture and future prospects- advantages - barriers. - Initiatives taken by the central and state governments, NGOs and other organizations for promotion of organic agriculture in India.
Module 2	Organic nutrient sources and their fortification – organic manures- methods of Composting - Green manures- bio fertilisers – types, methods of application – benefits and limitations.- Nutrient use in organic farming-scope and limitations.-Nutrient management in organic farming.
Module 3	Organic ecosystem and their concepts.- Choice of crops and varieties in organic farming – crop rotations – need and benefits – multiple cropping.- Fundamentals of insect, disease and weed management under organic mode of production- cultural- biological methods-non chemical pest and disease management.- Botanicals- pyrethrum, neem seed kernel extract, neem seed powder, soluble neem formulations, neem oil.
Module 4	Operational structure of NPOP – other agencies for organic production.- Inspection – certification - labelling and accreditation procedures for organic products.- Processing, - economic consideration and viability.- Marketing and export potential of organic products – national economy.
Module 5	Visit to organic farm to study the various components, identification and utilization of organic products.- Compost making- aerobic and anaerobic methods- Vermicompost preparation- Preparation of enriched farm yard manure- Visit to organic clusters and bio control lab to study the maintenance of biofertilizers/bio-inoculant cultures- Biological nitrogen fixers.- Methods of application of Bio-pesticides (Trichocards, BT, NPV)- Preparation of neem products and other botanicals for pest and disease control- Preparation of green pesticides (panchagavya, beezamrutam, jeevamrutam, ghanajeevamrutam, dravajeevamrutam).- Different methods of biofertiliser applications.- Quality analysis of biofertilisers/bioinoculants and compost- Case studies of Indigenous Technical knowledge (ITK) for nutrient , insect, pest,disease and weed management- Economic analysis of organic production system- Study of post harvest management in organic farming- Study of quality parameters of organic produce- Visit to organic farms to study the various components and their utilization

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	A Hand book of organic farming.	Arun K. Sharma.	Agrobios, India	2002
2	Organic farming-Theory and Practice.	Palaniappan, S.P and Annadurai, K.	Scientific publishers, Jodhpur,India.	1999
3	Sustainability through organic farming.	Mukund Joshi and Prabhakarasetty, T.K	Kalyani publishers, New Delhi.	2006

4	Principles and practices of organic farming.	Balasubramanian, R., Balakishnan, K and Siva Subramanian, K.	Satish Serial Publishing House	2013
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Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

AGRICULTURE INFORMATICS <SMCA>

COURSE CODE	23 SMCA 301	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23 SMCA 301
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	To apply an introduction of computers, their advantages, disadvantages, applications, anatomy, Input / output devices, memory concepts, WINDOWS operating system, MS-Office	3	PO5 & PSO3
CO2	To apply features of MS Word, MS- Excel, MS Access such as word processor, Mail merge, Track changes, Data presentation, analysis, graph creation, mathematical expression etc.	3	PO5 & PSO1
CO3	To apply concepts, components of Internet and World Wide Web, HTML-XML coding, information technology, ICT tools, computer simulation models in e-Agriculture	4	PO5 & PSO2
CO4	To apply IT, automated systems, mobile apps, Geospatial technology, decision support system for Agri-input and output management	3	PO5 & PSO1
CO5	To analyze computer, operating system, MS office and internet concepts for agricultural input and output data management, analysis and presentation	4	PO5 & PSO4

Syllabus

Module 1	Introduction to computers- Advantages- Disadvantages- Applications - Anatomy of Computers- Input / output devices -Memory Concepts - Units of Memory - RAM, ROM etc. Computer operating system - Definition and types - WINDOWS OS – Features –
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	Desktop – Icons etc. Applications of MS-Office - MS- Word - Creating - Editing and formatting a document.
Module 2	MS Word - Features of good word processor - Mail merge – Drop cap- Auto text- Track changes – Equation editor etc. MS- Excel - Data presentation, Tabulation – Merging of cells and graph creation - Mathematical expressions-Data analysis tool pack – Pivot table and graph etc. MS Access – Database - concepts-types - database - Uses of DBMS in agriculture
Module 3	Application of HTML - XML coding in agriculture informatics. Information and communication technologies (IT) in Agriculture. ICT, computer models and simulation for monitoring agri-input and output
Module 4	IT for agri-input-output management, automation, crop planning and calendar. Geospatial technology – for generating valuable agri-information. Decision support systems (DSS) for assistance in farm decisions.
Module 5	Booting and shut down of computer, handling Windows OS, Windows explorer/ file explorer, cut-copy-paste functions, Control panel, Notepad -Wordpad, MS word, Creating a table, merging of cells, columns, formats etc. Handling MS- Excel for creating a spreadsheet, alignment of rows-columns-cells, basic data analysis, test of significance, correlations and regressions, creating graphs. Handling MS- Power Point - MS- Access for creating slides, layouts, action buttons, multimedia features, data base, structuring with different types of fields, use of query facility for accessing the information, transforming the data of word - Excel and Access to other formats, Internet concepts - Creating Email - Search Engines - Website designing.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Microsoft Office 2010 Bible	John Walkenbach, Herb Tyson, Michael R. Groh, Faithe Wempen.	John Wiley & Sons	2010
2	Office 2010: The Missing Manual: The Book That Should Have Been in the Box	Nancy Conner and Matthew MacDonald	O'Reilly	2010
3	Computer Fundamentals	Bhanu Pratap	Cyber Tech Publications, New Delhi	2011
4	Computer Fundamentals, Third Edition	Pradeep K. Sinha and Priti Sinha	BPB Publications, New Delhi	2003
5	Principles of Computer Science, Schaum's Outline Series	Carl Reynolds and Paul Tymann	McGraw Hill, New Delhi	2008

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			20

In-Sem Summative	Mid semester exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

CROP IMPROVEMENT - II (FIBRE,SUGAR,STARCHES,NARCOTICS,VEGETABLES,FRUITS AND FLOWERS) <(CI-II)>

COURSE CODE	23GPBR312	MODE	OFF LINE	LTPS	1-0-2-0	PRE-REQUISITE	23GPBR312
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply origin, distribution, breeding objectives, breeding methods and hybrid seed production of Cereal crops like cotton, jute, sugarcane, sweet potato and potato.	3	PO1,PO2,PO3,PSO1, PSO2
CO2	To learn origin, distribution, breeding objectives, breeding methods and hybrid seed production of tobacco, tomato, brinjal, chilli, okra, cucumber, cabbage and cauliflower.	4	PO1,PO2,PO3,PO4,PSO1, PSO2
CO3	To learn origin, distribution, breeding objectives, breeding methods and hybrid seed production of garlic, onion, melons, banana, mango, guava and papaya.	4	PO1,PO2,PO3,PSO1, PSO2
CO4	To study about the centre of origin, floral biology, breeding objectives, breeding methods and seed production techniques of Lime, lemon, apple, pomegranate, sapota, rose, jasmine, chrysanthemum and marigold.	3	PO2,PO3,PO4,PO1, PSO1, PSO2
CO5	To Analyse the hybridization techniques, floral morphology. selfing, emasculation and crossing techniques in fibres, sugars and starch, vegetables, fruits and flower crops	4	PO3,PO4,PO5,PO9,PO11, PSO1, PSO2

Syllabus

Module 1	Introduction – General breeding objectives – Concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops - Breeding populationsrelevance in crop improvement. Fibres - Cotton and Jute- Origin – Distribution of species – Wild relatives and forms –Breeding objectives – Major breeding procedures (conventional and modern innovative approaches) for development of hybrids / varieties - Seed production technology of varieties and hybrids - Accomplishments. Sugars and starches – Sugarcane - Origin – Distribution of species Sugars and starches – Potato and sweet potato
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Module 2	Narcotics - Tobacco- Origin – Distribution of species Vegetables - Tomato and Brinjal - Origin – Distribution of species – Wild relatives and forms –Breeding objectives Vegetables - Chilli and Okra - Origin – Distribution of species – Wild relatives and forms –Breeding objectives Vegetables-Cucumber , Cabbage and cauliflower - Origin – Distribution of species – wild relatives and forms – Breeding objectives
Module 3	Vegetables - Garlic and Onion - Origin – Distribution of species – Wild relatives and forms –Breeding objectives Vegetables - Gourds and Melons- Origin – Distribution of species – Wild relatives and forms – Breeding objectives, Fruit crops - Banana and Guava - Origin – Distribution of species – Wild relatives and forms –Breeding objectives – Fruit crops- Mango and Papaya - Origin – Distribution of species – Wild relatives and forms –Breeding objectives
Module 4	Fruit crops - Lime, Lemons and Apple - Origin – Distribution of species – Wild relatives and forms –Breeding objective Fruit crops - Pomegranate and Sapota - Origin – Distribution of species – Wild relatives and forms –Breeding objectives Flower crops - Rose and Jasmine - Origin – Distribution of species – Wild relatives and forms – Breeding objectives Flower crops - Chrysanthemum and Marigold - Origin – Distribution of species – wild relatives and forms –Breeding objectives
Module 5	Emasculation and hybridization techniques in fibres, sugars, starches, narcotics, vegetables, fruits and flower crops; maintenance breeding of different crops, Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Principles of Plant Breeding. Essential of Plant Breeding.	Allard, R.W. Phundan Singh	John Wiley & Sons, New York. Kalyani Publishers, Ludhiana	1960 2006
2	Breeding of Asian Field Crops. Principles and Practice of Plant Breeding.	Poehlman, J.M. and Borthakur, D. Sharma, J.R.	Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi Tata McGraw-Hill Publishing Co. Ltd., New Delhi	1995. 1994
3	Vegetable Breeding.	Kalloo, G	Panima Educational Book Agency, New Delhi.	1994
4	Breeding of Horticultural Crops - Principles and Practices.	Kumar, N.	New India Publishing Agency, New Delhi	2006.
5	Principles of Plant Genetics and Breeding.	George Acquaah	Blackwell Publishing Ltd., USA.	2012.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid Semester Exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

PESTS OF HORTICULTURE CROPS, THEIR MANAGEMENT AND BENEFICIAL INSECTS (PHMBI)

COURSE CODE	23ENTO332	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23ENTO131, 23ENTO231
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Study of insect pests occurring on vegetables	3	PO1,PO3, PO11 &PSO2
CO2	Study of insect pests of fruits, flowers and plantation crops	4	PO1,PO3, PO11 &PSO3
CO3	study of sericulture and apiculture	4	PO1,PO3, PO11 &PSO3
CO4	study of Lac culture, pollinators, predators, parasitoids, weed killers and scavengers	3	PO1,PO3, PO11 &PSO3
CO5	Identification and Diagnosis horticulture crop pests	4	PO1,PO3, PO11 &PSO3

Syllabus

Module 1	Brinjal- Epilachna beetle, shoot and fruit borer, stem borer, mealy bug, aphid, leafhopper, lacewing bug, leaf webber and red spider mite- IPM practices. Bhendi- Shoot and fruit borer, leafhopper and whitefly and spider mite - TomatoSerpentine leaf miner, South American Leaf miner/ Tomato pink worm, fruit borer and whitefly - IPM practices. Cucurbits- Fruit flies, pumpkin beetles, semilooper, serpentine leaf miner and pumpkin leaf eating caterpillar - Coccinia-Coccinia gall fly and aphids - IPM practices. Crucifers- Diamond back moth, cabbage head borer, leaf webber, aphid, painted bug, tobacco caterpillar and cabbage butterfly - IPM practices. Potato- Tuber moth - Sweet potato - Sweet potato weevil, hairy caterpillar, tortoise beetle - Moringa- Hairy caterpillar, budworm, leaf webber and pod fly - ChilliesThrips, pod borers, aphid, mites, blossom midge - Amaranthus- Leaf eating caterpillar, stem weevil - IPM practices. Mango- Leafhoppers, stem borer, nut weevil, fruit fly, shoot borer, fruit borer, mealybug, aphids, leaf webber, termites, thrips, red tree ant, leaf gall midges
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	and red spider mite - IPM practices. Citrus- Butterfly, fruit sucking moths, leaf miner, psylla, rust mite, bark eating caterpillar, black fly and leaf mite
Module 2	Grapevine- Flea beetle, thrips, mealybug, stem girdler, stem borer, leaf eating caterpillars and root grub - IPM practices. Cashew- Tree borer, shoot and blossom webber, tea mosquito bug, thrips and leaf miner Pomegranate- Butterfly, thrips and fruit sucking moths - IPM practices. Guava- Tea mosquito bug, mealybug, fruit flies and spiralling whitefly - SapotaLeaf webber, parijatha hairy caterpillar, mealybugs - Ber- Fruit fly, fruit borer and fruit weevil. Banana- Rhizome weevil, skipper, aphid and pseudostem weevil - Papayawhiteflies, mealybugs and thrips - Apple - Woolly aphid and Codling moth - Custard apple- Mealybug - IPM practices. Coconut- Black headed caterpillar, rhinoceros beetle, red palm weevil, slug, termites, scale and mite - Oil palm- Black headed caterpillar, rhinoceros beetle and red palm weevil - IPM practices. Arecanut- Scales - Cocoa - Scales - Cardamom- Thrips - Pepper- Pollu beetle and shoot borer - Eucalyptus - Gall wasp - Neem - Tea mosquito bug and white grub - IPM practices. Turmeric and ginger- Rhizome fly and Lace wing bug - Betelvine- Shoot bug and tobacco caterpillar - Onion- Thrips and Spodoptera exigua - Coriander- Aphids and leaf eating caterpillar - Rose- Thrips, scales, leaf eating caterpillars and chafer beetles - Jasmine- Stink bug, bud worm and gall mite - Chrysanthemum- Aphid- IPM practices - Tobacco-Tobacco caterpillar, aphid, whitefly and stem borer - CoffeeWhite borer, red borer and green scale; Tea- Tea mosquito bug, thrips, red spider mite, pink mite, purple mite and scarlet mite- IPM practices. Economically important mite, nematode (vegetables, citrus, banana and coconut), rodent (coconut) and bird pests of horticultural crops and their management.
Module 3	Beneficial insects – Importance of silkworm, honeybee, lac insects, predators, parasitoids, pollinators, weed killers and scavengers. Species of Silkworms - Characteristic features of Mulberry Silkworm, Tasar Silkworm, Eri Silkworm and Muga Silkworm and their hosts- Biology – Voltinism - Ahimsa silk. Establishment of mulberry garden – Planting season and land preparation, preparation of planting material - Irrigation- spacing, varieties, planting inter cultivation, fertilization, irrigation, leaf harvest and leaf yield - Mulberry Planting under rainfed and irrigated conditions - Spacing and preparation of pits, planting, fertilization, inter-cultivation, maintenance, soil moisture conservation and leaf harvest - Pests and diseases of mulberry plants and their management - Rearing house, rearing equipment and appliances-rearing stand, chawki rearing trays, late age rearing trays, paraffin wax coated paper, bird feathers, bed cleaning nets, chop sticks, rubber foam, ant well, mountages, chopping knife, chopping board, feeding basins, disinfection and hygiene in rearing house. Mulberry silkworm races - Grainage centres, brushing of silkworm larvae, young age and late age silkworm rearing - Effect of temperature, humidity, air current and photoperiod - Leaf quality and leaf maturity on larval growth and survival - Feeding of late instars, bed cleaning and bed spacing for IV and V instars Mounting-mountages, mounting density, harvesting and assessment of cocoon yield and cocoon characters for marketing - Defective cocoons. Silk worm diseases- Pebrine-Symptoms, mode of transmission, stages of contamination and intensity, detection and control - Viral diseases- Nucleo polyhedro Virus and Cytoplasmic Polyhedro Virus - Symptoms, prevention and control. Grasserie - Symptoms, source of contamination, prevention and control - Infectious Flacherie - Symptoms, prevention and control - Fungal Diseases- White muscardine- Source of infection, symptoms, prevention and control - Uzi fly – Biology, nature of damage and symptoms and management. Beekeeping- Importance and multiple source of income - Species of Honey beesRock bee, Little bee, Indian honey bee, European bee and Dammar bee - Bee biologyLife cycle - Caste determination in honey bees- Structural adaptations of honeybees. Commercial methods of rearing, – Different types of the hive- Equipment - Smoker,

	bee veil, gloves, honey extractor, queen gate, queen excluder sheet, drone extruder, drone trap, comb foundation sheet, dummy division board, swarm trap, bee brush, feeder, queen cage and queen cell protector - Colony management in different seasons, winter, summer and rainy seasons.
Module 4	Bee pasturage – Different species of pollen and nectar yielding plants- Honey flow season and dearth period – Communication in bees – Round dance and wag tail dance- Management of bees for crop pollination – Queen bee substance -Honey extraction, testing of honey, honey composition and value, bee wax, pollen, royal jelly, propolis, venom and its uses. Enemies of bees and bee brood - Nature of damage and management of Greater wax moth, lesser wax moth, wax beetle, wasps, black ants, birds etc., - Nature of damage and management of honey bee - mites, <i>Acarapis woodi</i> , <i>Varroa jacobsoni</i> and <i>Tropilaelaps clareae</i> . Bee diseases – Nature of damage and management of American foul brood disease, European foul brood disease, Sac brood disease, Thai sac brood disease, Chalk brood, stone brood disease, <i>Nosema</i> and Amoeba disease - Colony collapse disorder in bees. Lac insect- Different species, morphology, behaviour, host plants, inoculation methods, natural enemies of lac insect and their management - Lac production – Processing, different forms of lac- raw lac, seed lac, shellac and lac by - products. Recent applications of lac. Identification of biological control agents - Insect predators and parasitoids, pathogens, entomopathogenic nematodes. Insect orders bearing predators and parasitoids used in pest control and their key identification characters (Dictyoptera: Mantidae; Hemiptera: Reduviidae, Anthocoridae, Lygaeidae, Pentatomidae; Neuroptera: Chrysopidae, Myrmeleontidae, Hemerobiidae; Coleoptera: Carabidae, Cicindelidae, Coccinellidae; Diptera: Asilidae, Tachinidae, Syrphidae; Lepidoptera: Noctuidae, Lycaenidae, Epipyropidae, Pyralidae; Hymenoptera: Vespidae, Braconidae, Ichneumonidae, Chalcididae, Trichogrammatidae, Platygasteridae, Elasmidae, Eulophidae, Scelionidae and Strepsiptera). Mass production/multiplication methods of predators (<i>Cheilomenes</i> and <i>Chrysoperla</i>) parasitoids (<i>Goniozus nephantidis</i>). Important species of pollinators, weed killers, and scavengers and their significance.
Module 5	Identification of insect pests of Solanaceous and Malvaceous vegetables and their damage symptoms. Identification of insect pests of Cruciferous and Cucurbitaceous vegetables and their damage symptoms. Identification of insect pests of leafy vegetables, potato, sweet potato, moringa and chilli and their damage symptoms (Potato and Chillies are Solanaceous crops). Identification of insect pests of mango, cashew, citrus & banana and their damage symptoms. Identification of insect pests of grapevine, pomegranate, sapota, papaya, apple, custard apple, ber and guava and their damage symptoms. Identification of insect pests of coconut, arecanut, cocoa, cardamom, pepper, date palm & oil palm, eucalyptus and neem and their damage symptoms. Identification of insect pests of spices, narcotics (turmeric, betel vine, onion, tobacco & ginger) and ornamental plants (jasmine, rose, chrysanthemum) and their damage symptoms. Identification of economically important mite, nematode (vegetables, citrus, banana and coconut), rodent (coconut) and bird pests of horticultural crops and their management. Acquaintance with silkworm species and small scale rearing of mulberry silkworm. Acquaintance with different appliances of silkworm rearing, model rearing house and methods of disinfection. Acquaintance with handling of chawki and late age silkworm rearing - Feed change and spacing techniques. Dissection of silkworm larval mouthparts and salivary glands. Acquaintance with important species of honey bees, caste system, structural adaptations, beekeeping appliances and different beehives. Seasonal management of honey bees and their enemies and diseases. Visit to nearby silkworm rearing and bee keeping centres. Identification of various lac products

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Insects in Vegetables.	Butani, D.K. and Jotwani, M.G.	Periodical Export Book Agency, New Delhi	1984
2	Elements of Economic Entomology	Vasantharaj David, B. and V.V. Rama Murthy	Popular Book Depot, Coimbatore	2016
3	Monograph on Crop Pests of Kerala and their Control.	Nair, MRGk.	Trissur Directorate of extension, Kerala agricultural University	1990.
4	Beekeeping: A Comprehensive Guide on Bees and Beekeeping.	Abrol, D.P	Scientific publishers, Jodhpur	2010
5	Monograph on Crop Pests of Kerala and their Control.	Nair, MRGk.	Trissur Directorate of extension, Kerala agricultural University	1990

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

Farm Management, Production and Resource Economics (AECOFM)

COURSE CODE	20AECO341	MODE	offline	LTPS	1-0-2-0	PRE-REQUISITE	23AECO141
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	To apply the concepts of farm management, production economics, types and systems of farming, production functions, factor-product relationship.	3	PO1,PO10, PSO1
CO2	To apply the conditions for optimum input and output, factor-factor relationship, product-product relationship and to know types of enterprises.	3	PO10,PO1, PSO2
CO3	To apply the concepts of cost, farm inventory, farm planning and budgeting and linear programming	3	PO1,PO10, PSO4
CO4	To analyse the concepts of risk and uncertainty situations in the production, economic and environmental linkages, environmental costs and to identify the important issues and management of natural resources.	4	PO7,PO10, PSO4

CO5	To analyse the problems of farm management, input-output relations in production economics and data on the natural resources	4	PO2,PO3,PO10, PSO4
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Syllabus

Module 1	Meaning and concept of farm management, definitions, objectives and relationship with other sciences - Importance of study of farm management -Farm management problems in India. Meaning and definitions of types and systems of farming and their characteristics- Changing structure of land holdings in India - Characteristics of small, marginal and tenant farm holdings. Concept of production function and its types, use of production function in decision-Making on a farm - Seven principles of farm management. Factor - Product relationship – Law of variable proportions – Definition, graphical and arithmetical explanation with the help of an example.
Module 2	Determination of optimum input and optimum output and decision rules. Factor-Factor relationship, resources and types - Substitutes and complements, variable and fixed resources - Iso-quants - Iso-cost lines - Meaning and characteristics- Principle of least cost combination/ Principle of factor substitution - Explanation and decision rules. Product-Product relationship - Iso- product curves and Iso-revenue lines - Meaning and characteristics - Principle of optimum product combination - Law of equi-marginal returns/ principles of opportunity cost, decision rules. Types of enterprises and their characteristics - Principle of comparative advantage
Module 3	Meaning and concept of cost, cost function /cost-output relationship - Types of production costs and their interrelationship. Farm inventory. Farm planning and budgeting. Linear programming.
Module 4	Concepts of risk and uncertainty in agriculture production. Economy and environmental linkages. Environmental costs of economic growth. Important issues in economics and management of common property resources.
Module 5	Computation of depreciation cost of farm assets. Determination of most profitable level of inputs use in a farm production process. Application of Equi-marginal returns/ opportunity cost principle in allocation of farm resources. Determination of least cost combination of inputs. Selection of most profitable enterprise combination. Farm holding survey. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises. Farm business analysis, Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India. Seminar on selected topics.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Introduction to Agricultural Economic Analysis	Bishop, C.E. and W. D. Tousaint	John Wiley and Sons, London	1958
2	Economics of Agricultural Production and Resource Use	Heady, Earl O	Prentice Hall of India, Private Limited, New Delhi	1964
3	Fundamentals of Farm Business Management	S.S. Johl, J.R. Kapur.	Kalyani Publishers, New Delhi	2007
4	Economics of Farm Production and Management	Raju, V.T. and D.V.S. Rao.	Oxford & IBH Publishing Co.	2006

			Pvt. Limited, New Delhi	
5	Agricultural Economics	Subbareddy, Raghuram, Sastry, Bhavani Devi	Oxford & IBH Publishing Co. Pvt. Limited, New Delhi	2016

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid-semester exam	20	20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

**DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT-II
(HORTICULTURAL CROPS) (DFHCM-II)**

COURSE CODE	23PATH 372	MODE	Offline	LTP S	1-0-2-0	PRE- REQUISITE	23PATH171
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply management practices for citrus, mango, Guava, Papaya, Ber, Sapota Banana and Pomegranate diseases	3	PO3,PO4,PSO1
CO2	To apply management practices for Grapevine, Apple, Peach, Chillies, Brinjal and Okra diseases	3	PO3,PO4,PSO1
CO3	To apply management practices for Potato, Tomato, Crucifers, Cucurbits, Betelvine, onion and garlic diseases	3	PO3,PO4,PSO1
CO4	To apply management practices for Beans, Colocasia, Coriander, Coconut, oil palm, Tea, Coffee Turmeric, ginger, mulberry, Rose, Marigold, Chrysanthemum, Jasmine and Crossandra diseases	3	PO3,PO4,PSO1
CO5	To analyze the diseases of horticultural crops citrus, mango, Guava, Papaya, Ber, Sapota Banana and Pomegranate Grapevine, Apple, Peach, Chillies, Brinjal and Okra diseases Potato, Tomato, Crucifers, Cucurbits, Betelvine, onion and garlic diseases Beans, Colocasia, Coriander, Coconut, oil palm, Tea, Coffee Turmeric,	4	PO1,PO3,PO4,PSO2

	ginger, mulberry, Rose, Marigold, Chrysanthemum, Jasmine and Crossandra diseases and field visits		
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Syllabus

Module 1	Symptoms, etiology, disease cycle and management of following diseases Citrus: canker, gummosis, felt, tristeza and greening; Mango: anthracnose, malformation, bacterial blight, powdery mildew, sooty mould, red rust and Loranthus; Guava: wilt and anthracnose; Papaya: foot rot, anthracnose, Ber: Powdery mildew; Sapota: Flat limb; Banana: Panama wilt, bacterial wilt, Erwinia rhizome rot, Sigatoka, bunchy top, banana mosaic; Pomegranate: Anthracnose and bacterial blight;
Module 2	Grape vine: downy mildew, Powdery mildew, anthracnose, Alternaria leaf spot and rust; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl ;Chillies: Damping off, anthracnose, wilt, powdery mildew, Choanephora blight Cercospora leaf spot, bacterial leaf spot, mosaic complex and leaf curl; Brinjal: Phomopsis blight and fruit rot, bacterial wilt, Sclerotinia blight and little leaf; Okra: Cercospora leaf spot, powdery mildew and Yellow Vein Mosaic;
Module 3	Potato: early and late blight, black scurf, common scab, wart, black leg, brown rot, leaf roll, mosaics, potato spindle tuber; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl, Septoria leaf spot, bacterial canker; Cruciferous vegetables: Club root, white rust, Downy mildew, powdery mildew, Alternaria leaf spot and black rot; Betelvine: Root and stem rot, Sclerotial wilt, Fusarium wilt, Anthracnose; Onion and garlic: Smudge, smut, purple blotch, and Stemphylium blight;
Module 4	Beans: anthracnose, rust, yellow mosaic, Bean common mosaic virus and bacterial blight; Colocasia: Phytophthora blight; Coriander: stem gall; Coconut: Stem bleeding, Ganoderma wilt, bud rot, grey blight and tatipaka; Oilpalm: Bunch rot and spear rot; Tea: blister blight; Coffee: rust; Turmeric: leaf spot, leaf blotch, rhizome rot; Ginger: rhizome rot/soft rot, leaf spot; Mulberry: powdery mildew; Rose: dieback, powdery mildew and black leaf spot; Marigold: Botrytis blight; Chrysanthemum: wilt, stunt, Septoria blotch; Jasmine: rust; Crossandra: wilt.
Module 5	Identification and histopathological studies of selected diseases of horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Diseases of crop plants in India	Rangaswami, G & Mahadevan, K.	Prentice Hall of India. Pvt. Ltd, New Delhi.	2001
2	Plant Diseases	Singh, R.S.	Oxford & IBH Publications, New Delhi	2005

3	Diseases of Fruit crops	Pathak, V.N.	Oxford & IBH Publications, New Delhi	2001
4	Diseases of Vegetable crops	Singh, R.S.	Oxford & IBH Publications, New Delhi	1999
5	Crop Diseases & Their Management	Chaube, H.S and V.S. Pundhir	Prentice Hall of India. Pvt. Ltd, New Delhi.	2012

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid-semester exam	20	20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

Post-harvest Management and Value Addition of Fruits and Vegetables <(PMVFV)>

COURSE CODE	23HORT381	MODE	OFFLINE	LTPS	1-0-2-0	PRE-REQUISITE	23HORT181
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Application of post harvest management, pre harvest factors affecting post harvest quality, changes occurring during ripening, causes for deterioration of harvested fruits and vegetables	3	PO1
CO2	Application and management of diseases after harvesting, harvesting and field handling of horticultural crops, storage structures and value addition concept	3	PO1,PO3
CO3	To apply principles and methods of preservation, intermediate moisture foods-jam, jelly, marmalade, preserve, candy concept and standards, fruit beverages,	3	PO4

CO4	Application of Processing- concept and standard, drying and dehydration of fruits and vegetables, canning of fruits and vegetables, different types of packaging materials	3	PO2,PO4
CO5	Analysing basic plant propagation and irrigation methods	4	PO1,PO3

Syllabus

Module 1	Importance of fruits and vegetables, extent and possible causes of post-harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; Role of ethylene; Post harvest disease and disorders; Heat, chilling and freezing injury; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric);
Module 2	Value addition concept; Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables
Module 3	Effect of temperature on shelf life and quality of produce, Demonstration of chilling and freezing injury in vegetables and fruits, Extraction and preservation of pulps and juices,
Module 4	Preparation of jam, Preparation of Jelly, Preparation of RTS, Preparation of Nectar, Preparation of Squash, Osmotically dried products, Fruit bar and Candy and Tomato products, Canned products, Quality evaluation of products — physico-chemical and sensory,
Module 5	Applications of different types of packaging containers for shelf life extension, Effect of temperature on shelf life and quality of produce, Demonstration of chilling and freezing injury in vegetables and fruits, Extraction and preservation of pulps and juices, Preparation of jam, Preparation of Jelly, Preparation of RTS, Preparation of Nectar, Preparation of Squash, Osmotically dried products, Fruit bar and Candy and Tomato products, Canned products, Quality evaluation of products — physico-chemical and sensory, Visit to processing unit/ industry

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Post-harvest Management and Processing of Fruits and Vegetables	Rathore, N.S., Mathur, G.K., Chasta, S.S.	ICAR	2012
2	Fruit and Vegetable Preservation: Principles and Practices.	Srivastava, R.P. and Sanjeev Kumar.	International Book Distribution Company,	2002
3	Preservation of Fruits and Vegetables.	Giridharilal, G.S., Siddappa and Tondon, G.L.	ICAR	2007
4	Post Harvest Physiology and Storage of Tropical and Subtropical Fruits.	Mitra, S.K.	CABI Publishers, Kolkatta.	2005

Tools used in Practical / Skill:

Sl No	Tool Name	Parent Industry	Open Source/ Commercial
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1	Fruit pulper	Horticulture	Commercial
2	Mixer grinder	Horticulture	Commercial
3.	Hot air oven	Horticulture	Commercial

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation – Lab Exercise	20	25
	Attendance	5	
In-Sem Summative	Mid Semester Exam	20	20
End-Sem Summative	Lab End Semester Exam	25	55
	End Semester Exam	30	

Communication Skills and Personality Development > <(CSPD)>

COURSE CODE	20AEXT 391	MODE	Offline	LTPS	1-0-2-0	PRE-REQUISITE	23AEXT3 91
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	To understand the communication, meaning, process, types of skills, listening, note taking, writing, oral presentation skills. Study of voice modulation basics and their usage for meaningful impact on people.	3	PO9 & PSO3
CO2	Applications of field diary, lab record, indexing, footnote and bibliographic procedures. Study the reading, comprehension of general, technical articles and precise writing summarizing, abstracting, individual group presentations. Extempore, impromptu, prepared presentations, public speaking; group discussion - Organizing seminars and conferences. Human behaviour - domains and components of behaviour.	3	PO9 & PSO2
CO3	To apply personality development, personality theories, importance of wants, desires, needs, drives, motives, aspirations, interests, objectives and goals. Transactional analysis, importance, methods and strategies.	4	PO9 & PSO1
CO4	To apply negotiation skills, stress management, conflict management emotional intelligence, creativity, team work, factors affecting and role of team work.	3	PO8 & PSO3

CO5	To analyze communication skills, practicing of writing field diary, lab record, indexing, footnote, bibliographic procedures, practicing of extempore, impromptu, public speaking, organizing seminars, conferences, team work and time management.	4	PO8 & PSO4
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Syllabus

Module 1	Communication - meaning, process of communication, verbal and non verbal communication. Communication skills - structural and functional grammar. Listening, note taking, writing skills and oral presentation skills. Voice modulation basics and their usage for meaningful impact on people.
Module 2	Field diary, lab record, indexing, footnote and bibliographic procedures. Reading, comprehension of general and technical articles and precise writing summarizing, abstracting; individual group presentations. Extempore, impromptu and prepared presentations, public speaking; group discussion - Organizing seminars and conferences. Human behaviour - Domains and components of behaviour.
Module 3	Personality and personality development - Meaning, scope, importance, factors influencing personality - Traits and type, approaches. Personality theories. Importance of wants, desires, needs, drives, motives, aspirations, interests, objectives and goals in personality development. Transactional analysis, - Importance, methods and strategies.
Module 4	Negotiation skills, stress management and conflict management - Meaning, concept, steps and techniques. Emotional intelligence - Meaning, concept and importance. Creativity - Meaning, concept, components and characteristics of creative people. Team work - Meaning, concept, characteristic features of effective teams, types of teams, factors affecting and role of team work
Module 5	Communication - Meaning and process of communication. Overview of non verbal communication skills, signs of body language. Non verbal communication skills - Practicing conscious body postures and movements. Overview of verbal communication skills. Practicing listening and note taking and writing skills. Practicing oral presentation skills. Practicing writing of field diary and lab record - Indexing, footnote and bibliographic procedures. Practicing reading and comprehension of general and technical articles. Practicing precise writing, summarizing, abstracting. Exercise on individual and group presentations. Practicing of extempore, impromptu, impromptu presentation, public speaking. Evaluative exercises on video recorded mock group discussions and interviews. Practical exposure on organizing seminars and conferences. Evaluative exercise on recorded video programme to build the confidence level of students. Practical exercise on importance of team work. Practical exercise on importance of time management.

Reference Books:

Sl. No.	Title	Author(s)	Publisher	Year
1	Essentials of Educational Psychology	Mangal S.K	PHI Learning Private Ltd., New Delhi	2016.
2	A Genesis of Behavioural Science	Nirajkumar	Gyan Publishing House, New Delhi	1997.

3	Games People Play-The Psychology of Human Relationship	Eric Berne	Grove Press Publishers	1964.
4	I am Ok You are Ok	Thomas Anthony Harris	Harper Publishers	1967.
5	Communication Skills	Shivaraman K	APH publications	2009.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	5	
	Continuous Evaluation - Lab Exercise	20	
			25
In-Sem Summative	Mid Semester Exam	20	
			20
End-Sem Summative	Lab End Semester Exam	25	
	End Semester Exam	30	
			55

LIVE-STOCK AND POULTRY MANAGEMENT (LSPM)

COURSE CODE	LSPM 201	MOD E	Offline	LTPS	2-0-2-0	PRE-REQUISITE	LSPM 201
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understanding Livestock and Poultry Production: Students will gain a solid understanding of the principles and practices involved in livestock and poultry production. They will learn about different breeds, housing requirements, feeding and nutrition, and general management techniques.	2	PO1, PO3, +PSO1
CO2	Applying Animal Health and Welfare Practices: Students will be able to apply effective animal health and welfare practices to ensure the well-being of livestock and poultry. They will learn about disease prevention, vaccination protocols, basic veterinary care, and the importance of providing a conducive environment for the animals.	3	PO7, P8, PO5+PSO1
CO3	Implementing Breeding and Reproduction Strategies: Students will develop the skills necessary to implement effective breeding and reproduction strategies in livestock and poultry management. They will learn about selection criteria, mating systems, artificial	3	PO9+PSO2

	insemination, and basic genetic principles to improve the quality and productivity of the animals.		
CO4	Managing Livestock and Poultry Operations: Students will acquire the necessary skills to manage day-to-day operations in livestock and poultry farms. They will learn about proper feeding and nutrition, record keeping, monitoring animal growth and performance, and making informed decisions related to culling, marketing, and overall farm management.	4	PO2, PO4+PSO2
CO5	Apply Problem-Solving and Decision-Making Skills: Students will develop problem-solving and decision-making skills through practical scenarios encountered in livestock and poultry management. They will learn to analyze situations, identify issues, and make informed decisions to address challenges in real-time.	4	PO6+PSO4

Syllabus

Module 1	Demographic distribution of live-stock population. Population dynamics of live-stock and role in Indian economy. Reproduction in live-stock and poultry. Housing systems live-stock and poultry. Design and construction of live-stock and poultry buildings. Selection of site and General principles affecting the design. Arrangements of building. Building materials.
Module 2	Indian breeds of cattle, buffalo, sheep, goat, swine and poultry. exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Management of calves, growing heifers and milch animals .Management of sheep, goat and swine. Incubation, hatching and brooding. Improvement of live-stock and poultry. Digestion and metabolism live-stock and poultry. Classification of feedstuffs for live-stock and poultry.
Module 3	Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration-Balanced ration.General principles of computation of ration.Formulation of rations and feeding dairy cattle and buffaloes. Formulation of rations sheep, goat and swine and poultry.Feed supplements Feed additives in the rations of live-stock and poultry. Feeding of live-stock and poultry.
Module 4	Diseases of cattle and buffaloes. Diseases of sheep, goat and swine. Diseases of Poultry. Sanitation – Sanitation of live-stock and poultry houses. Prevention of infectious diseases in live-stock and poultry. Vaccination schedule for cattle and buffaloes sheep, goat. Vaccination schedule for swine and poultry. Control of infectious diseases in live-stock and poultry
Module 5	Familiarizing with body points/parts of different domesticated animals and poultry. Approaching, handling methods of restraining. Casting of live-stock. Identification methods of farm animals and poultry (branding, tattooing, notching & tagging). A visit to the live-stock and poultry farms. Identification of various breeds and familiarizing with various farm routines and farm records.Judging of cattle, buffalo and poultry.Culling of live-stock and poultry.Layout plans for different live-stock and Poultry houses. Computation of rations for live-stock and Poultry. Formulation of concentrate mixtures and Poultry.Clean milk production and milking methods. Hatching equipments Hatchery operations and incubation. Management of chicks, growers and layers.Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

reference Books:

Sl No	Title	Author(s)	Publisher	Year
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1	Managing Pig Health and the Treatment of Disease: A Reference for the Farm"	Michael R. Muirhead and Thomas J. Alexander	Publisher: 5m Publishing	2012
2	Beef Cattle Production and Management Practices"	David D. Simms	Publisher: CRC Press	2010
3	Dairy Cattle Science"	M. E. Ensminger, T. G. Reinhardt, and D. C. Church	Publisher: Interstate Publishers	2000
4	Sheep and Goat Production Handbook for Ethiopia"	Solomon Gizaw, Alemu Yami, Dirk Hoekstra, and Azage Tegegne	Ethiopian Sheep and Goat Productivity Improvement Program (ESGPIP)	2001
5	Dairy Cattle Science"	M. E. Ensminger, T. G. Reinhardt, and D. C. Church	Interstate Publishers	1998

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten (AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

PRINCIPLES OF SEED TECHNOLOGY <<PST>>

COURSE CODE	23 GPBR 314	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply the introduction to seed and seed technology, seed quality, deterioration of cropvarieties, maintenance of genetic purity during seed production, history and development ofseed industry, seed certification, foundation and certified seed production of varieties andhybrids in rice and maize.	3	PO1,PO2, PSO1
CO2	To apply foundation and certified seed production of varieties and hybrids in sorghum, pearlmillet, groundnut, sesamum, sunflower, castor, black gram, green gram, bengal gram, redgram, cotton, mesta and sunhemp, organic	3	PO5,PO6,PO3, PSO1, PSO2

	seed production, varietal identification through grow out test.		
CO3	To apply the detection of genetically modified crops, planning, layout and establishment of seed processing plant, seed drying, seed processing and their step, seed drying, drying zones in seed bin drying, selection of crop dryers and systems of heated air drying, seed cleaning, upgrading the quality of cleaned seeds, seed treatment.	3	PO7,PO8, PSO2
CO4	To apply seed coating, seed packaging, seed storage, seed marketing, seed act, central seed committee, notification of standards and procedures, seed testing for quality assessment.	3	PO4,PO9,PO10, PSO2
CO5	To analyze seed production in cereals, pulses, oilseeds, seed certification, seed sampling, physical purity analysis, germination analysis, seed moisture tests, seed viability tests, seed dormancy, seed vigour test, seed health testing, grow out test, visit to seed testing laboratory, seed processing plant, seed production farm.	4	PO5,PO9,PO11,PO4, PSO2

Syllabus

Module 1	Introduction to seed and seed technology. Seed quality. Deterioration of crop varieties. Maintenance of genetic purity during seed production in self pollinated and cross pollinated crops. History and development of seed industry. Seed certification. Foundation and certified seed production of varieties and hybrids in rice. Foundation and certified seed production of varieties and hybrids in maize
Module 2	Foundation and certified seed production of varieties in groundnut, sesamum and varieties hybrids in sunflower and castor. Foundation and certified seed production of varieties in blackgram, greengram and bengalgram and varieties and hybrids in redgram. Foundation and certified seed production of varieties and hybrids in cotton. Foundation and certified seed production of varieties and hybrids in mesta and sunhemp. Organic seed production – Importance - Problems and perspectives for production of quality seeds. Varietal Identification through Grow Out Test. Electrophoresis, molecular and biochemical tests.
Module 3	Detection of genetically modified crops- Trans gene contamination in non-GM crops, GM crops and organic seed production. Planning, layout and establishment of seed processing plant – Factors to be considered in planning and designing a seed processing plant – Types of layouts. Seed drying, seed processing and their steps. Drying zones in seed bin drying. Selection of crop dryers and systems of heated air drying. Seed cleaning. Upgrading the quality of cleaned seeds. Seed treatment, its importance.
Module 4	Seed coating. Seed packaging. Seed storage. Seed marketing, structure and organization, sales generation activities, promotional media, factors effecting seed marketing. Seed Act. Central Seed Committee. Notification of standards and procedures. Seed testing for quality assessment.
Module 5	To analyze seed production in cereals, pulses, oilseeds, seed certification, seed sampling, physical purity analysis, germination analysis, seed moisture tests, seed viability tests, seed dormancy, seed vigour test, seed health testing, grow out test, visit to seed testing laboratory, seed processing plant, seed production farm.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Principles of Seed technology	Agarwal, P.K	ICAR, New Delhi.	1994
2	Techniques in SeedScience and Technology	Agarwal, P.K. and Dadlani, M.	South Asian Publishers, New Delhi.	1986
3	Seed Technology	Agarwal, R.L.	Oxford and IBH Publication Co., New Delhi	1995
4	Seed Technology.	Dhirendra Khare and Mohan S. Bhale.	Scientific Publishers (India), Jodhpur	2007
5	An introduction of Seed Technology.	Thomson, J.R.	Leonard Hill, London	1979

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

PROFESSIONAL ELECTIVES (PE)

MANURES, FERTILIZERS AND SOIL FERTILITY MANAGEMENT (MFSFM)

COURSE CODE	23SSAC221	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23SSAC121
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To apply the knowledge of Scientists responsible for the essentiality of nutrients and to know about Essential nutrients, Deficiency symptoms of nutrients due to Nitrogen, Leaching losses of nitrate nitrogen, Phosphorus and Potassium.	3	PO1,PO2, PSO1
CO2	To apply the concept of Calcium, Sulphur, Micronutrient (Zn, Mn, Fe, Cu, Boron, Molybdenum and Chlorine) on nutrient uptake and Soil fertility Evaluation	3	PO4,PO2, PSO2
CO3	To apply the concepts of Plant analysis, Soil test based fertilizers recommendation on Nutrient use efficiency. Methods of application of nutrients under rainfed and irrigated conditions, importance of organic manures, Bulky organic manures, Compost and composting and Methods of preparation of rural and urban compost.	3	PO2,PO4, PSO2
CO4	To analyse the concepts of Green manures, penning, sewage, sewerage, sullage, poudrette, Activated compost process. Chemical fertilizers, Phosphatic fertilizers, Secondary and micronutrient fertilizers, Amendments, Mixed fertilizers, Fertilizer Control Order (FCO).	4	PO2,PO4, PSO1
CO5	To analyse the analytical instruments and recording the observations from the soil samples and plant samples and also about the estimation and identification of different nutrients. Acquaint with the analytical instruments and recording the observations from the soil samples and plant samples and also about the estimation and identification of different nutrients.	4	PO8,PO1,PO2,PO4, PSO4

Syllabus

Module 1	Introduction, History of soil fertility and plant nutrition, Concepts of soil fertility, soil productivity, Navadhanya and Annapurna concepts in relation to soil fertility Soil as a source of plant nutrients, Nutrient Elements, Arnon's criteria of essentiality, Essential, functional and beneficial elements. Scientists responsible for the essentiality of nutrients, Ionic forms of plant nutrients in soil, Mechanism of nutrient transport, Movement of ions from soils to roots, Mass flow, diffusion, root interception and contact exchange. Essential nutrients, Classification and their functions in plants. Deficiency symptoms of nutrients - Corrective measures – Toxicity symptoms of different nutrients. Nitrogen - Occurrence, content and distribution - Factors influencing the content of nitrogen in soil. Forms of soil nitrogen - Nitrogen Cycle – Transformations in soils – Mineralization (amination and ammonification) - Fate of released ammonia – Factors affecting ammonium fixation - Nitrification – Factors affecting nitrification – Fate of released nitrate nitrogen. Leaching losses of nitrate nitrogen – Nitrification inhibitors- Denitrification – Immobilization, Nitrogen fixation - Different types – Biological fixation of nitrogen – Symbiotic and non symbiotic – Nitrogen balance sheet – Gains
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	and losses. Phosphorus - P – Cycle – Content in soils – Forms of phosphorus in soil - Inorganic and organic phosphorus compounds – Phosphorus fixation – Mechanisms of phosphate fixation -Factors affecting phosphate fixation in soil - Quantity and intensity parameters. Potassium - Content in soil – Source – Forms of soil potassium - Potassium fixation - Factors affecting potassium fixation – Quantity and Intensity parameters – Luxury consumption.
Module 2	Calcium - Sources and content – Forms of calcium in soil, factors affecting the availability of calcium in soil –Magnesium - Sources – Content – Forms of magnesium in soils - Factors affecting availability of magnesium - Functions. Sulphur - S – Cycle – Occurrence – Forms of Sulphur in soil - Sulphur transformation in soils – Mineralization and immobilization - Sulphur Oxidation – Factors affecting oxidation in soils - Sulphide injury – Causes, symptoms and remedial measures.Micronutrient - Sources – Forms in soil solution – Pools of micronutrients – Predisposing factors for occurrence of micronutrient deficiencies in soil and plants. Zn and Mn - Content – Forms in soils – Critical limits in soils and plants - Factors affecting their availability. Fe and Cu - Content – Forms in soils – Critical limits in soils and plants. Factors affecting their availability. Boron and Molybdenum - Content – Forms in soil - Critical limits in soils and plants. Factors affecting their availability. Chlorine - Content – Forms in soils – Critical limits in soils and plants. Factors affecting its availability – Beneficial Elements-Sodium, Cobalt, Vanadium and Silicon. Soil fertility Evaluation: - Approaches – Soil testing – Objectives of soil testing – Chemical methods for estimating available nutrients.
Module 3	Plant analysis – Rapid tissue tests – Indicator plants - Biological methods of soil fertility evaluation, A- value – Microbiological methods – Sackett and Stewart techniques – Mehlich technique – Cunninghamella plaque method – Mulder’s Aspergillus niger technique – Mistcherlich’s pot culture method. Soil test based fertilizers recommendation:- Critical nutrient concept (Cate and Nelson) – Critical levels of nutrients in soils - General recommendations Use of empirical equations for scheduling fertilizer doses - Targeted yield approach. Nutrient use efficiency:- Soil, plant and management factors influencing Nutrient use efficiency in respect of N, P, K, S, Fe and Zn fertilizers – Foliar application – Fertigation – Liquid fertilizers. Methods of application of nutrients under rainfed and irrigated conditions. Introduction and importance of organic manures - Definition and difference between manures and fertilizers-Classification of manures (Bulky & Concentrated) with suitable examples. Importance of manures in soil fertility management. Bulky organic manures – Preparation of FYM – Methods of collection and storage. Losses of nutrients from FYM during collection and storage -Ways to minimize these losses. Compost and composting – Different methods of composting including the starters and raw materials. Methods of preparation of rural and urban compost. Mechanical compost plants – Their advantages over conventional composting –Vermi-composting.
Module 4	Green manures – Classification with examples. Advantages and limitations of green manuring and green leaf manuring. Biogas plant – Principles of operation and its advantages. Definitions of penning, sewage, sewerage, sullage, poudrette, Activated compost process. Concentrated organic manures – Oil cakes, blood meal, bone meal, horn meal, fish meal, meat meal and guano. Chemical fertilizers – Classification with examples – Nitrogenous fertilizers – composition and properties of major nitrogenous fertilizers viz., Ammonium sulphate, urea and calcium ammonium nitrate. Phosphatic fertilizers – Composition of Rock phosphate – Occurrence, types and properties-properties of SSP, TSP and basic slag – Potassic fertilizers –MOP, SOP properties. Secondary and micronutrient fertilizers – Different sources of these nutrients and their contents - Conditions leading to their deficiency - Methods of application and mode of action of NPK fertilizers in soils. Amendments – Role of important organic and inorganic amendments and synthetic conditioners as amendments - Complex fertilizers – Types, composition of DAP, MAP, UAP, important nitrophosphates. Mixed fertilizers

	<p>– Advantages and disadvantages over straight fertilizers - Nanofertilizers- Fertilizer grade – Fertilizer ratio – unit value of fertilizers – Problems - INM - Components - Advantages. Fertilizer Control Order (FCO) – Its importance and regulations - Specifications for important fertilizers - Fertilizer storage – Specifications - Problems during storage.</p>
Module 5	<p>Introduction to analytical instruments and principles-spectrometry and flame photometry. Estimation of available N in soils. Estimation of available P in soils. Estimation of available K in soils. Estimation of available S in soils. Estimation of available Ca and Mg in soils. Estimation of available Zn in soils. Basics of Plant analysis and estimation of N in plant samples. Estimation of P in plant samples. Estimation of K & S in plant samples. Identification acid radicals in fertilizers /salts. Identification of basic radicals in fertilizer /salt. Estimation of N in Ammonium sulphate. Estimation of N in Urea and FYM. Estimation of water soluble P₂ O₅ in SSP. Estimation of K in Muriate of potash or Sulphate of potash by using Flame photo meter</p>

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Fundamentals of Soil Science	Indian Society of Soil Science	IARI, New Delhi	2012
2	Manures and Fertilisers	Yawalkar K.S, Agarwal, T.P and Bokde, S	Agril. Publishing House, Nagpur	1995
3	Soil Fertility and Fertilizers: An Introduction to Nutrient Management	Samuel Tisdale, Nelson Werner L, Beaton James D and Havlin John L.	Macmillian Publishing Co., New York	2005
4	Introductory Soil Science	D. K .Das	Kalyani Publishers, New Delhi	2014
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Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

ELCT 305 Agricultural Waste Management

COURSE CODE	ELCT 305	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	ELCT 305
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	This CO provides the information about Introduction to agricultural waste management: Definitions of agricultural waste, residues and agricultural waste management- Roles and responsibilities - Sources of wastes and their classification. Nature and characteristics of agricultural waste - Nature of agricultural waste - Introduction- Major environment-related drivers for agriculture-Greenhouse gas emissions to the air- Climate change. Kinds of wastes-Problems of waste: List of wastes- Non-Hazardous-Hazardous- Agricultural waste fibres Agricultural Waste-Classification: Animal-tissue waste-Plant-tissue wasteAnimal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site- Wastes from forestry-Agrochemical waste containing hazardous substances. Role of soil and plants in waste management. Sources of waste (Cropped	3	PO2, PO5, PSO1

	fields): Field residues- Process residues. sources of waste in allied sectors of agriculture.		
CO2	This CO informs the students regarding Sources of waste in agro based industries: Rapeseed cake (RS), orange peel (OP), wheat bran (WB), spirulina powder (S)- Sugarcane: Molasses, Peels. Sources of waste - Urban waste etc. and their management. Impact of agricultural waste on soil quality -Mechanism of interaction of waste with soil- Soil degradation- On-farm management of crop residues- Effect of compost, FYM, green manures on soil quality. Impact of agricultural waste on plant quality. Biological processes of agricultural waste management. Utilization of Agricultural waste (Paddy, wheat, sugar cane, cotton and production- Utilization of sewage- Mulches. AGRO Recycling of Agricultural waste: Introduction- Significance of Recycling application- Re feeding - Anaerobic digestion.	3	PO2, PO5, PSO1
CO3	This CO about Potential of recyclable crop residues and their management: Availability of crop residues-Waste generated from different crops- Crop residues management strategies in different countries- Managing crop residues with conservation agriculture. In-situ management of agriculture waste: Introduction- Waste management functions- Six basic functions: production, collection, storage, treatment, transfer, utilization- Waste management systems. Composting (Types of composting and their suitability for different situations). Vermicomposting for bio- conservation of biodegradable waste. Biogas Technology. Agricultural waste (influence on water resources)-Eutrophication. Agricultural waste (influence on air resources) – Nitrous Oxide emissions and ammonia emissions from soil in relation to climate change effects. Agricultural waste (influence on animal resources): Poultry waste-Goat and sheep waste- Penning- FYM.	3	PO2, PO5, PSO2
CO4	This CO about Impacts of waste on human, animal health and environment: Impacts of solid waste on health- -Effect of heavy metal on health of humans and animals. Effect of hazards wastes on environment- Surface water contaminationGroundwater contamination- Air contamination- Soil contamination. Management of bedding & litter in livestock management: Definitions - Litter amendments- Acidifiers- Other amendments-Disposal and reuse. Wasted feed (types of feed from different by-products of agriculture): - Nutrient concentrations in different by - products- Left over feed and their utilization. Run-off from feed lots and holding areas and waste water from dairy parlours: Water use on dairy farms- Open lot run off quality-Primary and secondary stage lagoons- Settling basin and primary lagoon. Argo-waste recycling through farming system. Waste management machineries: Introduction and scope- Selecting waste handling equipment- Waste production equipment-Waste treatment equipment- Waste transfer equipment- Waste utilization equipment. Environmental benefit of waste management.	4	PO2, PO5, PSO1
CO5	Collection and preparation of agricultural waste sample. Determination of pH, EC, CEC.Determination of heavy metals. Determination of BOD, COD, TSS.Determination of TDS, NH4. Determination of total P and dissolved reactive. Analysis of nutrient status of N of agricultural waste. Analysis of nutrient status of P and K of agricultural waste. Analysis of nutrient status of secondary	4	PO2, PO5, PO3, PSO2

	nutrients of agricultural waste. Analysis of nutrient status of micronutrients of agricultural waste. Waste management equipment operation. Maintenance and safety hazards, computer software and models. Survey of different Agri-wastes from livestock, dairy and poultry. Survey of different Agri-wastes from food processing, fruit and vegetable and agrichemicals. Preparation of compost, vermi composting and biogas. Analysis of compost.		
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Syllabus

Module 1	Introduction to agricultural waste management: Definitions of agricultural waste, residues and agricultural waste management- Roles and responsibilities - Sources of wastes and their classification. Nature and characteristics of agricultural waste - Nature of agricultural waste - Introduction- Major environment-related drivers for agriculture-Greenhouse gas emissions to the air- Climate change. Kinds of wastes-Problems of waste: List of wastes- Non-Hazardous-Hazardous- Agricultural waste fibres Agricultural Waste-Classification: Animal-tissue waste-Plant-tissue wasteAnimal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site- Wastes from forestry- Agrochemical waste containing hazardous substances. Role of soil and plants in waste management. Sources of waste (Cropped fields): Field residues- Process residues. sources of waste in allied sectors of agriculture.
Module 2	regarding Sources of waste in agro based industries: Rapeseed cake (RS), orange peel (OP), wheat bran (WB), spirulina powder (S)- Sugarcane: Molasses, Peels. Sources of waste - Urban waste etc. and their management. Impact of agricultural waste on soil quality -Mechanism of interaction of waste with soil- Soil degradation- On-farm management of crop residues- Effect of compost, FYM, green manures on soil quality. Impact of agricultural waste on plant quality. Biological processes of agricultural waste management. Utilization of Agricultural waste (Paddy, wheat, sugar cane, cotton and production- Utilization of sewage- Mulches. AGRO Recycling of Agricultural waste: Introduction- Significance of Recycling application- Re feeding - Anaerobic digestion.
Module 3	Potential of recyclable crop residues and their management: Availability of crop residues-Waste generated from different crops- Crop residues management strategies in different countries- Managing crop residues with conservation agriculture. In-situ management of agriculture waste: Introduction- Waste management functions- Six basic functions: production, collection, storage, treatment, transfer, utilization- Waste management systems. Composting (Types of composting and their suitability for different situations). Vermicomposting for bio- conservation of biodegradable waste. Biogas Technology. Agricultural waste (influence on water resources)-Eutrophication. Agricultural waste (influence on air resources) – Nitrous Oxide emissions and ammonia emissions from soil in relation to climate change effects. Agricultural waste (influence on animal resources): Poultry waste- Goat and sheep waste- Penning- FYM.
Module 4	Impacts of waste on human, animal health and environment: Impacts of solid waste on health- -Effect of heavy metal on health of humans and animals. Effect of hazards wastes on environment- Surface water contaminationGroundwater contamination- Air contamination- Soil contamination. Management of bedding & litter in livestock management: Definitions - Litter amendments- Acidifiers- Other amendments- Disposal and reuse. Wasted feed (types of feed from different by- products of agriculture): - Nutrient concentrations in different by - products- Left over feed and their utilization. Run-off from feed lots and holding areas and waste water from dairy parlours: Water use on dairy farms- Open lot run off quality-Primary and secondary stage lagoons-Settling basin and primary lagoon. Argo-waste recycling through farming system. Waste management machineries: Introduction and scope- Selecting waste handling equipment-Waste production equipment-Waste treatment equipment- Waste transfer equipment-Waste utilization equipment. Environmental benefit of waste management.

Module 4	Collection and preparation of agricultural waste sample. Determination of pH, EC, CEC. Determination of heavy metals. Determination of BOD, COD, TSS. Determination of TDS, NH ₄ . Determination of total P and dissolved reactive. Analysis of nutrient status of N of agricultural waste. Analysis of nutrient status of P and K of agricultural waste. Analysis of nutrient status of secondary nutrients of agricultural waste. Analysis of nutrient status of micronutrients of agricultural waste. Waste management equipment operation. Maintenance and safety hazards, computer software and models. Survey of different Agri-wastes from livestock, dairy and poultry. Survey of different Agri-wastes from food processing, fruit and vegetable and agrichemicals. Preparation of compost, vermi composting and biogas. Analysis of compost.
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Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Recycling of crop, animal, human and industrial wastes	Tandon, H.L.S.	Fertilizer Development and Consultation organisation, New Delhi	2009
2	Soil health management	Tandon, H.L.S.	Fertilizer Development and Consultation organisation, New Delhi	2009
3	Agricultural waste management: problems, processes and approaches.	Raymond C Loehr	New Delhi	1974
4				
5				

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.336	
	Atten (AG)	3.3334	
			16.667
			26.6664
In-Sem Summative	Mid semester Exam	16.667	
End-Sem Summative	End Semester Exam	39.9996	
			56.6666

BIOPESTICIDES AND BIOFERTILIZERS (BPBF)

COURSE CODE	23ENTO333	MODE	Off line	LTPS	2-0-2-0	PRE-REQUISITE	Fundamentals of
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							Entomology II
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Study of history and concepts of biopesticides	3	PO1,PO3, PO11 &PSO2
CO2	Study of biorationals – insecticides from living organisms	4	PO1,PO3, PO11 &PSO3
CO3	study of status and scope of biofertilizers	4	PO1,PO3, PO11 &PSO3
CO4	study of Cynobacterial biofertilizers	3	PO1,PO3, PO11 &PSO3
CO5	Acquaintance with mass production of bio agents	4	PO1,PO3, PO11 &PSO3

Syllabus

Module 1	History and concept of biopesticides. Importance, scope and potential of biopesticides Definitions and classification of biopesticides Biopesticides – Pathogens - Entomopathogenic bacteria- Classification - Spore forming – Crystalliferous and Non crystalliferous; Non spore forming, Mode of entry, Mode of action, Virulence, Pathogenicity and Symptoms - advantages and limitations. Biopesticides – Pathogens – Entomopathogenic viruses- Classification – Polyhedral Inclusion Bodies (Nucleo and Cytoplasmic); Granulovirus and Non inclusion virus - Mode of entry, Mode of action, Virulence, Pathogenicity and Symptoms, advantages and limitations. Biopesticides – Pathogens - Entomopathogenic fungi- Classification (fungi belonging to phyla, Zygomycota, Ascomycota and Deuteromycota), Mode of entry, Mode of action, Virulence, Pathogenicity and Symptoms, advantages and limitations. Biopesticides – (Protozoa and EPN) Entomopathogenic Protozoa, Entomopathogenic Nematodes (Steinernematidae, Heterorhabditidae), Mode of entry, Mode of action, Virulence, Pathogenicity and Symptoms advantages and limitations. Biopesticides – Botanical pesticides – Plants having insecticidal properties viz., Chrysanthemum, Neem, Pongamia, Custard apple, Derris, Tobacco and sweet flag. Their active ingredients, mode of action, advantages and disadvantages
Module 2	Biorationals – Insecticides from animals and other living organisms that have insecticidal properties and also safe to non-target organisms – Pheromones, Chitin synthesis inhibitors, Juvenile hormones and Male sterile technique. Mass production technology of bio-pesticides- Entomopathogenic bacteria – Bacillus thuringiensis. Mass production technology of bio-pesticides- Entomopathogenic virus – NPV. Mass production technology of bio-pesticides- Entomopathogenic fungi - Beauveria bassiana, Metarrhizium anisopliae and Nomuraea rileyi. Mass production technology of bio-pesticides- Entomopathogenic protozoa and EPN (Steinernema carpocapsae and Heterorhabditis bacteriophora). Formulations- Wettable powders and Liquids - Methods of application of biopesticides - Foliar and Dust application. Methods of quality control and techniques of bio pesticide evaluation (Quantification of virus load in case of NPV (PIBs), Haemocytometer ; CFU count for Entomopathogenic fungi etc., Impediments or limitations in mass production and use of biopesticides.

Module 3	Introduction, status and scope of bio fertilizers. Structure and characteristic features of bacterial biofertilizers. Rhizobium-prerequisites for infection, nodulation process and biochemistry of nitrogen fixation Cross inoculation groups of Rhizobium. Azotobacter-Characteristics, their significance and utilization in agriculture. Azospirillum-Occurance, Characteristics, its significance and utilization in agriculture Mechanism of phosphate solubilization: PSB Bacillus & Pseudomonas - Their significance and utilization in agriculture K solubilization-Microorganisms involved and their utilization. Actinorrhizal Symbiotic N ₂ fixer-Frankia
Module 4	Cynobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon . Fungal biofertilizers-AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers. FCO specifications and quality control of biofertilizers. Application technology of bio fertilizers for seeds, seedlings, tubers, sets etc . Biofertilizers- Storage, shelf life, quality control (Plant infection test) and marketing of biofertilizers. Factors influencing the efficacy of biofertilizers
Module 5	Study on preparation or mass production technology of important biopesticides – bacteria <i>Bacillus thuringiensis</i> . Study on preparation or mass production technology of important biopesticides – Entomopathogenic virus - SI NPV and Ha NPV. Study of mass production technology of important biopesticides – Entomopathogenic fungi - <i>Beauveria bassiana</i> , <i>Metarhizium anisopliae</i> , <i>Nomuraea rileyi</i> . Study of mass production technology of important biopesticides – EPN (<i>Steinernema carpocapsae</i>); Isolation and identification of soil borne EPNs (<i>Galleria</i> larval bait/trap technique). Identification and preparation of important botanical insecticides (NSKE; Tobacco decoction, Pongamia and Annona leaf extracts). Visit to nearby biopesticide laboratory. 7 Field visit to explore naturally infected cadavers of Bt, Virus, Fungus. Identification of potential entomopathogenic entities in the field - from soil and plants & Studies on quality control of biopesticides. Isolation of Rhizobium from soil and root nodules. Isolation and purification of Azospirillum and Azotobacter from rhizosphere soil. Isolation and purification of P and K solubilizers from rhizosphere soil. Mass production technology of BGA (Blue Green Algae). Production Technology of Azolla. Isolation of and purification of VAM (Vascular Arbuscular Mycorrhiza) fungi from rhizosphere soil by wet sieving and decantation and sucrose gradient method. Mass multiplication and inoculums production of biofertilizers. Quality assessment of different biofertilizers (both carrier and liquid based) including plant infection test

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Botanical and Bio pesticides.	BS Parmar and C. Deva Kumar	West Will Publishing House, New Delhi pp 199	1993
2	Applied Entomology. Vol I & II ,	Srivastava, K. P. and Dhaliwal, G.S	Kalyani Publishers, New Delhi	2015
3	Biofertilizers Technology	Kannaiyan, S., K. Kumar and K. Govindarajan (eds.)	Scientific Pub., Jodhpur	2004
4	Biofertilizer Technology, Marketing and Usage-	Motsora, M.R., P.Bhattacharya and Beena Srivastava	A Source Bookcum-Glossary (FDCO, New Delhi).	1995

5	Biofertilizers in Agriculture and Forestry	Subbarao, N.S.	Oxford and IBH Pub. Co., New Delhi	1993
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Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

MICRO-PROPAGATION TECHNOLOGIES (MPT)

COURSE CODE	23ELCT36 2	MOD E	Offline	LTPS	1-0-4-0	PRE-REQUISITE	21CPHY1 62
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Understanding the principles and techniques involved in micro-propagation, such as tissue culture, aseptic techniques, and in vitro plant regeneration.	3	PO1, PSO2+PSO1
CO2	Acquiring practical skills in the preparation and sterilization of culture media, explant selection and preparation, and establishment of aseptic cultures.	4	PO7, PO5+PSO3
CO3	Developing proficiency in the manipulation of plant growth regulators to control plant development and achieve desired outcomes in micro-propagation.	3	PO9, PO8+PSO3
CO4	Gaining knowledge of the factors influencing the success of micro-propagation, including environmental conditions, nutrient requirements, and disease management.	3	PO2, PO4+PSO3
CO5	Demonstrating the ability to apply micro-propagation techniques to propagate and mass-produce plants, including understanding the stages involved, monitoring plant growth, and transferring plantlets to ex vitro conditions.	4	PO6, PO3+PS4

Syllabus

Module 1	Meaning and concept of in vitro culture and micro-propagation; Historical mile stones, advancement and future prospects of micro propagation; totipotency, dedifferentiation;
Module 2	Tissue culture methodology: Sterile techniques, synthetic and natural media components, growth regulators, environmental requirement, genetic control of regeneration; Plant regeneration pathways-Organo genesis and Somatic embryogenesis.

Module 3	Micro-propagation – Definition, methods, stages of micro-propagation and its significance; Axillary bud proliferation approach – Shoot tip and meristem culture; Organogenesis-Purpose, methods and requirements for organogenesis, indirect and direct organogenesis; Somatic embryo genesis
Module 4	Procedures and requirements for organogenesis, indirect and direct embryogenesis; Differences between somatic and gametic embryogenesis, Synthetic seed- Concepts, necessity, procedure and requirements for production of synthetic seeds.
Module 5	Laboratory organization, Sterilization techniques for explants, glassware, plasticwares, labwares and working platform. Preparation of stocks and working solution. Preparation and sterilization of growth regulators. Preparation of working medium and Experimentation on determining optimum concentration of growth regulators. Callus induction and regeneration of whole plants from different parts of plants. Direct regeneration into whole plants using bud, node and other tissues. Induction of somatic embryos. Experiments of synthetic seeds production and testing storability and germination efficiency

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Plant Tissue Culture: Techniques and Experiments	by Roberta H. Smith and Robert L. Smith	Academic Press.	2012
2	Plant Propagation by Tissue Culture: Volume 1. The Background" by, published by (Publication date:)	Edwin F. George and Michael A. Hall	Springer.	2008
3	Micropropagation of Orchids	Joseph Arditti	Wiley-Blackwell	2008
4	Micropropagation: Technology and Application"	Prasad and Kumar.	S. Mohan Jain and Pramod K. Gupta	2010.
5	Plant Propagation by Tissue Culture: Volume	Edwin F. George and Michael A. Hall,	Springer.	2008

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten (AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

WEED MANAGEMENT (WM)

COURSE CODE	23ELCT306	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23 AGRO 102
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To study and illustrate and familiarize the students about the weeds, herbicides and methods of weed control	3	PO6,PO8 &PS1
CO2	To Apply and learn different herbicide formulation about the weeds, herbicides and methods of weed control	3	PO4 &PS2
CO3	To Explain about the Herbicide compatibility with nutrients and their application	3	PO4&PS2
CO4	To Explain and analyze Bio-herbicides and their application in agriculture concept of herbicide mixture and utility in agriculture	3	PO4&PS2
CO5	To Demonstrate and Identification and proper crop management in weed control practices with practical knowledge.	4	PO4&PS2

Syllabus

Module 1	Weed -Definition- Dimensions of the problem- weeds on different ecosystems, Classification of weeds based on morphology- Life cycle-soil reaction and special features with examples Reproduction in weeds-Sexual-Asexual-Vegetative propagation. Crop-weed interference-Crop-weed association-Crop-weed competition- Principles-Factors affecting crop-weed competition
Module 2	Biological weed control-Types of bioagents-Selection criteria-Outstanding examples Bioherbicides - Concept-Relative merits and limitations-Commercially available bioherbicides. Herbicide-Definition-Advantages and limitations of herbicide usage in India- Nomenclature of herbicides-Herbicide label information-presently available herbicides in the market
Module 3	Mode of action of herbicides-Important biochemical modes of action of herbicides interfering with photosynthetic reactions, normal respiration-Growth and development. Mode of action of herbicides-Important biochemical mode of action of herbicides- Protein and nucleic acid synthesis inhibitors-Lipid synthesis inhibitors-Branched chain amino acid synthesis inhibitors-Aromatic compound biosynthesis inhibitors and other modes of action of herbicides
Module 4	Herbicide selectivity-Fundamental principles of selectivity- Differential rate of absorption -Differential rate of translocation. Weed management in wheat, maize, jowar, bajra and other minor millets- Yield loss-Weed flora and time of occurrence-Nonchemical and chemical methods
Module 5	Weed identification. Herbicide label information for different herbicides and mixtures Participation in different methods of herbicide application and precautionary measures. Weed management in pulses; redgram, bengalgram- Yield loss-Weed flora and time of occurrence-Nonchemical and chemical methods

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Modern Weed Management (4th edition),	Gupta, O.P	Agrobios (India) Ltd, Jodhpur	2012

2	Principles of Weed Science (2nd edition),	Rao, V.S	Kalyani Publishers, Ludhiana.	1992
3	Applied Weed Science. (2nd edition)	Ross, M.A and Lembi, C.A.	Kalyani Publishers, Ludhiana.	1999
4	Weed management-ICAR	Saraswat, V.N., Bhan, V.M. and Yaduraju, N.T. (eds.)	PHI learning Pvt Ltd, Delhi-92	1998

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	16.667	
			25
In-Sem Summative	Mid semester exam	26.6664	
			20
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			55

COMMERCIAL PLANT BREEDING <<CPB>

COURSE CODE	23 ELCT 315	MODE	Offline	LTPS	1-0-4-0	PRE-REQUISITE	
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
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CO1	Modes of reproduction, modes of pollination in crop plants for development of parental lines and testing of genetic purity in parents and hybrids	3	PO1, PO4, PSO1
CO2	Hybrid seed production of rice, maize, sorghum, pearl millet, castor	3	PO4, PO2, PSO2
CO3	Hybrid seed production in sunflower, cotton and pigeon pea, quality seed production of vegetables under open and protected environment	3	PO1, PO4, PSO2
CO4	Alternative strategies for line development, IPR, testing and registration of crop varieties, seed production techniques, types of seed and quality testing	3	PO2, PO4, PSO2
CO5	Floral biology, crossing and selfing techniques, hybrid seed production techniques in sorghum, pearl millet, maize, rice, rape seed- mustard, sunflower, castor, pigeonpea, cotton and vegetable crops, seed drying, storage and seed processing, visiting public and private seed production firms	4	PO8, PO11, PO1, PO2, PO4, PSO1, PSO2

Syllabus

Module 1	Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production. Genetic purity test of commercial hybrids. Advances in hybrid seed production of rice
Module 2	Advances in hybrid seed production of maize. Advances in hybrid seed production of sorghum. Advances in hybrid seed production of pearl millet. Advances in hybrid seed production of castor.
Module 3	Advances in hybrid seed production of sunflower. Advances in hybrid seed production of cotton. Advances in hybrid seed production of pigeon pea. Quality seed production of vegetable crops under open and protected environment.
Module 4	Alternative strategies for the development of the line and cultivars; haploid inducer, tissue culture techniques and biotechnological tools. IPR issues in commercial plant breeding; DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.
Module 5	Study of floral biology, crossing and selfing techniques, hybrid seed production techniques in sorghum, pearl millet, maize, rice, rape seed- mustard, sunflower, castor, pigeonpea, cotton and vegetable crops, seed drying, storage and seed processing, visiting public and private seed production firms

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Seed Technology.	Agarwal, R.L.	Oxford and IBH Publication Co., New Delhi.	2015
2	Seed Technology			2014

		Khare, Dhirendra and Bhala, M.S.	Scientific Publishers. Jodhpur.	
3	Essentials of Plant Breeding.	Phundan Singh	Kalyani Publishers, New Delhi.	2014
4	Plant Breeding: Principles and Methods.	Singh, B.D.	Kalyani Publishers, New Delhi..	2015
5	Principles and Practice of Plant Breeding	Sharma, J.R.	TataMcGraw Hill, Publishing Company Ltd., New Delhi.	1994

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

AGROCHEMICALS

COURSE CODE	23ENTO334	MODE	Off line	LTPS	2-0-2-0	PRE- REQUISITE	Fundamentals of Entomology II
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Study of introduction and role of Agrochemicals	3	PO1,PO3, PO11 &PSO2
CO2	Study of fungicides	4	PO1,PO3, PO11 &PSO3

CO3	study of status and scope of biofertilizers	4	PO1,PO3, PO11 &PSO3
CO4	study of novel insecticides	3	PO1,PO3, PO11 &PSO3
CO5	Application of various Agrochemicals (Insecticides/fungicides/herbicides) formulations and techniques	4	PO1,PO3, PO11 &PSO3

Syllabus

Module 1	<p>Agro An introduction to agrochemicals, their type and role in agriculture .Agro Effect of agro chemicals on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture</p> <p>Agro Herbicides – Definitions – Advantages and limitations of herbicide usage in India and Andhra Pradesh – Classification of herbicides based on chemical nature, time and method of application. Agro Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Pl Path Fungicides– Classification – Based on movement in plant, based on application methodology, based on mode of action, based on chemical nature, based on utility (against lower fungi, powdery mildews, rusts, smuts, coloured fungi etc. Pl Path Inorganic fungicides- Characteristics, preparation and use of sulphur and copper fungicides, Mode of action-Bordeaux mixture, copper oxychlorid and sulphur fungicides. Pl Path Organic sulphur fungicides- Mode of action-Dithio carbamates characteristics, preparation and use of Zineb and Maneb</p>
Module 2	<p>Pl Path Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, Triazoles, Strobilurins characteristics and use. Ento Introduction and classification of insecticides: inorganic and organic insecticides Inorganic insecticides - Arsenic Compounds - Fluorine and sulphur; Botanicals, Plant derived insecticides - Neem based products - different commercial formulations containing azadirachtin, neem seed kernel extract, neem cake and their uses – Nicotine, rotenone, plumbagin and pyrethrum – Source – Properties and uses., Ento Organochlorines- Synthetic organic insecticides – Chlorinated hydrocarbons – Dichloro Diphenyl Trichloroethane (DDT) and Hexacholoro Cyclo Hexane (HCH). Cyclodiens - Aldrin, dieldrin, heptachlor and endosulfan - Toxicity and mode of action. Ento Organo phosphates - Systemic, non-systemic and translaminar action of insecticides with examples – Brief mode of action – Toxicity, formulations and uses of malathion, methyl parathion, diazinon, dichlorvos, fenitrothion, quinalphos, phosalone, chlorpyrifos, phosphomidon, monocrotophos, methyl demeton, dimethoate, triazophos, profenophos, acephate and phorate. Ento Carbamates - Mode of action – Toxicity, formulations and uses of carbaryl, propoxur, carbofuran, aldicarb and methomyl - Ento Synthetic pyrethroids - Brief mode of action – Toxicity, formulations and uses of allethrin, resmethrin, bioresmethrin, bioallethrin, fenvalerate, permethrin, deltamethrin, cypermethrin, lambda cyhalothrin, cyfluthrin, fenpropathrin, flucythrinate, fluvalinate and fenfluthrin. Ento -Insecticides of other groups - Nicotinoid insecticides - Brief mode of action – Toxicity, formulations and uses of imidacloprid, acetamiprid, thiamethoxam and clothianidin. Ento Biorationals - Brief mode of action, toxicity, formulations and use - Phenyl pyrazoles, fipronil - Macro cyclic lactones –Spinosyns - Sainosad; Avermectins –Abamectin and emamectin benzoate; Oxadaizines – indoxacarb; Thioureas - Diafenthiuron; Pyridine azomethines - Pymetrozine; Pyrroles - Chlorfenapyr. Formamidines – Chlordimeform and Amitraz; Ketoenols - Spirotetramat, Spiromesifen and Spirodiclofen. Diamides - Chlorantraniliprole, Cyantraniliprole and Flubendiamide</p>

Module 3	Ento IGRs- Brief mode of action - Toxicity, formulations and use- Chitin synthesis inhibitors - Diflubenzuron, Flufenoxuron, Chlorfluazuron, Triflumuron, Teflubenzuron, Lufenuron, Novaluron, and Buprofezin; Juvenile hormone (JH) mimics – Juvabione, Methoprene , Hydroprene, Kinoprene, Pyriproxyfen and Fenoxycarb- Anti JH or precocenes, Ecdysone agonists - Methoxyfenozide , Halofenozide and Tebufenozide. Ento Biopesticides and reduced risk insecticides- Plant bio-pesticides for ecological agriculture, Botanicals, Bio-insect repellent, Ento Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil and plant - Botanicals, plant and animal systemic insecticides their characteristics and uses. Ento Recent advances in pest control- Repellents (physical and chemical) and antifeedants - Importance of antifeedants and limitations of their use – attractants - Sex pheromones - List of synthetic sex pheromones - Use in IPM - Insect hormones – Gamma irradiation – Genetic control – Sterile male technique. SSAC Fertilizers and their importance - Classification with examples Nitrogenous fertilizers- Feed stocks-Manufacturing process and properties of Ammonium sulphate, ammonium nitrate. SSAC Manufacturing process and properties of ammonium chloride and urea Slow release nitrogenous fertilizers. SSAC Phosphatic fertilizers-Uses-Types and properties - Manufacturing process and properties of SSP, TSP, bone meal and basic slag. SSAC Potassic Fertilizers-Natural Sources- Manufacturing process and properties of Muriate of Potash, Sulphate of Potash and Potassium Nitrate - Mode of action of N, P and K in soils or reactions of fertilizers in soils
Module 4	Cynobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon . Fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers. FCO specifications and quality control of biofertilizers. Application technology of bio fertilizers for seeds, seedlings, tubers, sets etc . Biofertilizers- Storage, shelf life, quality control (Plant infection test) and marketing of biofertilizers. Factors influencing the efficacy of biofertilizers
Module 5	Agro Sampling of fertilizers and pesticides (Insecticides/fungicides/ herbicides). Agro Study and identify various fertilizers & formulations of herbicides available in market and calculation of doses of fertilizers and herbicides. Ento Study and identify various formulations of insecticides available in market. Ento Calculation of doses of insecticides. Ento Pesticides application technology to study about various pesticides appliances. Pl Path Study and identify various formulations of fungicides available in market. Pl Path Calculation of concentrations and doses of fungicides. SSAC Sampling of fertilizers and pesticides for chemical analysis. SSAC Quick tests for identification of common fertilizers. SSAC Identification of anions and cations in unknown fertilizer. SSAC Estimation of nitrogen in Urea. SSAC Estimation of water soluble P ₂ O ₅ and citrate soluble P ₂ O ₅ in Single Super Phosphate by Pemberton's method. SSAC Estimation of potassium in MOP/SOP by flame photometer method. SSAC Determination of copper content in Copper Oxochloride. SSAC Determination of sulphur content in Sulphur fungicide (elemental sulphur). SSAC Determination of purity of Thiram and Ziram Market Survey of Agrochemicals.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Elements of Economic Entomology.	Vasantharaj David, B and Ramamurthy V V.	Np Namuratha Publications, Chennai	2016.
2	General and Applied Entomology.	Vasantharaj David, B and	Tata McGraw-Hill Publishing	2006.

		Aanathakrishnan, T.N..	House, New Delhi.	
3	A text book of Insect toxicology.	Srivastava R P and Saxena R C	Himanshu Publications, Udaipur	1989
4	Methods of Pesticide analysis. Oxford IBH, New Delhi	S Sriramulu.	A Source Bookcum- Glossary (FDCO, New Delhi).	1979
5	Nene YL and Thapliyal PN. Fungicides in Plant Disease Control.	Subbarao, N.S.	Oxford and IBH Pub. Co., New Delhi	1993

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Continuous Evaluation - Lab Exercise	13.3336	
	Atten(AG)	3.3334	
			16.667
In-Sem Summative	Mid Semester Exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

Fundamentals of Information Technology (FIT)

COURSE CODE	23FIT2101	MODE	Offline	LTPS	2-0-0-0	PRE- REQUISITE	Nil
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CO No	Course Outcomes	PO	BTL
CO1	Understand the architectural design of a computer and various basic concepts of operating systems	PO1	2
CO2	Understand programming fundamentals Analyse various software development methodologies	PO3,PO4	2
CO3	Understanding of database design and Apply various SQL commands and Transaction Processing.	PO3,PO5	2
CO4	Apply OOP and model for different case studies using UML	PSO1	3

Syllabus

Module 1	Fundamentals of Computers: Introduction, Architecture, organization of a small computer, center Processing Unit, Execution cycle, Instruction categories, measures of CPU performance, Memory, Input/output devices, BUS-addressing modes.
Module 2	System Software: Assemblers, Loaders and linkers, compilers and interpreters. Operating System: introduction, memory management schemes, Process management, scheduling, threads. Programming Fundamentals: Problem solving with algorithms, Programming styles, coding Standards and Best practices, Introduction to C Programming, Testing and Debugging.

Module 3	Code reviews. System Development Methodologies: Software development Models. User Interface Design: introduction, the process, Elements of UI design & reports. RDBMS: Introduction, Data processing, the database technology, Data models ER Modeling: Concept, Notations, Extended ER features, Logical database design Normalization: Functional Dependency, Normal Forms.
Module 4	SQL: DDL statements, DML statements, DCL statements, writing Simple queries. SQL tuning techniques: Embedded SQL, OLTP. Object oriented concepts: Object oriented programming, relationship, Inheritance, Abstract classes, polymorphism, UML Diagrams, Object Oriented Design Methodology. Rational Rose Tool: Application of OOC using Rational Rose Tool.

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

Protected Cultivation (ELCT 383)

COURSE CODE	ELCT 383	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	ELCT 383

Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To study about scope and importance of protected cultivation, world type protected structure, Green houses – Definition- History - Greenhouse effect, Types of green houses. Greenhouse design, Cladding material involved in greenhouse, Environment control- Supplemental lighting, Ventilation and cooling in a green house	3	PO1, PO2,
CO2	To study about Soil preparation and management, types of benches and containers, Irrigation management, Automation – Parameters to be controlled. Propagation and production of quality planting material, Greenhouse cultivation of important horticultural crops, Fertilizer requirement – Fertigation – Training and pruning, Cultivation practices for Carnation, training and pruning, grading, packing	3	PO2, PO4, PO3
CO3	To study about cultivation practices, varieties, propagation, training, pruning, special intercultural operation, use of growth regulators, harvesting, grading, packing, yield of major flower crops Chrysanthemum, Gerbera, Orchids Anthurium, Liliun, Tulip. Soil preparation, Planting, Spacing, planting density	3	PO3, PO4

	harvesting, grading, packing, yield of major vegetable crops Tomato.		
CO4	To study about cultivation practices, varieties, propagation, training, pruning, special intercultural operation, use of growth regulators, fertilizer application, Soil preparation, Planting, Spacing, planting density harvesting, grading, packing, yield of major vegetable crops Bell pepper, cucumber and fruit crops such as straw berries. To study about Pot plants, Selection of plants, Climatic requirement – Potting and Repotting. Cultivation of economically important medicinal – Stevia, Ginseng and aromatic plants. Off-season production of flowers and vegetables, Flower and vegetables forcing Techniques. Insects of greenhouse crops, Disease management in green houses.	3	PO4, PO2
CO5	Analysing types of green-houses based on shape, construction, cladding material, materials for construction of greenhouses, construction of pipe framed green house, Measurement of environmental parameters inside greenhouse, Calculation of ventilation rates in active summer cooling system, Calculation of rate of air exchange in active winter cooling system, Raising of seedlings and saplings under protected conditions, Use of protrays in quality planting material production, Bed preparation and planting of crop for production, Intercultural operations, Soil EC and pH measurement, Regulation of irrigation, Fertilizers through drip, fogging ad misting.	4	PO8, PO2, PO10

Syllabus

Module 1	Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights
Module 2	Automation, Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops Carnation
Module 3	Greenhouse cultivation of important horticultural crops Carnation, rose, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato,
Module 4	Green house cultivation of important crops bell pepper, cucumber, strawberry, pot plants, etc. Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.
Module 5	Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Greenhouse Technology and Applications.	Vilas M. Salone and Ajay K. Sharma.	Agrotech Publishers. New Delhi	2012

2	<i>Greenhouse Management of Horticultural Crops.</i>	S. Prasad and U. Kumar	Second edition, Agrobios.	2012
3	Vegetables Growing in India.	K. Radha Manohar and C. Igathinathane	<i>Greenhouse Technology and Management</i> BS Publications	2013.
4	<i>Green House Operation and Management.</i>	Paul V. Nelson.	Ball publishing USA.	1991

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	56.6666

Protected Cultivation (ELCT 383)

COURSE CODE	ELCT 383	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	ELCT 383
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	To study about scope and importance of protected cultivation, world type protected structure, Green houses – Definition- History - Greenhouse effect, Types of green houses. Greenhouse design, Cladding material involved in greenhouse, Environment control- Supplemental lighting, Ventilation and cooling in a green house	3	PO1, PO2 & PSO1
CO2	To study about Soil preparation and management, types of benches and containers, Irrigation management, Automation – Parameters to be controlled. Propagation and production of quality planting material, Greenhouse cultivation of important horticultural crops, Fertilizer requirement – Fertigation – Training and pruning, Cultivation practices for Carnation, training and pruning, grading, packing	3	PO2, PO4, PO3&PSO2
CO3	To study about cultivation practices, varieties, propagation, training, pruning, special intercultural operation, use of growth regulators, harvesting, grading, packing, yield of major flower	3	PO3, PO4 & PSO1

	crops Chrysanthemum, Gerbera, Orchids Anthurium, Liliium, Tulip. Soil preparation, Planting, Spacing, planting density harvesting, grading, packing, yield of major vegetable crops Tomato.		
CO4	To study about cultivation practices, varieties, propagation, training, pruning, special intercultural operation, use of growth regulators, fertilizer application, Soil preparation, Planting, Spacing, planting density harvesting, grading, packing, yield of major vegetable crops Bell pepper, cucumber and fruit crops such as straw berries. To study about Pot plants, Selection of plants, Climatic requirement – Potting and Repotting. Cultivation of economically important medicinal – Stevia, Ginseng and aromatic plants. Off-season production of flowers and vegetables, Flower and vegetables forcing Techniques. Insects of greenhouse crops, Disease management in green houses.	3	PO4, PO2&PSO2
CO5	Analysing types of green-houses based on shape, construction, cladding material, materials for construction of greenhouses, construction of pipe framed green house, Measurement of environmental parameters inside greenhouse, Calculation of ventilation rates in active summer cooling system, Calculation of rate of air exchange in active winter cooling system, Raising of seedlings and saplings under protected conditions, Use of protrays in quality planting material production, Bed preparation and planting of crop for production, Intercultural operations, Soil EC and pH measurement, Regulation of irrigation, Fertilizers through drip, fogging ad misting.	4	PO8, PO2, PO10 &PSO4

Syllabus

Module 1	Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights
Module 2	Automation, Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops Carnation
Module 3	Greenhouse cultivation of important horticultural crops Carnation, rose, chrysanthemum, gerbera, orchid, anthurium, liliium, tulip, tomato,
Module 4	Green house cultivation of important crops bell pepper, cucumber, strawberry, pot plants, etc. Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.
Module 5	Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
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1	Greenhouse Technology and Applications.	Vilas M. Salone and Ajay K. Sharma.	Agrotech Publishers. New Delhi	2012
2	<i>Greenhouse Management of Horticultural Crops.</i>	S. Prasad and U. Kumar	Second edition, Agrobios.	2012
3	Vegetables Growing in India.	K. Radha Manohar and C. Igathinathane	<i>Greenhouse Technology and Management</i> BS Publications	2013.
4	<i>Green House Operation and Management.</i>	Paul V. Nelson.	Ball publishing USA.	1991

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	56.6666

Hitech Horticulture <(HiH)>

COURSE CODE	23ELCT283	MODE	OFFLINE	LTPS	2-0-2-0	PRE-REQUISITE	23HORT181
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Course Outcomes

CO#	CO Description	BTL	PO Mapping
CO1	Introduction, Scope and Importance of Hitech horticulture and its applications in nursery management, Propagation methods like micro propagation, protected cultivation etc.	3	PO1,PO3
CO2	A brief idea about Green House establishment, Updated irrigation methods like micro irrigation, Fertigation and modern canopy management.	3	PO3
CO3	High Density planting and its advantages and constraints, Application of remote sensing techniques like GIS, DGPS and VRA in Horticulture.	3	PO3
CO4	Knowledge on Precision farming in Horticulture crops, Mechanised harvesting techniques of Horticulture produce and Green food production etc.	3	PO3

CO5	A brief idea about Green houses, Shade nets and poly houses. Identification and application of modern horticulture techniques for irrigation, canopy management, land and climate assesment.	4	PO1,PO3
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Syllabus

Module 1	Introduction, Scope and Importance of Hitech horticulture and its applications in nursery management, advanced propagation methods like micro propagation, Tissue culture etc. Protected cultivation advantages and its limitations, Modern planting methods and latest mechanization aspects and its applications in Horticulture.
Module 2	Green House establishment, Updated irrigation methods like micro irrigation, Fertigation etc. Site specific nutrient management, Tools required for proper canopy canopy management.
Module 3	High Density planting and its advantages and constraints, Application of remote sensing techniques like GIS, DGPS and VRA in Horticulture. Yield monitoring, field mapping, precision crop input application (fertilizers, pesticides, weedicides etc.)
Module 4	Knowledge on Precision farming in Horticulture crops, Machanised harvesting techniques of Horticulture produce and Green food production etc.
Module 5	Types of Polyhouses and shade net houses, intercultural operations, tools and equipments identification and application, micro propagation, nursery-portrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

Reference Books:

Sl No	Title	Author(s)	Publisher	Year
1	Greenhouse Management of Horticultural Crops. 2nd edition,	Prasad, S. And Kumar, U	Agribios publishers, New Delhi	2012
2	Precision Farming in Horticulture	Singh, H.P., Singh, G., Samuel, J.C., and Pathak, R.K	NCPAH, MOA, PFDC, CISH, Lucknow	2003
3	Canopy Management of Fruit Crops	Srivasthava, K.K.	International book distributing co., Lucknow	2007
4	Text Book of Remote Sensing and Geographical Information Systems	Sahu, K.C.	Atlantic publishers & Distributors	2008
5	Glaustas Horticulture	Muthukumar and Selvakumar	New Vishal Publications	2012

Tools used in Practical / Skill:

Sl No	Tool Name	Parent Industry	Open Source/ Commercial
1	Shade net, Poly house, Glass House	Horticulture	Open source
2	All gardening and Propagation tools	Horticulture	Open source

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	ContinuousEvaluation – LabExercise	13.336	16.667
	Attendance	3.3334	
In-Sem Summative	Mid Semester Exam	26.6664	26.6664
End-Sem Summative	Lab End SemesterExam	16.667	56.6666
	End Semester Exam	39.9996	

Agribusiness Management (ABM)

COURSE CODE	23ELCT342	MODE	Offline	LTPS	2-0-2-0	PRE-REQUISITE	23ELCT342
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Course Outcomes

CO#	CO Description	BTL	PO & PSO Mapping
CO1	Learning and understanding the basics of various fundamental concepts in Agribusiness management. These basic concepts are needed for further proper understanding of the course and subject.	2	PO8 & PSO1
CO2	Understanding the concept of how to enter a market or industry. The requirements to build a factory/plant/company for goods production or service production. The marketing techniques that can be used will be understood.	2	PO9 & PSO2
CO3	Understanding the next steps after planning and setting up of a factory/plant/company. To decide on the product mix, the packaging decisions, selling strategy. Capital management, financial awareness for establishing a business with strong foundation will be understood.	3	PO10 & PSO4
CO4	Understanding various techniques of appraisal of the business in terms of finance, product, market share etc. Understanding the product and project cycle to know what kind of decisions to be made at what time.	2	PO11 & PSO1
CO5	Balance sheet analysis, profit & Loss analysis, break even analysis, financial ratio analysis for a business, planning of a hypothetical business to understand the real-world situations and problems that one has to face during setting up of a business.	3	PO11 & PSO4

Syllabus

Module 1	<p>Agribusiness – Meaning, scope and structure and dimensions (Agricultural input sector - Agricultural production sector - Agricultural processing sector and Marketing and trade sector) - Importance of agribusiness in Indian economy, Distinctive features of agribusiness</p> <p>Management – Definitions and concepts - Pipeline diagram - Agribusiness Management – Meaning and definitions and salient features.</p> <p>Management functions – Wheel diagram, planning, its importance - Types of plans - Structure of planning - Goals or objectives - Strategies, policies procedures, rules, programmes – Characteristics of good plan - Steps in planning.</p> <p>Organizing– Meaning, purpose, staffing – Definition - Staffing process.</p> <p>Directing – Motivation – Ordering – Leading – Supervision, coordination, communication and control – Meaning and definitions, purpose.</p> <p>Decision making – Organizational culture – Management of organizational conflicts – Managing change – Leadership styles – Group dynamics – Motivation</p>
Module 2	<p>Managing human resources in agribusinesses - HR Functions - Role of HR managers – Human resource planning.</p> <p>Human resource training and development – Participative management, labour management relations, conflict management.</p> <p>Production management - Production, plant layout and material handling, operations planning and control - Inventory management - Inventory – Meaning – Definition – Objectives of inventories - Quality management production control – Scheduling methods (Net working methods – PERT & CPM) - Quality control</p> <p>Marketing management in agribusiness – New product development, consumer behavior and the buying process.</p> <p>Developing marketing strategies - Four P's of marketing and planning, marketing mix.</p>
Module 3	<p>Market segmentation - Meaning, types, and importance.</p> <p>Product concept – Product line and mix - Branding agricultural products.</p> <p>Packaging, its functions - Physical distribution.</p> <p>Selling, advertising, marketing research, marketing extension, rural retailing supply chain management for agribusiness.</p> <p>Capital management in agribusiness – Fixed capital and working capital - Meaning, types, operating cycle and working capital importance.</p> <p>Financial management – Importance of financial statements – Balance sheet and profit and loss statement, cash flow statement - Meaning, components and formats of financial statements.</p>
Module 4	<p>Analyzing financial statements – Liquidity ratios – Leverage ratios – Activity ratios – Turnover ratios – Profitability ratios</p> <p>Strategic management – Meaning, concept and scope – External and internal environmental factors influencing strategy – Scanning the external and internal environment – Strategy formulation - SWOT analysis of agribusiness enterprise.</p> <p>Agro based industries – Importance, need – Institutional arrangements for the promotion of agro-based industries – Procedure to be followed to set up agrobased industries – Constraints in establishing agro-based industries.</p> <p>Project – Meaning – Definition – Project cycle – Guidelines for preparation of project reports.</p> <p>Project appraisal and evaluation techniques – Undiscounted measures and decision rules - PBP ROR, and discounted measures and decision rules – NPW,</p>

	BCR, IRR, N/K ratio, Sensitivity analysis.
Module 5	Balance sheet analysis and Analysis of Profit and Loss statement, Break Even Analysis/ Cost –Volume-and Profit analysis, Financial Ratio Analysis, Development of Business performance tracking system, Compounding and Discounting Techniques, Project Appraisal Techniques, Preparing Business plans , SWOT Analysis, Visit & Study of Profile of Agro-based industries , Formulation of project feasibility report of agribusiness enterprise, Marketing management of agribusiness enterprise.

Reference books:

S. No.	Title	Author(s)	Publisher	Year
1	<i>Economic Analysis of Agricultural Projects.</i>	Gitteger Price, J.	John Hopkins University Press, London.	1989
2	<i>Management of the Farm Business.</i>	Harsh, S.B. Conner, U.J. and Schwab G.D.	Prentice Hall Inc., New Jersey, USA.	1981
3	<i>Essentials of Management.</i>	Joseph, L. Massie.	Prentice Hall of India Pvt. Ltd., New Delhi.	1995
4	<i>Introduction to Agribusiness</i>	Omri Rawlins, N.	Prentice Hall of India Pvt. Ltd., New Delhi	1980
5	<i>Marketing Management: A South Asian Perspective.</i>	Philip Kotler, Kevin Lane Keller, Abraham Koshy and Mithileswar Jha.	International 13 th edition. Pearson Prentice Hall.	2009

Evaluation Components:

Evaluation	Component	Weightage	Total
In-Sem Formative	Attendance	3.3334	
	Continuous Evaluation - Lab Exercise	13.3336	
			16.667
In-Sem Summative	Mid semester exam	26.6664	
			26.6664
End-Sem Summative	Lab End Semester Exam	16.667	
	End Semester Exam	39.9996	
			56.6666

22RAWE (0-0-20-0) Rural Awareness Works Experience (RAWE) and Agro-Industrial Attachment (AIA)

The programme will be undertaken by the students during the VII semester for a total duration of 20 weeks with a weightage of 0+20 credit hours in two parts viz., RAWE and AIA. It will consist of general orientation and on campus training by different faculties followed by village attachment/unit attachment in University/College/KVK or a Research station. The students will be attached with the agro-industries to get an experience of the industrial environment and working. Weightage in terms of credit hours will be given depending upon the duration of stay of students in villages/agro-industries. At the end of RAWE/AIA, the students will be given one week for project report preparation, presentation and evaluation. The students would be required to record their observations in field and agro-industries on daily basis and will prepare their project report based on these observations.

22 ELP (0-0-20-0) Experiential Learning Programme (ELP)

This programme will be undertaken by the students preferably during the VIII semester for a total duration of 24 weeks with a weightage of 0+20 credit hours. The students will register for any of two modules (of 0+10 credit hours each) listed below :

1. Production Technology for Bio-agents and Bio-fertilizers
2. Seed Production and Technology
3. Mushroom Cultivation Technology
4. Soil, Plant, Water and Seed Testing
5. Poultry Production Technology
6. Hybrid Seed Production Technologies
7. Floriculture and Landscaping
8. Food Processing
9. Commercial Horticulture
10. Agriculture Waste Management
11. Organic Production Technology
12. Commercial Sericulture