



VELS
UNIVERSITY



PALLAVARAM - CHENNAI - INDIA

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)

SCHOOL OF AGRICULTURE

Academic Regulations and Syllabus

BACHELOR OF SCIENCE (HONOURS) IN HORTICULTURE

OUTCOME BASED EDUCATION

2022

SCHOOL OF AGRICULTURE

B. Sc., (Hons.) Horticulture

Curriculum and Syllabus: Regulation, 2022

VISION

The School of Agriculture, VISTAS aims is to be a Centre of hub in training, teaching and innovation in the field of horticulture and allied sectors for food and ecological security. This school will provide innovative solutions for short and long term problems through research, extension and entrepreneurship by adopting advanced horticultural techniques.

MISSION

To mold horticultural graduates with high knowledge and competence by imparting practical technical education through innovative and analytical approach with an objective to create valuable manpower for sustainable agriculture, Agro- Industry and contribution to the society

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES

SCHOOL OF AGRICULTURE

Academic Regulations and Syllabus of B.Sc., (Hons.) Horticulture

(Applicable to the students admitted from 2022)

TITLE

- 1.1. These academic Regulations shall be called “**Vels Institute of science, Technology and Advanced Studies (VISTAS), School of Agriculture, B.Sc., (Hons.) Horticulture Academic Regulations - 2022**” for obtaining Bachelor Degree in the School of Agriculture.
- 1.2. The regulations provided herein shall apply to the students admitted from the academic year from 2022-23 onwards.

DEFINITIONS

- 2.1. Academic Year means a period consisting of two consecutive semesters including the inter-semester break as announced by the University/ Deans of respective colleges. The first year of study shall be the first and second semesters following a student’s admission. The second year of study shall be the third and fourth semesters; the third year, the fifth and sixth semesters and the fourth year, the seventh and eighth semesters.
- 2.2. Coordinator means a teacher of the faculty who has been nominated by the Dean concerned to look after academic matters of a particular year of the degree programme. He/she will attend to registration, preparation of time tables, and distribution of courses, regulation of credit load and maintenance of individual student’s records of the concerned batch of every year.
- 2.3. An academic counselor means a teacher of the faculty who has been nominated by the Dean for counseling a group of students in academic matters.
- 2.4. A curriculum is a group of courses and other specified requirements for the fulfillment of the degree program.
- 2.5. Curricula and Syllabi are a list of approved courses for the Degree Programme. Where each course is identified with a three-letter code, a course number, outline of the syllabus, and credit is assigned.
- 2.6. The course is a teaching unit of a discipline to be covered within a semester as detailed in the Curricula and Syllabi issued by the School of Agriculture, VISTAS.

- 2.7. The credit Load of a student during a semester is the total number of credits of all the courses a student registers during that particular time in the semester.
- 2.8. A credit, in theory, means one hour of classroom lecture, and a credit in practical means two and a half hours of laboratory or workshop or fieldwork per week. For example, a 1+1 course (2 credits) means 1 hour of theory and 2½ hours of practical per week. As per the guidelines of UGC/ICAR, 30 students per batch will be allotted for practical classes.
- 2.9. Grade Point means the total marks in percentage obtained in a course divided by 10 and rounded to two decimal places.
- 2.10. Credit Point means the grade point multiplied by the credit load of the course.
- 2.11. Overall Grade Point Average (OGPA) means the total credit points of the courses completed by the student divided by the total credits of the courses. The OGPA is to be worked out and then rounded to two decimals.
- 2.12. Duration of Semester means each semester of 105 working days inclusive of the mid-semester and practical examinations but excluding the study holidays and final theory examinations.
- 2.13. The transcript card is the consolidated report of the academic performance of a student issued by the Vels Institute of Science, Technology and Advanced Studies (VISTAS) on completion of the curriculum.
- 2.14. Class Grade Chart means a grade chart prepared by the Controller of Examinations indicating marks obtained by the students belonging to a particular class for each course.
- 2.15. Statement of Marks means a report of grades, credit points, and OGPA obtained by a student in a particular semester.
- 2.16. Re-examination/Re-appearance is an examination written for the failed courses by a student without undergoing regular class/course.

ADMISSION

- 3.1. Admission of the student to B.Sc., (Hons.) Horticulture program in the School of Agriculture shall be based on merit and follow the policy and guidelines of ICAR and Vels Institute of Science, Technology and Advanced Studies (VISTAS). The minimum admission requirement

shall be decided by the VISTAS and issued from time to time. The decision of the VISTAS is final in deciding the procedure of admission and finalization of the number of seats.

- 3.2. Tuition fees and other fees: The various fees payable by the students will be decided by the VISTAS from time to time.

In case of new admission, the fees for the semester are payable in advance failing which they will not be admitted.

In other cases, the fees are payable within seven working days from the commencement of the semester.

In the case of default, a fine as per the VISTAS rules will be collected.

The students who fail to pay the tuition fees within seven working days from the commencement of the semester will not be allowed to attend the classes and their names will be struck off from the rolls. However, if the defaulting students pay the fees along with the fines in addition to a prescribed readmission fee, they will be permitted to attend the classes. The period for which his/her name is removed from the rolls will be treated as an absence to calculate the minimum attendance (80%) requirements.

Students who are away on a study tour, camp activities or other extracurricular activities organized by the Institute or the faculty at the commencement of the semester may, however, pay their semester tuition fees and other fees within the third working day after they return from such programs, without a fine.

Scholarship: A student who has been granted scholarships by the Welfare Departments or by the Government of India or by the State Government will, however, be exempted from the levy of fines, provided the fees are paid on the next day after the scholarship amount is disbursed to him/her. The concession referred to above will apply to those who have been granted scholarships and not to those who have only applied and are expecting sanctions.

The candidate should obtain a Hall Ticket from the Controller of Examinations through the Dean after clearing all arrears including the hostel dues before the commencement of each semester's final examination.

SYSTEM OF EDUCATION

- 4.1. **Maximum Duration Permissible:** The system of education followed for all the undergraduate programs is the Semester System with duration of four academic years (8 Semesters). The maximum duration permissible for a student shall be 'n' plus four academic years (16 semesters), where 'n' denotes the normal duration of the degree program (8 semesters). The hostel facilities will be provided only for the actual duration of an academic program.
- 4.2. **Credit Requirements:** The minimum credit requirement for each Degree Programme is 180
- 4.3. **Medium of Instruction:** The medium of Instruction in the School of Agriculture shall be English.
- 4.4. **Maximum Credit Load:** A student can register for a maximum of 25 credits during a semester. An additional, 1 or 2 credits shall be permitted at the discretion of the respective Deans of the colleges.
- 4.5. **Course Teacher:** The Dean concerned, in consultation with the respective Head of the Department, will nominate the course teacher for each course at the beginning of the semester. The course teacher shall be responsible to the Head of the Department in all matters connected with the conduct of the course. The Head of the Department will monitor the progress of the course(s) of the respective Department.
- 4.6. **Academic Counselor:** The Dean of the college will allot a group of not less than five students to the nominated Academic Counselor. The Academic Counselor will counsel the group of students in curricular and extra-curricular activities for the entire period of the degree program by conducting periodical meetings.
- 4.7. **Class Time Table:** At the beginning of each semester, the Dean of the college will prepare the class time table with the help of the Coordinator of the respective year.
- 4.8. **Working Days and Time Schedule:** Except Sundays and other listed holidays, all other days of the week including Saturdays are working days for the students. Normal Working Hours: 7.30 a.m. to 5.00 p.m. Depending upon the need, the respective Dean will decide about the timings. The schedule may vary in each teaching campus to suit the local needs.
- 4.9. **Commencement and Closure of Semesters:** The date of commencement and closure of semesters as well as inter-semester break shall be announced by the Dean of the School of Agriculture after the approval of the Dean's committee. The schedule of the final theory examinations shall be announced by the Controller of Examinations in consultation with the

Dean of the School of Agriculture. The University through the Deans' Committee should approve any deviation after dates are announced.

- 4.10. Inter-semester Break: A break of about 15 (fifteen) days shall normally be allowed between any two consecutive semesters. A longer inter-semester break during summer may be allowed every year, subject to a maximum of 30 days during May - June.
- 4.11. Academic Calendar: A common academic calendar shall be prepared by the Faculty Dean (Agriculture) every year by including the date of registration, date of mid-semester examinations, final theory examinations, inter-semester break, and summer holidays for all the undergraduate programs. The Dean of the School of Agriculture shall schedule the academic activities within the specified period without deviation.
- 4.12. Condensation of Semesters: The Dean concerned has the responsibility to adhere to the common Academic Calendar. However, under an extraordinary situation upon the recommendation of the Dean's Committee and with the permission of the VISTAS, condensation of the semester may be made up to a maximum of 10 days to cope with the examination schedule. The loss of classes in such cases should be compensated by a special timetable.

REGISTRATION OF COURSES

- 5.1. A course shall be offered only once in an academic year during the semester as listed in the course curricula and syllabi.
- 5.2. All eligible candidates shall register for the requisite courses at the beginning of each semester **IN PERSON** under the guidance of the Coordinator. **IN ABSENTIA** registration will not be permitted under any circumstance.
- 5.3. Registration without fine: The courses prescribed for a semester can be registered on the date scheduled in the academic calendar. Registration is also permitted on the second day (which is the first working day of the semester) without a fine.
- 5.4. Registration with fine: Late registration shall be permitted by the Deans concerned for up to seven working days inclusive of the date of registration on payment of a late registration fee.
- 5.5. Procedure to get permission for late registration: The student concerned shall apply with proper reason to the Dean concerned through the Academic Counselor and Coordinator to get the permission of the Dean for the late registration of the courses. Beyond the prescribed time

limit, no student shall be permitted to register for the courses for a particular semester.

- 5.6. For calculating 105 working days for a semester, the second day of registration will be counted as the first working day of the semester. For example,

Model

| | | |
|---|--------------------------|---------------------|
| Date of Registration | : 02.12.2022 (Monday) | 1 st Day |
| Last date for Registration without fine | : 03.12.2022 (Tuesday) | |
| | : 04.12.2022 (Wednesday) | |
| | : 05.12.2022 (Thursday) | |
| | : 06.12.2022 (Friday) | |
| | : 07.12.2022 (Saturday) | |
| | : 08.12.2022 (Sunday) | |
| Last date for Registration with fine | : 09.12.2022 (Monday) | 7 th Day |

ATTENDANCE REQUIREMENTS

- 6.1. A minimum of 80 percent attendance separately in theory and practical of the concerned course is a must, failing which the student shall not be permitted to appear for both final theory and practical examination in the course concerned and grade 'E' (incomplete) will be awarded. The student must re-register the course when offered again, with the permission of the Dean.
- 6.2. For the first year of first semester students, for calculating 80 percent attendance the number of working days will be calculated only from the date of joining of the student.
- 6.3. Students failing to attend the classes/ examinations on the unofficial ground will be treated as 'absent'. Hundred percent attendance is compulsory individually in each of the courses like RAWE, VSP, AITP, ADO/ADA/NGO placement and All India study tour, and similar other programs.
- 6.4. The PED, NCC/NSS courses shall be registered during the first semester and evaluated at the end of the fourth semester.
- 6.5. Students deputed for sports, cultural meets, etc., with the prior permission of the Dean of the colleges shall be given attendance for the period of absence. However, students under this category must have attended a minimum of 50% of classes in the total theory and practical classes conducted.

6.6. Calculation of Attendance

Theory class: The number of classes conducted for a course from the first working day as per the time table to the last theory class of that semester is to be construed as the total number of theory classes conducted by the course teacher. The mid-semester examinations are normally conducted during class hours. Attendance for the mid-semester examination will be counted as a theory class. Final theory examinations will be conducted after 105 working days.

Practical class: The final practical examination will be conducted in the last practical class as per the time table which will not be considered as attendance for the practical class of a particular course. The student belonging to a batch will attend classes and earn attendance in the particular batch only as per the time table. No student shall be permitted to attend along with another batch to gain attendance either in theory or in practical.

EXAMINATIONS

- 7.1. The evaluation of a student's performance shall be made separately for each course registered by the student.
- 7.2. Distribution of Marks: Each course shall carry a maximum of 100 marks for grading. The distribution of marks shall be as follows.

| I | Courses with both Theory and Practical | Marks |
|------------|---|--------------|
| | Mid –Semester Examination | 30 |
| | Practical Examination | 20 |
| | <u>Practical Marks Split up</u> | |
| | Written | 10 |
| | Assignment / Specimen Collection | 05 |
| | Record / Viva – Voce | 05 |
| | Final Theory Examination | 50 |
| | Total | 100 |
| II | Courses with only Theory | |
| | Mid –Semester Examination | 40 |
| | Assignment | 10 |
| | Final Theory Examination | 50 |
| | Total | 100 |
| III | Courses with only Practical | |
| | Mid –Semester Examination | 40 |
| | Assignment | 10 |
| | Record / Viva – Voce | 10 |
| | Final Practical Examination | 40 |
| | Total | 100 |

- 7.2. Evaluation of course work: The results of the course shall be indicated by grade points ranging from 0 to 10.0. The minimum grade point to be secured for the successful completion of a

course will be 6.00. Securing a grade point less than 6.00 in a course will be treated as 'Re Appearance (RA)' and the grade point will be 0 for calculating the GPA/OGPA. In the case of course with theory and practical, a minimum of 50% mark separately in theory and practical with an aggregate of 60 percent is essential. An OGPA of 6.50 shall be the minimum requirement for the award of a Degree. The following symbols shall be used in the grade sheets.

| | |
|-----------|--|
| E | Incomplete (Lack of Attendance) |
| AB | Absent |
| RR | Re-registration |
| RA | Re-appearance |
| IE | Improvement Examination |
| EE | Incomplete for reasons other than attendance |

- 7.3. Evaluation pattern for courses with only practical: The evaluation of courses with only practical's is grouped and mark distribution is tabulated. The pattern of questions is to be decided by the course teacher and external examiner. Wherever specimen collections are required a portion of marks shall be allotted either from written test marks or record marks. In the event of a difference of opinion between internal and external examiners, the Deans concerned shall decide the pattern of examination.

7.3.1. Physical and Health Education1(0+1) (NC)*

The students will be evaluated for 100 marks. The course teacher will evaluate the performance and behavior of students in the classes and marks will be awarded at the end of the second semester as detailed below.

| Particulars | Max marks |
|--------------------------------------|------------------|
| Attendance & routine activities | 60 |
| Behavior | 10 |
| Participation in tournaments / Camps | 20 |
| Viva-voce | 10 |
| Total | 100 |

7.3.3. NSS/NCC (0+1)

The duration of NCC /NSS training is for four semesters (I, II, III and IV).NCC/NSS courses shall be registered during the first semester and evaluated at the end of the fourth semester.

NSS

Each student enrolled in NSS should also attend at least one special camp not exceeding 10 days duration. 80% attendance is mandatory for attendingspecial camp. Marks will be awarded as follows

| Particulars | | Max. Marks |
|--|----|------------|
| NSS Regular Programme | | |
| Semester I | 15 | 60 |
| Semester II | 15 | |
| Semester III | 15 | |
| Semester IV | 15 | |
| NSS Special Camp | | |
| Attendance in daily activities during a special camp | 30 | 40 |
| Special camp activity report | 05 | |
| <i>Viva - voce</i> on the 10th day of the special camp | 05 | |
| Total | | 100 |

At the end of the fourth semester, the course teacher shall send the marks awarded to the Controller of Examination through the Dean, School of Agriculture.

NCC

Each student enrolled in NCC should attend 10 parades per semester, thus 40 parades in four semesters.

| S.No. | Particulars | Sem I | Sem II | Sem III | Sem IV | Total |
|-------|--|-----------|-----------|-----------|-----------|------------|
| 1. | Regular activities and Behaviour | 10 | 10 | 10 | 10 | 40 |
| 2. | Participation in camps and special assignments | 5 | 5 | 5 | 5 | 20 |
| 3. | Written test and viva | 10 | 10 | 10 | 10 | 40 |
| | Total | 25 | 25 | 25 | 25 | 100 |

7.3.4. Graded and Non grades courses are as followed below

| I | Courses with both Theory and Practical (1+1), (2+1), (3+1) | Marks |
|----|--|------------|
| | Mid –Semester Examination | 30 |
| | Practical Examination | 20 |
| | <u>Practical Marks Split up</u> | |
| | Written | 10 |
| | Assignment / Specimen Collection | 05 |
| | Record / Viva – Voce | 05 |
| | Final Theory Examination | 50 |
| | Total | 100 |
| II | Courses with only Theory (1+0), (2+0) | |
| | Mid –Semester Examination | 40 |
| | Assignment | 10 |
| | Final Theory Examination | 50 |

| | | |
|------------|---|------------|
| | Total | 100 |
| III | Courses with only Practical (0+1), (0+2) | |
| | Mid –Semester Examination | 40 |
| | Assignment | 10 |
| | Record / Viva – Voce | 10 |
| | Final Practical Examination | 40 |
| | Total | 100 |

7.3.5. Rural Agricultural Work Experience (RAWE)

Course on Rural Agricultural Work Experience (RAWE) will be offered in the VII Semester for eight weeks. The village attachment will be organized by the Department of Agricultural Extension. For each batch of students, there will be a designated RAWE Coordinator from the Department of Agricultural Extension, who will continuously guide, supervise and monitor the work of students during their placements in rural areas. The designated Teachers from the courses related to the subject matter areas will also visit and guide the students on technological aspects and solve the problems, which are beyond the competence of students as well as, evaluate the performance of the students on the concerned subject. They will also support the students during the extension educational activities.

The orientation program will be organized by different departments during the first week of the semester followed by Village attachment. The students would be required to record their observations in the field on daily basis and will prepare their project report based on these observations. For Agro-Industrial attachment, the students will be attached to Agro-based industries which are organized by Department of Agricultural Economics. The final examination will be conducted separately for each attachment at the end of the semester. The marks will be awarded as detailed below.

| Components | VSP (60days) | ADA (10days) | NGO (10days) | Industry (10 days) | Total (90days) |
|--|-------------------------|-------------------------|-------------------------|-------------------------------|---------------------------|
| Participation and oral presentation | 30 marks | 10 marks | 10 marks | 10 marks | 60 marks |
| Record | 10 marks | 5 marks | 5 marks | 5 marks | 25 marks |
| Overall exhibition | - | - | - | - | 15 marks |
| Total | 40 marks | 15 marks | 15 marks | 15 marks | 100 marks |

7.3.6. Educational Tours- HOR 201(0+1) & AEX404(0+1)

Educational tour courses **HOR 201** Study tour-I and **AEX404** All India Tour (0+1) are compulsory. Those who miss the study tours for any valid reason must re-register and undertake the tour along with juniors to complete the degree program. The tours will be taken

during the fourth and seventh semesters, respectively. The duration of HOR 201 shall not exceed 7 to 10 days and that of AEX404 shall not exceed 15 to 20 days. The study tour shall be conducted within 105 working days. The tours will be arranged by the respective departments of the study in consultation with the Dean, School of agriculture. The final examination will be conducted separately at the end of the semester by the University. The Marks for the tours are to be awarded as follows

| Particulars | Max. Marks |
|---------------------|-------------------|
| Attendance | 10 |
| Behavior | 15 |
| Tour diary | 15 |
| Tour record | 15 |
| Written examination | 30 |
| Viva –voce | 15 |
| Total | 100 |

7.3.7.Project Work

| Particulars | Evaluation | Marks |
|---|--------------------------|--------------|
| Research area identification and collection of literature | 7 th semester | 20 |
| Work done | 8 th semester | 30 |
| Report | 8 th semester | 20 |
| Presentation | 8 th semester | 20 |
| Viva voce | 8 th semester | 10 |
| Total | | 100 |

7.3.8.Experiential learning

These courses will be offered in the VIII semester. A student can choose any two experiential learning programs of his/her choice. The maximum number of students allowed to register in a department will be decided by the Dean depending on enrolment. If more number of students opts for the same department the particular subject mark is considered for selecting a student. Periodical evaluation of the above course will be done by the course teacher during different stages of work. The final evaluation of the above course will be done by the teacher in charge and another staff member appointed as examiner by the Head of the Department. The final examination will be conducted by the University before the commencement of regular final semester examinations.

| Particulars | Max. Marks |
|------------------------------|-------------------|
| Project Planning and Writing | 10 |
| Presentation | 10 |
| Regularity | 10 |
| Monthly Assessment | 10 |

| | |
|--|------------|
| Output Delivery | 10 |
| Entrepreneurship skills | 10 |
| Technical Skill Development/ Business networking | 20 |
| Report Writing Skills | 10 |
| Final Presentation | 10 |
| Total | 100 |

- 7.4. **Mid Semester Examination:** Writing the mid-semester examination is a prerequisite for writing the final theory and practical examinations. Students failing to write mid-semester examinations will not be permitted to attend the classes further in the course concerned and the student will be awarded 'E' grade. The mid-semester examination mark list should reach the office of the Controller of Examinations within fifteen days from the date of conduct of the mid-semester examination
- 7.5. **Missing Examination:** A student who fails to attend a mid-semester examination due to unavoidable circumstances shall be permitted with prior approval of the Dean to take up missing examination of the particular course, subject to payment of the fee for each missing mid-semester examination. Students deputed for official programs of the University are exempted from paying the fee for missing tests. Such missing examinations should be completed outside the regular class hours within 10 working days of the respective examinations. Attendance will not be given for taking up missing examinations. The missing examinations are allowed only for mid-semester examinations and not for final theory and practical examinations.
- 7.6. **Theory Examination:** An examination schedule approved by the Dean and the Controller of Examinations for the mid-semester and final examinations respectively shall be final.

Duration for mid-semester and final theory examinations

Mid-semester: 1 hour

Final theory (Handwritten)

1+1, 2+1, 1+2 and 2+2 Credits : 2½ hours (50 marks)

1+0, 2+0 and 3+0 Credits : 3 hours (50 marks)

0+1 and 0+2 credits : 3 hours (50 marks)

Exam pattern

Mid Semester examination – Hand written mode

Final Practical Examination – Hand written mode

Final Theory Examination – Hand written mode

- 7.7. **Practical Examination:** The Dean of Colleges will announce the schedule of final practical examinations. The Controller of Examinations, based on the proposal sent by the Deans concerned, will nominate the external examiner and the course teacher shall be the internal examiner. In the event of an external/ internal examiner nominated for practical examination could not conduct the examination, then the Dean concerned shall nominate an alternative examiner to conduct practical examination in anticipation of approval by the Controller of Examinations. Submission of bonafide practical records certified by the Course Teacher is a pre-requisite for appearing in the practical examinations failing which 'F' grade will be awarded. The duration of the practical examination shall be two and a half hours. The practical marks should be communicated to the Controller of Examinations within 10 days of the last working day. If a student fails to write practical examination, 'F' grade will be awarded if he/she has 80% attendance. The student has to appear for the reappearance examination.

7.8. **Question Paper Setting and Evaluation**

The mid-semester question papers will be set and answer papers evaluated by the course teacher concerned and the mid-semester exam is on hand written.

The semester final theory question paper for all the courses will be set by the Controller of Examinations after obtaining question papers from external examiners outside the University.

The practical examination will be conducted and evaluated by the external examiner with the help of the internal examiner.

The Controller of Examinations will arrange for the evaluation of the semester final theory papers with internal examiners.

- 7.9. **Postponement of Final Examination:** Whenever the Government declares holidays on the dates of final examinations, the examination that falls on the particular date will be postponed to the date after the last examination as per the original examination schedule.

- 7.10. **Improvement and Re-examination:** Improvement and re-examination are permitted only for

the final theory and practical examinations. The students are permitted to write the improvement and re-examinations as and when conducted with the permission of the Dean of College. Improvement and re-examination fee of Rs. 500/ paper or as per VISTAS norms. A student is permitted to write either theory or practical examination alone or both in the reappearance examination for the failed subjects. A student is permitted to write a reappearance examination for the failed subjects only three times during n+4 years duration excluding the regular final examination (Mid-term assignment and continuous evaluation record marks will be retained as such and the student must produce the evaluated record). In the event of a student failing to secure a pass in the three re-examinations permitted he/she has to reregister the course along with juniors. The registration for the improvement/re-examination shall be done on the date specified by the Controller of Examinations. Each registration is considered an attempt even if the student is absent from the examination. The latest theory / practical examination marks will be retained for the subsequent reappearance examinations for which the student has not opted.

The student having an OGPA of less than 6.50 is eligible to improve the grade point only once in courses with a grade point less than 8.00. A student who has an OGPA of 6.50 and above is not eligible to improve his/her grade points in any course. In case a student fails to secure a higher grade point in the subsequent attempts, the higher grade point secured by the student either in regular or improvement examinations will be accounted. Improvement and re-examination will not apply to the industry and institutional educational tours, RAWE, agro-industrial tie-up programs, crop production, NSS, NCC, and physical education courses. The camp requirement in NSS and NCC may be allowed along with juniors if the student has secured more than 80% attendance in the regular courses.

- 7.11. Mess due clearance certificate has to be produced by every student before taking the final examinations.
- 7.12. The minimum grade point to be secured for a pass in a course is 6.00.
- 7.13. A student has to maintain a minimum OGPA of 6.50 out of 10.00 at the end of the final year (VIII semester) to become eligible for the award of a degree.
- 7.14. Reappearance examination for the undergraduate failed subjects shall be conducted once in six months, during the semester breaks for 100 marks.

7.15. Rules of evaluated answer papers

The evaluated answer papers of the mid-semester shall be shown to the students after the examination. Discrepancies if any, in awarding marks, the student can approach the teacher concerned immediately, for rectification. The answer papers should be retained with the course teacher for six months and then disposed off.

Evaluated final theory answer papers may be retained for up to six months by the Controller of Examinations after the conduct of the examination and then disposed off. The same applies to improvement/re-examination also.

In the event of a candidate who has failed to secure the minimum required mark to pass in the subject shall be permitted to write the re-appearance either final theory or practical or both examinations.

A student who desires to forego the chance of improvement/re-examination is also permitted to reregister the failed courses as and when the course(s) are offered with the permission of the Dean concerned on payment of the re-registration fee as specified by the VISTAS.

7.16. **Revaluation/Re-totaling**

A student can submit a request for revaluation/ re-totaling in the prescribed format to the Controller of Examinations through the Dean concerned not later than ten working days after the issue of class grade charts to the student. Appeals received thereafter will be summarily rejected. The fee for revaluation or re-totaling per subject is to be paid in the form of a demand draft drawn in favor of the Controller of Examinations.

Revaluation is not permissible normally for practical examinations. However, the Dean of the college, if satisfied, may constitute a committee consisting of at least three faculty members to moderate the marks of practical examinations. The report of the committee in such cases should be submitted within two days. The decision of the Dean of the college shall be final.

7.17. **Late for Examinations**

The students who are late by 30 minutes shall not be allowed to enter the examination hall. Similarly, no student will be allowed to leave the examination hall within 30 minutes of the commencement of the examination.

DISCONTINUANCE AND READMISSION

- 8.1. A student who discontinues the first semester (I year) without getting permission from the Dean concerned will not be re-admitted. However, the student who discontinues the first semester (I year) for genuine reasons with the prior permission of the Dean (within 30 days) will be re-admitted in the first semester of the next year along with the junior batch (I year) of students with the approval of the Academic Council.
- 8.2. Students admitted to any of the courses discontinuing their studies with permission of the concerned Dean before completing the course may be re-admitted to the course, if they should have completed at least one semester before such discontinuance.
- 8.3. A student discontinuing studies temporarily on valid and genuine grounds with the prior permission of the Dean of the College will be awarded Grade 'E' for all the registered courses. The student has to rejoin with the permission of the Dean at the beginning of the same semester along with the junior batch of students on payment of a re-registration fee and semester fee.
- 8.4. When a student discontinues his/her studies in a semester (other than the first semester) on his/her own accord after getting the written permission of the Dean concerned or by the order of the University, he/she shall be re-admitted to the same semester where he/she discontinued, along with the junior batch of students.
- 8.5. In case of revision of curricula and syllabi the student has to complete all the course works in the original syllabus in which he/she has joined, by registering equivalent / special semester courses (or) the student has to forgo all the courses registered so far in the original curricula and syllabi and register all the courses from the first semester in the new syllabus along with juniors.
- 8.6. A student shall not be allowed to discontinue consecutively, beyond a period of two semesters. If the discontinuance period exceeds two semesters the name of the student will be removed from the enroll.

- 8.7. A student who discontinues a course in the undergraduate degree program is not eligible for admission again to any other undergraduate degree program of the University. An undertaking to this effect shall be obtained from the student by the Dean concerned at the time of discontinuation.

MALPRACTICES IN EXAMINATIONS AND MISCONDUCT OF STUDENTS

- 9.1. The Deans of the Colleges shall be responsible for dealing with all cases of unfair means by students in writing records, assignments, and examinations.
- 9.2. The invigilator or the course teacher concerned shall report each case of unfair means with full details of the evidence and written explanation of the student concerned to the Dean immediately.
- 9.3. The Dean shall take appropriate action on receipt of the report and the penalty may be as indicated below:

Students found using unfair means during the mid-semester examination may be debarred from the College for the remaining period of the semester and deemed to have failed in all the courses during the semester.

Students found using unfair means during the final theory / practical examination may be deemed to have failed in all the courses in that semester and also debarred from the College for the next semester.

For using unfair means of a serious nature (which will be decided by the committee nominated by the Dean concerned) warranting higher penalties than those indicated in clauses (a) and (b) the student may be debarred from the University for two semesters or more or permanently with the approval of the Vice-Chancellor. In clause(c) , the students concerned shall not be allowed to sit for the remaining examinations in the concerned course or other courses.

- 9.4. Details of each case together with all material evidence and recommendations of the Dean shall be communicated forthwith to the Registrar of the University. The Dean shall issue necessary orders and report each case falling under clauses (a), (b) and (c) the above to the Registrar immediately.

- 9.5. Ragging Rules: Students found involved in ragging or in any other misconduct, or if a complaint is received from the affected student(s) to that effect, will be immediately expelled from the current semester and the Dean shall further constitute a committee to probe and conduct enquiry into the matter and based on the report of the committee, the Dean shall pass the final orders on merit of case within three working days.
- 9.6. Unlawful Activities: In case of students found involved in any unlawful activities either within or outside the Hostel/College Campus, besides expulsion both from the Hostel and College, at the discretion of the Dean, the matter will be reported to the Police of the jurisdiction to be dealt with, in accordance with the appropriate law in force.

AWARD OF THE DEGREE

The degree namely B.Sc., (Hons.) Horticulture shall be awarded during convocation under the seal of the Vels Institute of Science, Technology and Advances Studies (VISTAS) to the students who have successfully completed the entire graduation requirement as detailed below.

The candidates should have undergone successfully the prescribed course of Study in the University. They shall further be required to have completed and passed 180 course credits and shall have earned an overall grade point average (OGPA) of 6.50 out of 10 for all courses completed in B.Sc. (Hons.) Horticulture degree programme. In addition to the above, students shall in the judgment of the Faculty, possess good conduct and character.

The University shall issue Provisional Certificate (PC) to the candidates after having passed all provisional examinations.

B.Sc., (Hons.) Horticulture

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Graduates of the Horticulture program will,

PEO1: PREPARATION

To educate the students about the basics of Horticulture and guide them to utilize the knowledge in tackling the problems in a scientific mode with a cost-effective approach

PEO2: CORE COMPETENCE

To inculcate the reasoning power through understanding the fundamentals of horticulture and evaluate the practical problems in crop production, processing, storage and marketing and make an appropriate decision based on technical and scientific knowledge acquired during education in solving any problem in practical aspects. To understand the scientific aspects of

horticulture and apply various technologies in research activities of crop improvement, adopting and evolving new technologies.

PEO3: PROFESSIONALISM

To acquire knowledge and establish oneself as a successful and dynamic professional in the field of horticulture both locally and globally. To pursue higher study learning participation in post-graduation and research programs and to utilize the knowledge for advancement in teaching, research and innovation of horticulture.

PEO4: SKILL

To provide various types of training and field demonstration to inculcate skills like proficiency in languages, technical communication, analytical capacity and planning for research on various branches of horticulture both in the laboratory and field. To streamline the thinking ability to be a team leader, with a good interpersonal relationship and as a technical advisor.

PEO5: ETHICS

To apply ethical and social aspects of modern horticulture innovations by using various tools like genetic engineering, data collection and processing, and its application for higher horticulture production to make farming a commercial venture.

PROGRAMME OUTCOMES (PO) AND PROGRAMME SPECIFIC OUTCOMES (PSO)

| PROGRAMME OUTCOMES (PO) | | |
|--------------------------------|--------------------------|--|
| PO-1 | Domain Knowledge | Impart knowledge of basic sciences, applied sciences, fundamentals in horticulture and related fields. |
| PO-2 | Problem analysis | To identify, review, analyze and formulate the problem in horticultural practices and post-harvest techniques. |
| PO-3 | Problem solutions | Understand the impact of professional horticultural solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development. To demonstrate the capacity to think critically and select viable solutions to solve problems. |

| | | |
|------|---|--|
| PO-4 | Conduct surveys and investigations | Understand how all aspects of horticulture are linked by scientists, marketers, and producers to understand the production output and to make an economically viable decision. To understand how employer characteristics and decision-making at various levels enhance the success of a horticultural enterprise. To understand components of horti-business and economics of the market. |
| PO-5 | Usage of Modern Tools | Knowledge of Weather codes and Symbols, Reading and Recording of weather and climatic data. To get trained to maintain climatological records, soil data, soil nutrition, and modern biotechnology usage in horticulture. Communication methods and to develop such products through the financial support of banks etc., |
| PO-6 | Societal role | To demonstrate research-based knowledge of the legal and ethical environment impacting horticultural organizations and exhibit an understanding and appreciation of the ethical implications of decisions. |
| PO-7 | Environment and Sustainability | Demonstrate knowledge to an understanding of basic horticulture and agriculture production with the breadth and depth of the profession of horticulture and agriculture. Basic biology: taxonomy, anatomy, morphology, and physiology. The characteristics of the environment and their influence on plant growth and development. Current applications of horticultural and agricultural principles and practices for propagation, pestmanagement, production, maintenance, and business practices. Comprehensive knowledge of horticultural and agricultural production. |
| PO-8 | Ethics | To develop critical, self-critical opinions and approaches aiming at solving the most important practical problems in the field of horticulture by applying gained competencies and following high standards of academic integrity (ethics and morals) both in the profession and in society as a whole. |
| PO-9 | Individual and Team Work | To demonstrate an understanding and appreciation for the importance, and impact of globalization and diversity in modern agriculture organizations. Understanding of globalization and NGO |

| | | |
|-------|---------------------------------------|--|
| | | working. To develop competence to work in Government, public and private sectors as an individual and as a team for sustainable agriculture and horticulture. |
| PO-10 | Communication | To demonstrate the ability to analyze data and draw appropriate statistical conclusions. To demonstrate the ability to communicate effectively both orally and in writing. |
| PO-11 | Project Management and Finance | Able to demonstrate critical thinking and prepare projects to solve the problem and apply them to a variety of farm animal and or plant production systems. |
| PO-12 | Life-long learning | This program will also help students to enhance their employability for jobs in different sectors including self-employment as a horti-entrepreneur. |

PROGRAMME of SPECIFIC OUTCOMES (PSO)

| | |
|-------|--|
| PSO-1 | Applying the knowledge of crop cultivation, crop improvement, soil and crop management for sustainable organic horticultural production and development. |
| PSO-2 | Analyzing and identifying complex horticultural problems and formulating ethical solutions using the principles of horticultural science, engineering, and business management. |
| PSO-3 | Developing innovative processes, products, and technologies to meet the challenges in horticulture farming practices and through the transfer of technology using various extension tools. |

VISTAS - SCHOOL OF AGRICULTURE
Curriculum and Syllabus of B.Sc., (Hons.) Horticulture
 (Applicable to the students admitted from 2022)

SEMESTER WISE COURSE & CREDIT DISTRIBUTION

| I YEAR I SEMESTER | | | | |
|--------------------------|--------------------|--|------------------------|---------------------|
| Sl. No | Course code | List of Courses | Contact Periods | Credit hours |
| 1. | MAT 101 | Elementary Statistics and Computer Application | 72 | 3(2+1) |
| 2. | SAC 101 | Fundamental of Soil Science | 56 | 2(1+1) |
| 3. | AEX 101 | Economics and Marketing | 72 | 3(2+1) |
| 4. | BIC 101 | Elementary Plant Biochemistry | 56 | 2(1+1) |
| 5. | CRP101 | Introductory Crop Physiology | 56 | 2(1+1) |
| 6. | FSC 101 | Fundamentals of Horticulture | 72 | 3(2+1) |

| | | | | |
|--------------|---------------------|--|------------|------------------|
| 7. | FSC 102 | Plant Propagation and Nursery Management | 56 | 2(1+1) |
| 8. | PBG 101 | Principles of Genetics and Cytogenetics | 72 | 3(2+1) |
| 9 | AGM 101 | Introductory Microbiology | 56 | 2(1+1) |
| 10. | ENG 101 | Communication Skills and Personality Development | 56 | 2(1+1) |
| 11. | TAM 101/ EMG 102 | □□□□□□□□□□□□□□ □□□□□□□□□□□□ □□□□□□□□ □□□□□□ □□□□□□□□□□□□ / Development education | 40 | 1(0+1) |
| 12. | NSS/NCC 101 | National Service Scheme/National Cadet Corp | 40 | 1 (0+1)(NC)* |
| TOTAL | | | 704 | 26(14+12) |

*NC: Non-gradual courses

I YEAR II SEMESTER

| Sl. No. | Course code | List of Courses | Contact Periods | Credit hours |
|--------------|----------------|---|-----------------|------------------|
| 1. | FSC 103 | Tropical and Subtropical Fruits | 72 | 3(2+1) |
| 2. | VSC 101 | Tropical and Subtropical Vegetables | 72 | 3(2+1) |
| 3. | PBG 102 | Principles of Plant Breeding | 72 | 3(2+1) |
| 4. | SAC 102 | Soil Fertility and Nutrient Management | 56 | 2(1+1) |
| 5. | AGR 101 | Water Management in Horticultural Crops | 56 | 2(1+1) |
| 6. | PAT 101 | Fundamentals of Plant Pathology | 72 | 3(2+1) |
| 7. | ENS 101 | Environmental Studies and Disaster Management | 72 | 3(2+1) |
| 8. | CRP 102 | Growth and Development of Horticultural Crops | 56 | 2(1+1) |
| 9. | PED 101 | Physical and Health Education | 40 | 1(0+1) (NC)* |
| 10. | COM 101 | Information and communication technology* | 56 | 2(1+1) (NC)* |
| 11. | NSS/NCC 101 | National Service Scheme/National Cadet Corp | 40 | - |
| TOTAL | | | 664 | 24(14+10) |

*NC: Non-gradual courses

II YEAR III SEMESTER

| Sl. No | Course code | List of Courses | Contact Periods | Credit hours |
|--------|-------------|---|-----------------|--------------|
| 1. | AEN 201 | Fundamentals of Entomology | 72 | 3(2+1) |
| 2. | VSC 202 | Temperate Vegetable Crops | 56 | 2(1+1) |
| 3. | AEN 202 | Nematode pests of horticultural crops and their Management | 56 | 2(1+1) |
| 4. | PAT 202 | Diseases of fruit, Plantation, Medicinal and Aromatic Crops | 72 | 3(2+1) |
| 5. | PHT 201 | Fundamentals of Food Technology | 56 | 2(1+1) |

| | | | | |
|---------------------------------|-------------|--|--------------|------------------|
| 6. | FSC 203 | Temperate Fruit Crops | 56 | 2(1+1) |
| 7. | AGR 202 | Weed Management in Horticultural Crops | 56 | 2(1+1) |
| 8. | FLG 201 | Commercial Floriculture | 72 | 3(2+1) |
| 9. | BIT 201 | Elementary Plant Biotechnology | 56 | 2(1+1) |
| 10. | NCC/NSS 101 | National Service Scheme/National Cadet Corp* | 40 | - |
| *NC: Non-gradual courses | | | TOTAL | 592 |
| | | | | 21 (12+9) |

II YEAR IV SEMESTER

| Sl. No | Course code | List of Courses | Contact Periods | Credit hours |
|-----------------------------|--------------|---|-----------------|------------------|
| 1. | SAC 203 | Soil, Water and Plant Analysis | 56 | 2(1+1) |
| 2. | PSM 201 | Spices and Condiments | 72 | 3(2+1) |
| 3. | FLG 203 | Ornamental Horticulture | 56 | 2(1+1) |
| 4. | PSM 202 | Plantation Crops | 72 | 3(2+1) |
| 5. | FSC 204 | Breeding of Fruit and Plantation Crops | 72 | 3(2+1) |
| 6. | AEG 201 | Farm Power and Machinery | 56 | 2(1+1) |
| 7. | AEN 203 | Insect Pests of Fruit, Plantation, Medicinal & Aromatic Crops | 72 | 3(2+1) |
| 8. | VSC 203 | Precision Farming and Protected Cultivation | 72 | 3(2+1) |
| 9. | FSC 205 | Dry land Horticulture | 56 | 2(1+1) |
| 10. | HOR 201 | Short Tour* | 20 | 1(0+1) |
| 11. | NSS/ NCC 101 | National Service Scheme/National Cadet Corp* | 40 | - |
| *Non-gradual courses | | | Total | 644 |
| | | | | 24(14+10) |

III YEAR V SEMESTER

| Sl. No | Course code | List of Courses | Contact Periods | Credit hours |
|--------|-------------|---|-----------------|--------------|
| 1. | AGR 303 | Organic Farming | 72 | 3 (2+1) |
| 2. | AGR 304 | Introduction to Major Field Crops | 56 | 2 (1+1) |
| 3. | PSM 303 | Medicinal and Aromatic crops | 72 | 3 (2+1) |
| 4. | FOR 301 | Introductory Agroforestry | 56 | 2 (1+1) |
| 5. | VSC 304 | Breeding of Vegetable, Tuber and Spice Crops | 72 | 3 (2+1) |
| 6. | PAT 303 | Diseases of Vegetables, Ornamentals and Spice Crops | 72 | 3 (2+1) |
| 7. | FSC 305 | Orchard and Estate Management | 56 | 2(1+1) |

| 8. | AGR 305 | Agro-meteorology and Climate Change | 56 | 2 (1+1) |
|-----------------------------|---------------------|--|-----------------|-------------------|
| 9. | VSC 305 | Potato and tuber crops | 56 | 2 (1+1) |
| 10. | FLG 204 | Principles of Landscape Architecture | 56 | 2(1+1) |
| 11. | ELC 301- ELC 314 | Elective Course | 56 | 2(1+1) |
| TOTAL | | | 680 | 26 (15+11) |
| III YEAR VI SEMESTER | | | | |
| Sl. No | Course code | List of Courses | Contact Periods | Credit hours |
| 1. | AEN 304 | Apiculture, Sericulture and Lac culture | 56 | 2(1+1) |
| 2. | AEN 305 | Insect Pests of Vegetable, Ornamental and Spice Crops | 72 | 3(2+1) |
| 3. | PHT 302 | Postharvest Management of Horticultural Crops | 72 | 3(2+1) |
| 4. | SST 301 | Seed production of Vegetable, Tuber and Spice Crops | 72 | 3(2+1) |
| 5. | SST 302 | Breeding and Seed Production of Flower and Ornamental Plants | 72 | 3(2+1) |
| 6. | PHT 303 | Processing of Horticultural Crops | 96 | 3(1+2) |
| 7. | ABM 301 | Horti-Business Management | 56 | 2(2+0) |
| 8. | ABM 302 | Entrepreneurship Development and Business Management | 56 | 2(1+1) |
| 9. | AEX 302 | Fundamentals of Extension Education | 56 | 2 (1+1) |
| 10. | ELC 301- ELC 314 | Elective Course | 56 | 2(1+1) |
| TOTAL | | | 664 | 25(15+10) |

| IV YEAR VII SEMESTER | | | | | |
|---|-------------|---|--------------|-----------------|--------------|
| Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA) | | | | | |
| Sl. No | Course code | Activities | No. of weeks | Contact periods | Credit hours |
| 1. | AEX 403 | General orientation & On campus training by different faculties | 1 | 320 | 20(0+20) |
| | | Village attachment | 8 | | |
| | | Unit attachment in Univ./College. KVK/research Station | 5 | | |
| | | Plant Clinic | 2 | | |
| | | Agro-Industrial Attachment | 3 | | |
| 2. | HOR 402 | Project Report Preparation, | 1 | 40 | 1(0+1) |

| | | Presentation and Evaluation | | | |
|--|-------------|---|-----------------|-----------------|------------|
| 3. | AEX 404 | All India Tour* | | 40 | 1(0+1)* |
| *Non-gradual compulsory courses | | | Total | 20 | 400 |
| 22(0+22) | | | | | |
| IV YEAR VIII SEMESTER | | | | | |
| Sl. No | Course Code | List of Courses | Contact Periods | Credit hours | |
| 1. | HEL 401 | Module I - Experiential Learning Programme/ | 160 | 10(0+10) | |
| 2. | HEL 402 | Module II - Hands on training (HOT) | 160 | 10(0+10) | |
| Total | | | 320 | 20(0+20) | |

Agro - Industrial Attachment

- The students would be attached with the industries for a period of 3 weeks to get an experience of the industrial environment and working.
- Educational tour will be conducted in break between IV & V Semester or VI & VII Semester.
- Project work registered in VII semester onwards and it will be evaluated in VIII semester and the result declared at VIII semester marks.

RAWE Component – I

Village Attachment Training Programme

| S.No. | Activity | Duration |
|-------|---|----------|
| 1. | Orientation and Survey of Village | 1 week |
| 2. | Agronomical Intervention | 1 week |
| 3. | Plant Protection Interventions | 1 week |
| 4. | Soil Improvement Interventions(Soil sampling and testing) | 1 week |
| 5. | Fruit and Vegetable Production Interventions | 1 week |
| 6. | Food Processing and Storage interventions | 1 week |
| 7. | Animal Production interventions | 1 week |
| 8. | Extension and Transfer of Technology activities | 1 week |

RAWE Component – II

Industrial Attachment

- Students shall be placed in Agro and Cottage industries and Commodities Boards for 03 weeks.
- Industries include Seed/ Sapling production, Pesticides-insecticides, Postharvest-processing-value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

1. Acquaintance with industry and staff Study of the structure, functioning, objective, and mandates of the industry.
2. Study of various processing units and hands-on pieces of training under the supervision of industrial staff.
3. Ethics of industry.

4. Employment is generated by the industry.
5. Contribution of the industry promoting environment.
6. Learning business network including outlets of the industry.
7. Skill development in all crucial tasks of the industry.
8. Documentation of the activities and tasks performed by the students.
9. Performance evaluation, appraisal, and ranking of students.

List of Elective Courses: A students can select two elective courses out of the following and offer during V** and VI** semesters.

| Sl. No | Course Code | Title of the Elective courses | Credits |
|--------|-------------|---|---------|
| 1. | ELC 301 | Production technology of underexploited vegetable crops | 2(1+1) |
| 2. | ELC 302 | Agrochemicals | 2(1+1) |
| 3. | ELC 303 | Turfing and turf management | 2(1+1) |
| 4. | ELC 304 | Food Safety and Standards | 2(1+1) |
| 5. | ELC 311 | Biopesticides and Biofertilizers | 2(1+1) |
| 6. | ELC 312 | Hi-tech. Horticulture | 2(1+1) |
| 7. | ELC 313 | CAD for outdoor and indoor scaping | 2(1+1) |
| 8. | ELC 314 | Agricultural Journalism | 2(1+1) |

List of Experiential Learning Courses for Semester VIII**

| Sl. No | Course Code | Title of the Module | Credits |
|--------|-------------|---|----------|
| 1. | HEL 401 | Commercial Horticulture | 10(0+10) |
| 2. | HEL 402 | Protective Cultivation of High Value Horticulture Crops | 10(0+10) |
| 3. | HEL 403 | Processing of Fruits and Vegetables for Value Addition | 10(0+10) |
| 4. | HEL 404 | Floriculture and Landscape Architecture | 10(0+10) |
| 5. | HEL 405 | Bio-inputs: Bio-fertilizers and Bio-pesticides | 10(0+10) |
| 6. | HEL 406 | Mass Multiplication of Plant and Molecules through Tissue Culture | 10(0+10) |
| 7. | HEL 407 | Mushroom culture | 10(0+10) |
| 8. | HEL 408 | Bee keeping | 10(0+10) |

Note: In addition to above ELP modules other important modules may be given to the students by SAUs.

Total No. of Contact Hours :4668

Total No. of Credits : 188

ABSTRACT OF DEPARTMENT –WISE CREDIT

| S. No. | Group | Credits |
|-------------------------|---|------------------------|
| 1. | Fruit Science | 17 (10+7) |
| 2. | Vegetable science | 13 (8+5) |
| 3. | Postharvest Technology | 8 (4+4) |
| 4. | Floriculture & Landscape Architecture | 7(4+3) |
| 5. | Spices, Plantation, Medicinal and Aromatic Crops | 9 (6+3) |
| 6. | Genetics and Plant Breeding | 6 (4+2) |
| 7. | Agronomy and agro forestry | 13(7+6) |
| 8. | Soil Science and Agricultural Chemistry | 6(3+3) |
| 9. | Plant Pathology | 9 (6+3) |
| 10. | Agricultural Entomology | 13 (8+5) |
| 11. | Seed science and technology | 6 (4+2) |
| 12. | Agricultural Economics | 7 (5+2) |
| 13. | Agricultural Engineering | 2(1+1) |
| 14. | Agricultural Extension | 2(1+1) |
| 15. | Biochemistry /Microbiology/Environmental Sciences/ biotechnology | 9(5+4) |
| 16. | Crop physiology | 4(2+2) |
| 17. | Statistics / Computer Application | 5(3+2) |
| 18. | English / Tamil | 3 (1+2) |
| 19. | NSS/NCC/Physical Education | 2(0+2) |
| 20. | Educational Tour | 2(0+2) |
| Total | | 144 |
| RAWE and ELP | | 20+20 |
| Elective courses | | 4(2+2) |
| Grand Total | | 144+20+20+4=188 |

LIST OF DEPARTMENT WISE COURSES

| Sl. No | Course Code | List of Courses | Semester | Credit hours |
|--|-------------|---|--------------|------------------|
| Fruit Science | | | | |
| 1. | FSC 101 | Fundamentals of Horticulture | I | 3(2+1) |
| 2. | FSC 102 | Plant Propagation and Nursery Management | I | 2(1+1) |
| 3. | FSC 103 | Tropical and Subtropical Fruits | II | 3(2+1) |
| 4. | FSC 305 | Orchard and Estate Management | V | 2(1+1) |
| 5. | PSM 202 | Plantation Crops | IV | 3(2+1) |
| 6. | FSC 203 | Temperate Fruit crops | III | 2(1+1) |
| 7. | PBG 102 | Principles of Plant Breeding | II | 3(2+1) |
| 8. | PBG 101 | Principles of Genetics and Cytogenetics | I | 3(2+1) |
| 9. | FSC 204 | Breeding of Fruit and Plantation Crops | IV | 3(2+1) |
| 10. | FSC 205 | Dryland Horticulture | IV | 2(1+1) |
| | | | TOTAL | 26(16+10) |
| Vegetable Science | | | | |
| 1. | VSC 101 | Tropical and Subtropical Vegetable crops | II | 3(2+1) |
| 2. | PSM 201 | Spices and Condiments | IV | 3(2+1) |
| 3. | VSC 304 | Breeding of Vegetable Tuber and Spice Crops | V | 3(2+1) |
| 4. | SST 301 | Seed Production of Vegetable, Tuber and Spice Crops | VI | 3(2+1) |
| 5. | VSC 202 | Temperate Vegetable crops | III | 2(1+1) |
| 6. | VSC 305 | Potato and Tuber Crops | V | 2(1+1) |
| 7. | VSC 203 | Precision Farming and Protected Cultivation | IV | 3(2+1) |
| | | | TOTAL | 19 (12+7) |
| Postharvest Technology | | | | |
| 1. | PHT 302 | Postharvest Management of Horticultural Crops | VI | 3(2+1) |
| 2. | PHT 303 | Processing of Horticultural Crops | VI | 3(1+2) |
| 3. | PHT 201 | Fundamentals of Food Technology | III | 2(1+1) |
| | | | TOTAL | 8(4+4) |
| Floriculture & Landscape Architecture | | | | |
| 1. | FLG 203 | Ornamental Horticulture | IV | 2(1+1) |
| 2. | SST 302 | Breeding and Seed Production of Flower and Ornamental Crops | VI | 3(2+1) |
| | FLG 204 | Principles of Landscape Architecture | V | 2(1+1) |
| | FLG 201 | Commercial Floriculture | III | 3(2+1) |
| 3. | PSM 303 | Medicinal and Aromatic Crops | V | 3(2+1) |
| | | | TOTAL | 13 (8+5) |
| Plant Protection | | | | |
| 1. | PAT 101 | Fundamentals of Plant Pathology | II | 3(2+1) |

| | | | | |
|-----|------------------------|---|-----------------|-----------------------|
| | | □□□□/ Development Education | | |
| 7. | COM 101 | Information and Communication Technology | II | 2(1+1) |
| 8. | PHE 101 | Physical and Health Education (NC)* | II | 1(0+1) |
| 9. | NSS/ NCC 101 | NSS/NCC(NC)* | I,II,III& IV | 1(0+1) |
| 10. | AEX 403 | Rural Agricultural Work Experience and Agro industrial attachment | VII | 20(0+20) |
| 11. | HEL401 | Module I | VIII | 10(0+10) |
| 12. | HHT401 | Module II | VIII | 10(0+10) |
| 13. | HOR 201 | Short Tour* | IV | 1(0+1) |
| 14. | AEX404 | All India Tour* | VII | 1(0+1) |
| 15. | ELC 301- ELC 314 | Elective Course | V&VI | 4 (2+2) |
| | | | TOTAL | 62 (10+52) |

STUDENT PROJECT

| Sl. No | Course No | List of Courses | Semester | Credit hours |
|--------------|-----------|-----------------|----------|---------------|
| 1. | | Project Work | VII,VIII | 1(0+1) |
| TOTAL | | | | 1(0+1) |

I YEAR I SEMESTER

| Sl.No. | Course No. | Course Title | Credit Hours |
|---------------------------------|---------------------|--|------------------|
| 1. | MAT 101 | Elementary Statistics and Computer Application | 3(2+1) |
| 2. | SAC 101 | Fundamental of Soil Science | 2(1+1) |
| 3. | AEX 101 | Economics and Marketing | 3(2+1) |
| 4. | BIC 101 | Elementary Plant Biochemistry | 2(1+1) |
| 5. | CRP101 | Introductory Crop Physiology | 2(1+1) |
| 6. | FSC 101 | Fundamentals of Horticulture | 3(2+1) |
| 7. | FSC 102 | Plant Propagation and Nursery Management | 2(1+1) |
| 8. | PBG 101 | Principles of Genetics and Cytogenetics | 3(2+1) |
| 9. | AGM 101 | Introductory Microbiology | 2(1+1) |
| 10. | ENG 101 | Communication Skills and Personality Development | 2(1+1) |
| 11. | TAM 101/ ENG 102 | □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□/ Development education | 1(0+1) |
| 12. | NSS/NCC 101 | National Service Scheme/National Cadet Corp | 1 (0+1)(NC)* |
| *NC: Non-gradual courses | | TOTAL | 26(14+12) |

MAT 101 Elementary Statistics and Computer Application 3(2+1)

Course objectives

1. To enable better understanding of students about the statistical methods
2. To impact knowledge on computer applications and their importance in horticulture

THEORY

UNIT I Introduction to statistics

Basic concepts: Variable statistics, types and sources of data, classification and tabulation of data, construction of frequency distribution, tables, graphic representation of data, simple, multiple component and percentage, bar diagram, pie diagram, histogram, frequency polygon and frequency curve average and measures of location, mean, mode, median, geometric mean, harmonic mean, percentiles and quadrilles, for raw and grouped data. Dispersion: Range, standard deviation, variance, coefficient of variation for raw and grouped data. Probability: Basic concept, additive and multiplicative laws. Theoretical distributions, binominal, poison and normal distributions, sampling, basic concepts, sampling vs. complete enumeration parameter and statistic, sampling methods, simple random sampling and stratified random sampling.

UNIT II Tests of Significance

Basic concepts, tests for equality of means, and independent and paired t-tests, chisquare test for application of attributes and test for goodness of fit of Mendalian ratios. Correlation: Scatter diagram, correlation co-efficient and its properties, regression, fitting of simple linear regression, test of significance of correlation and regression coefficient.

UNIT III Experimental designs

Basic concepts, completely randomized design, randomized block design, latin square designs, factorial experiments, basic concepts, analysis of factorial experiments up to 3 factors – split plot design, strip plot design, long term experiments, plot size, guard rows.

UNIT IV Computer application

Introduction to computers and personal computers, basic concepts, operating system, DOS and Windows, MS Word- Features of word processing, creating document and tables and printing of document, MS Excel-Concept of electronic spreadsheet, creating, editing and saving of spreadsheet, inbuilt statistical functions and formula bar, MS Power point-preparation, presentation of slides and slide show.

UNITV Introduction to programming languages

BASIC language, concepts, basic and programming techniques, MS Office, Win Word, Excel, Power point, introduction to multi-media and its application. Visual basic- concepts, basic and programming techniques, introduction to internet.

PRACTICAL

Construction of frequency distribution table and its graphical representation, histogram, frequency polygon, frequency curve, bar chart, simple, multiple, component and percentage bar charts, pie chart, mean, mode for row and grouped data, percentiles, quadrille, and median for row and grouped data, coefficient of variation, 't' test for independent, will equal and unequal variants, paired 't' test, chi-square test for contingency tables and theoretical ratios, correlation and linear regression. Studies on computer components – Basic language, visual basic, programming techniques, MS Office, Excel, power point.

Course outcomes

1. Understand the computation of basic concepts of statistics
2. To study the experimental design
3. Analyze testing of hypothesis and various statistical tests to find the solution in various problems
4. Get information on computer application
5. To know the usage of programming languages

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2. Nageswara Rao, G. 2007. Statistics for Agricultural Sciences. B.S. Publications, Hyderabad.
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2. https://www.hzu.edu.in/agriculture/Introduction_to_Agriculture_Statistics.pdf
3. <https://agrimoon.com/wp-content/uploads/Statistics.pdf>

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

Course objectives

1. To gain basic knowledge of soil fertility and productivity
2. To study importance or significance of soil macronutrient and micronutrients
3. To assess and develop importance of soil physical and chemical properties
4. To study about soil pollution and mitigation process

THEORY

UNIT I Basics of soil science

Soil as a natural body, Pedological and edaphological concepts of soil. Components of soil. Soil genesis: Composition of Earth & crust- soil forming rocks and minerals – Primary and secondary minerals.

UNIT II Soil physical properties

Weathering of rocks and minerals. Factors of soil formation. Soil forming processes. Soil Profile. Soil texture, structure, density and porosity, soil colour, consistence and plasticity. Soil water retention, movement and availability.

UNIT III Soil physico chemical and chemical properties

Soil air, composition, gaseous exchange-problem and its effect on crop growth. Source, amount and flow of heat in soil, Soil temperature and crop growth Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability.

Unit IV- Soil organic matter

Electrical conductivity, Soil colloids – inorganic and organic. Silicate clays: constitution and properties, sources of charge, ion exchange, cation and anion exchange capacity and base saturation. Composition, properties and its influence on soil properties. Humic substances - nature and properties.

UNIT V Soil Biology

Soil Biology: Soil organisms: macro and microorganisms, their beneficial and harmful effects. Soil enzymes. Soil pollution – Types and behaviour of pesticides. Inorganic contaminants. Prevention and mitigation of soil pollution.

PRACTICAL

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil colour. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise

phenomenon of water in soil column and water movement in soil. Demonstration of heat transfer in soil. Preparation and standardization of laboratory reagents, indicators and buffers. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Estimation of organic matter content of soil. Study of soil map.

Course outcomes

1. To know the basics of soil crust and formation.
2. To know the basic components of soil and definitions.
3. To become acquainted with basic soil physico chemical properties.
4. To understand about the soil organic matter and microorganism interaction.
5. To understand about different soil pollution and reclamation.

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3. Sehgal, J. 2005. Pedology concepts and applications, Kalyani Publishers, New Delhi.
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AEX 101 Economics and Marketing 3(2+1)

Course objectives

1. To study the basic micro and macro-economic principles, economic theories applied to horticulture and its role in Indian Economy
2. To impart knowledge on marketing functions, analysis and finance management

THEORY

UNIT I Scope of Economics and consumer behaviour

Nature and scope of economics, definition and concepts, divisions of economics, economic systems, approaches to the study of economics. Consumption – theory of consumer behaviour, laws of consumption, classification of goods. Wants – their characteristics and classification,

UNIT II Theory of Consumption

Utility and its measurement, cardinal and ordinal, law of diminishing marginal utility, law of equi-marginal utility, indifference curve and its properties, consumer equilibrium. Theory of demand, demand schedule and curve, market demand. Price, income and cross elasticities, Engil's law of family expenditure – consumer's surplus. Law of supply – supply schedule and elasticities.

UNIT III Factors production and Macro Economic theory

Factors of production – land and its characteristics, labour and division of labour, theories of population. Capital and its characteristics – classification and capital formation. Enterprises – forms of business organization– merits and demerits. National income: Meaning and importance, concepts of national income accounting and approaches to measurement, Money: meaning and functions of money, classification of money, inflation, Tax: meaning, direct and indirect taxes, VAT/GST.

UNIT IV Theory of Distribution and Marketing

Market equilibrium, distribution – theories of rent, wage, interest and profit. Price determination under various market structures. Marketing- definition – Marketing Process – Need for marketing – Role of marketing — Marketing functions – Classification of markets – Marketing of various channels – Price spread – Marketing Efficiency – Integration – Constraints in marketing of agricultural/Horticultural produce.

UNIT V Marketing Analysis and Finance

Market intelligence – Basic guidelines for preparation of project reports- Bank norms –Insurance– SWOT analysis – Crisis management. Agricultural Finance- meaning, Agricultural credit: meaning, definition, need, classification. Institutional and non-institutional sources, commercial banks and nationalization of commercial banks, Micro financing including KCC. RRBs, RBI, NABARD, World Bank, Credit analysis: 3R's, 7P's and 3C's of credits.

PRACTICAL

Law of Diminishing Marginal Utility, Equi-marginal Utility, Indifference Curve analysis, Individual and market demand, Estimation of Consumer surplus, Measurement of National Income, Types and functions of money. Market structure and Price termination. Perfect Competition- Monopoly-Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Identification of marketing channel– Calculation of Price Spread – Identification of Market Structure – Visit to different Markets, Visit to credit agencies.

Course outcomes

1. To know about scope of economics and consumer behavior
2. To understand the theory of Consumption
3. To get knowledge about the factors production and macro economic theory
4. To know about the constraints in marketing of agricultural/horticultural produce
5. To apply financial analysis in testing the business proposals

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BIC 101 Elementary of Plant Biochemistry 2(1+1)

Course objectives

1. Provides the fundamental knowledge of plant biochemistry
2. To study the specific knowledge of compounds and biochemical pathways that occur in plants

THEORY

UNIT I Carbohydrates

Carbohydrates - occurrence and classification. Structure of monosaccharides, oligosaccharides and polysaccharides. Physical and chemical properties of carbohydrates – optical isomerism, optical activity, mutarotation, reducing property, reaction with acids and alkalies.

UNIT II Lipids

Lipids - occurrence and classification. Storage lipids - Fatty acids and triacyl glycerol. Essential fatty acids and phospholipids - types and importance; Sterols - basic structure and their importance. Physical and chemical constants of oils. Rancidity of oils.

UNIT III Proteins

Amino acids - Classification and properties, essential amino acids. Importance and classification of proteins based on functions and solubility. Structure of proteins. Properties and reactions of proteins.

UNIT IV Enzymes

Enzymes - Properties, classification and nomenclature. Coenzymes, cofactors and isoenzyme. Mechanism of enzyme action. Factors affecting enzyme activity. Allosteric enzymes.

UNIT V Nucleic acids

Nucleic acids: Function, classification, structure, replication, transcription and translation.

PRACTICAL

Qualitative tests of carbohydrates and amino acids. Quantitative estimation of carbohydrates, lipids, proteins, pigments and vitamins. Titration methods for estimation of amino acids/lipids. Assay of enzyme. Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides.

Course outcomes

1. Able to know what the basic technologies are involved in plant biochemistry

2. Students learn about the occurrence, structure and classification of carbohydrates and lipids
3. Students get knowledge on properties, classification and nomenclature of enzymes
4. Students will understand the function, classification, structure, replication, transcription and translation of nucleic acids
5. Students get practical knowledge of quantitative estimation of carbohydrates, lipids, proteins, pigments and vitamins

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2. Thayumanavan, B, Krishnaveni, S and Parvathi, K, (2004), Biochemistry for Agricultural Sciences, Galgotia Publications Pvt Ltd., New Delhi. ISBN :81-7515-459-4.
3. Lehninger, Nelson, D. L. and Michael, M. C. 2004. Principles of Biochemistry. Freeman Publishers.
4. Rameshwar, A. 2006. (3rd edit).Practical Biochemistry. Kalyani Publishers, NewDelhi.
5. Sadasivam, S and Manickam, A. 1996. Biochemical methods for Agricultural sciences. New ageInternational publishers, New Delhi.

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CRP 101 Introductory Crop Physiology 2(1+1)

Course objectives

1. To impart basic knowledge on various functions and processes related to crop production, mineral nutrition, plant growth regulators and environmental stresses, mechanism of absorption and translocation of water and nutrients from soil to plants.
2. To study the various pathways of photosynthesis, respiration and application, plant growth regulators and stress physiology in plants

THEORY

UNIT I Water Relations in Plants

Water relations in plants: role of water in plant metabolism - osmosis, imbibitions, diffusion, water potential and its components, measurement of water potential in plants - absorption of water, mechanism of absorption and ascent of sap; Stomata - Structure, distribution, classification, mechanism of opening and closing of stomata; Osmotic pressure - guttation, stem bleeding; transpiration – types – mechanism of transpiration- factors affecting transpiration - Antitranspirants.

UNIT II Plant Nutrition

Essentiality of nutrients – Arnons and Leibieg; classification – based on requirement, biochemical function and mobility in plants – macro, secondary and micronutrients; Mechanism of absorption and its role in plant metabolism. Deficiency and toxicity symptoms; sand, hydroponics and aeroponic culture; Foliar nutrition and fertigation – significance and relevance. Biological nitrogen fixation.

UNIT III Photosynthesis

Photosynthesis – significance - structure and function of chloroplast; Electromagnetic radiation - - Photosynthetically active radiation – resonance transfer; dark and light reactions, cyclic and non-cyclic electron transfer, CO₂ fixation – C₃, C₄ and CAM metabolism, advantages of C₄ pathway. Photorespiration and its implications, factors affecting photosynthesis. Mode of herbicide action.

UNIT IV Phytohormones and Secondary metabolites

Phytohormones – physiological function of auxin, cytokinin, GA, ABA, ethylene. Secondary metabolites - Significance – classification – role in plant defense

UNIT V Stress Physiology

Different types of Abiotic stresses - water stress - deficit and excess - physiological changes – adaptation – drought escape, avoidance and tolerance; Temperature stress -

Physiological changes - low and high temperature – adaptation – mechanism of tolerance; Cold stress - Chilling and freezing injury – tolerance; Salt stress - physiological changes-adaptation – extrusion, compartmentalization and exclusion - mechanism of tolerance.

PRACTICAL

Solution preparation; Measurement of water potential, osmosis, root pressure, structure of the stomata, Distribution, opening and closing of the stomata, measurement, transpiration measurement Nutritional disorders - Importance of light and chlorophyll in photosynthesis, pigment identification in horticultural crops and studying the enzyme activity of catalase, estimation of phenols, estimation of tolerance indices – proline, Chlorophyll stability index, relative water content (RWC), studying plant movements.

Course outcomes

1. Define the basics aspects of various functions and processes related to crop productivity
2. Classify the mineral nutrient deficiencies and their symptoms
3. Investigate about the various plant growth regulators, competent in enzyme assays and environmental stresses.
4. Examine the hands-on exposure to preparation of solutions, analysis of pigment composition, estimation of growth analytical parameters and the nutrient deficiencies in crops
5. Perform skillfully to diagnose nutrient deficiencies in crop and ameliorate them and will be competent in enzyme assays and applications of plant growth regulators.

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3. Ray Noggle, G. and Fritz, G.J., 1991, Introductory Plant Physiology, Prentice Hall of India Pvt, Ltd., New Delhi.
4. Jain, J. K., 2007. Fundamentals of Plant Physiology. S. Chand & Company Ltd., New Delhi.

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FSC 101 Fundamentals of Horticulture 3(2+1)

Course objectives

1. To inculcate the basic and fundamental aspects of horticulture
2. To impart knowledge in various aspect of crop management practices

THEORY

UNIT I Basic concepts of horticulture

Scope and importance – divisions of horticulture - classification of horticultural crops and nutritive value, area and production, exports and imports, fruit and vegetable zones of India and of different states, nursery techniques and their management - soil and climate, vegetable gardens, nutrition and kitchen garden and other types of gardens – principles,

UNIT II Orchard establishment

Nursery techniques and their management, planning and layout, management of orchards, planting systems and planting densities.

UNIT III Crop management

Types and methods of pruning and training of fruit crops, types and use of growth regulators in horticulture, water management– irrigation methods, merits and demerits, weed management, fertility management in horticultural crops-manures and fertilizers, different methods of application, cropping systems, intercropping, multi-tier cropping, mulching– objectives, types merits and demerits

UNIT IV Bearing habit

Classification of bearing habits of fruit trees, factors influencing the fruitfulness and unfruitfulness

UNIT V Special practices

Rejuvenation of old orchards, top working, frame working, principles of organic farming, market chain management.

PRACTICAL

Features of orchard, planning and layout of orchard, tools and implements, identification of various horticultural crops, layout of nutrition garden, preparation of nursery beds for sowing of vegetable seeds, digging of pits for fruit plants, planting systems, training and pruning of orchard trees, preparation of fertilizer mixtures and field application, preparation and application of growth regulators, layout of different irrigation systems, identification and management of nutritional disorder in fruits, assessment of bearing habits, maturity standards, harvesting, grading, packaging and storage.

Course outcomes

1. Students learn basic concepts and knowledge of horticulture
2. Students get practical experience on nursery development and maintenance
3. Students get hands on practical experience on different types of cutting, layering, grafting and budding
4. Students learn about the physiology of rooting and graft union formation in vegetative propagated plants
5. Students gain basic knowledge on propagation structures construction and maintenance

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4. <http://www.horticultureworld.net/hort-india.htm>

FSC 102 Plant Propagation and Nursery Management 2(1+1)

Course objectives

1. To impart basic knowledge on plant propagation and nursery management of horticultural crops
2. To obtain knowledge on various plant propagation structures

UNIT I Introduction and propagation structures

Importance of plant multiplication - site selection - nursery management - media and containers - soil sterilization – media preparation - manures and manuring - protray culture - mist chamber – humidifiers – greenhouses - glasshouses - cold frames, hot beds, poly-houses, phytotrons - tools and implements

UNIT II Sexual propagation

Importance, advantages and disadvantages of sexual propagation – seed dormancy - types of dormancies – seed treatments - internal and external factors for seed dormancy - use of growth regulators in seed - types and stages of seed germination - apomixis – types of apomixis - mono and polyembryony

UNIT III Asexual propagation

Vegetative propagation - importance, advantages and disadvantages - methods of vegetative propagation – cutting – types of cutting - factors influencing rooting of cuttings - physiological and bio chemical basis of rooting - layering - methods of layering – grafting and budding - methods of grafting and budding - pre-curing and collection of scions - bud wood selection and certification

UNIT IV Physiology of vegetative propagation

Selection and maintenance of mother trees, collection of scion wood stick, scion-stock relationship, and their influences, bud wood certification, formation of graft union, factor affecting of graftage and budding, healing of graftage and budding, bud union – stock - scion relationship – influence of root stock on scion and scion on root stock- graft incompatibility.

UNIT V Specialized organs and Micro propagation

Propagation through specialized organs – division, stolons, pseudobulbs, offsets, runners, corm, runners, suckers - micrografting, meristem culture, callus culture, anther culture, organogenesis, somaclonal variation - hardening of plants in nurseries - nursery registration act - insect/pest/disease control in nursery, cost of establishment of propagation structures.

PRACTICAL

Media for propagation of plants in nursery beds, potting and repotting. Preparation of nursery beds and sowing of seeds. Raising of rootstock. Seed treatments for breaking dormancy and inducing vigorous seedling growth. Preparation of plant material for potting. Hardening plants in the nursery. Practicing different types of cuttings, layering, grafting's and buddings including top grafting and bridge grafting etc. Use of mist chamber in propagation and hardening of plants. Preparation of plant growth regulators for seed germination and vegetative propagation. Visit to a tissue culture laboratory. Digging, labelling and packing of nursery fruit plants. Maintenance of nursery records. Use of different types of nursery tools and implements for general nursery and virus tested plant material in the nursery. Cost of establishment of a mist chamber, greenhouse, glasshouse, polyhouse and their maintenance. Nutrient and plant protection applications during nursery

Course outcomes

1. To get basic knowledge on plant propagation and multiplication
2. To learn practical experience on nursery development and maintenance
3. To get hands on practical experience on different types of cutting, layering, grafting and budding
4. To learn about the physiology of rooting and graft union formation in vegetative propagated plants
5. To gain basic knowledge on propagation structures construction and maintenance

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PBG 101 Principles of Genetics and Cytogenetics 3(2+1)

Course objectives

1. To understand the basic concepts of genetics, principles and their application, ultra-structure of cell and cell organelles.
2. To impart knowledge on inheritance and variation and to understand the parallelism between the behavior of chromosomes and genes.
3. To understand the modern concepts of genetics at molecular level.

THEORY

UNIT I Cytology

Brief history of developments in genetics and cytogenetics; Physical basis of heredity: Structure and function of cell and cell organelles – Differences between Prokaryotes and Eukaryotes. Cell division – mitosis, meiosis and their significance, cell cycle - zygote formation and embryodevelopment - identical and fraternal twins. Chromosome structure, chemical composition, nucleosome, centromere, telomere, euchromatin, heterochromatin, NOR, satellite chromosome, karyotype, ideogram – chromosome banding; Types of chromosomes based on position of centromere, based on structure and function: based on the role in sex determination, normal and special chromosomes - polytene, lampbrush, Other types of chromosomes - B, ring and isochromosomes; Gametogenesis and syngamy in plants.

UNIT II Mendelian laws and modifications of Mendelian laws

Pre-Mendelian ideas about heredity – Vapour and fluid theory, Magnetic power theory, Preformation theory, Lamarck's theory, Darwin's theory, Germplasm theory and Mutation theory. Mendel's experiments and laws of inheritance. Rediscovery of Mendel's work. Terminologies: gene, allele, locus, homozygous, heterozygous, hemizygous, genotype, phenotype, monohybrid, dihybrid, trihybrid, polyhybrid. Chromosomal theory of inheritance. Allelic interactions – Dominance vs. recessive, complete dominance, codominance, incomplete dominance, over dominance. Deviation from Mendelian inheritance – Non allelic interaction without modification in Mendelian ratio – Bateson and Punnett's experiment on fowl comb shape. Non allelic interaction with modification in Mendelian ratio – i.) Dominant epistasis (12:3:1) ii.) Recessive epistasis (9:3:4) iii.) Duplicate and additive epistasis (9:6:1) iv.) Duplicate dominant epistasis (15:1) v) Duplicate recessive epistasis (9:7) vi.) Dominant and recessive epistasis (13:3); Summary of epistatic ratios (i) to (vi). Lethal genes, Pleiotrophy, penetrance and expressivity, phenocopy: Multiple alleles, blood group in humans, coat colour in rabbits, self-incompatibility in plants; pseudo alleles, isoalleles.

UNIT III Sex determination, sex linkage and cytoplasmic inheritance

Sex determination: Autosomes and sex chromosomes - chromosomal theory of sex determination - different types – sex determination in human, fowl, butterfly, grasshopper, honey bee, fumea; Sex determination in plants – Melandrium, papaya, maize. Genic balance theory of Bridges, quantitative theory, hormonal theory, barr bodies, metabolic differentiation theory; Gynandromorphs – sex reversal in chicken. Sex linked inheritance – criss cross inheritance – reciprocal difference; holandric genes; sex influenced and sex limited inheritance. Cytoplasmic inheritance and maternal effects – features of cytoplasmic inheritance, chloroplast, mitochondrial - plastid colour in *Mirabilis jalapa* - iojap gene of maize, cytoplasmic male sterility in rice, kappa particles of paramecium - plasmid and episomic inheritance and mutation

UNIT IV Quantitative inheritance, Linkage, Crossing over, Chromosomal aberration and Mutation

Linkage - coupling and repulsion; Experiment on Bateson and Punnett – Chromosomal theory of linkage of Morgan – Complete and incomplete linkage, Linkage group. Crossing over – significance of crossing over; cytological proof for crossing over - Stern's experiment; Factors controlling crossing over. Strength of linkage and recombination; Two point and three point testcross. Double cross over, interference and coincidence; genetic map, physical map. Chromosomal aberration: Variation in chromosome structure – deletion, duplication, inversion and translocation – genetic and cytological implications; Chromosomal aberration: Variation in chromosome number – euploid, aneuploid, types of aneuploids and their origin; Nondisjunction- Klinefelter syndrome and Turner syndrome; Definition of eugenics and eugenics; Polyploid - auto and allopolyploids, their characters; evolution of wheat, Triticale, cotton, tobacco, Brassicas. Use of haploids, dihaploids and doubled haploids in Genetics. Mutation – characteristics of mutation – micro and macro mutation – CIB technique - molecular basis of mutation- Transition and transversion; major physical and chemical mutagens. Quantitative inheritance – Multiple factor hypothesis – Nilsson Ehle experiment on wheat kernel colour. Polygenes – transgressive segregation, comparison of quantitatively and qualitatively inherited characters; modifiers; Types of gene action controlling quantitative traits.

UNIT V Modern concept of genetics

DNA, the genetic material – Griffith's experiment, experiment of Avery, McClelland and McCarthy – confirmation by Hershey and Chase; RNA as genetic material – Frankel, Conrat and Singer experiment. Structure of DNA – Watson and Crick model – Central

dogma of life. Proof for semi conservative method of DNA replication; Models of DNA replication; RNA types -mRNA, tRNA, rRNA; Genetic code, protein synthesis; Regulation of gene expression – operon model of Jacob and Monod; Structural genes and regulator genes. Cistron, muton and recon; Complementation test; exons, introns – split genes – Transposable genetic elements- Ac – Ds system in maize. Functional genomics, Metagenomics, Transcriptomics, Proteomics, Metabolomics and Phenomics.

PRACTICAL

Study of fixatives and stains - Study of microscopes – Preparation of fixatives and stains – pretreatment of materials for mitosis and meiosis – study of mitosis and meiosis. Study of genetic ratios of – monohybrid, dihybrid – incomplete dominance. Gene interaction - multiple alleles and multiple factors. Study of linkage, estimation of strength of linkage and recombination frequency in two point and three-point test cross data and F₂ data – Drawing of genetic map – interference and coincidence - Genetics variation in pea.

Course outcomes

1. Explain the basic principles of inheritance and Cell structure
2. Discuss about the practical hands on experience in the basic skills employed in Microscopes
3. Developed the capacity to work out the various classical examples in genetics, crossing over and their interactions and Sex determination
4. Explain the Structure and Models of DNA, RNA and Protein Synthesis.
5. Discriminate to the carry out cytological analysis in breeding populations.

References

1. Gupta P.K., 1997. Cytogenetics. Rastogi Publications, Meerut
2. Verma, P.S. and V.K. Agarwal. 2007. Genetics. S.Chand and Company Ltd./ New Delhi.
3. Pundhansingh. 2014. Elements of Genetics. Kalyani Publishers
4. Daniel Sundararaj, G. Thulasidas and M. Stephen Dorairaj, 1997. Introduction to Cytogenetics and Plant Breeding. Popular Book Depot, Chennai –15.
5. Strickberger. M.W. 1996. Genetics. Prentice-Hall of India Pvt. Ltd. New Delhi.
6. Singh, B.D. 2004. Fundamentals of Genetics, Kalyani Publishers, Chennai.

E- Resources

1. www.nmsu.edu,
2. www.biology200.gsu.edu

AGM 101 Introductory Microbiology 2(1+1)

Course objectives

1. To enable better understanding of students about the various groups of microorganisms.
2. To familiarize students with the basic laboratory techniques, instruments and equipment use in the field of microbiology.

THEORY

UNIT I History and scope of microbiology

Contributions of Anton Von Leeuwenhoek, Louis Pasteur, John Tyndall, Robert Koch, Edward Jenner, Joseph Lister, Beijerinck, Winogradsky and Waksman; Position of microorganisms in living world; Spontaneous Generation theory; Germ theory of disease.

UNIT II Microscopy and Microbial physiology

Microscopy – principles and types. Prokaryotes Vs Eukaryotes; Bacterial size, shape, arrangement and morphology; Structure and organization of a bacterial cell; Bacterial growth, reproduction; Growth curve.

UNIT III Virology and Microbial Genetics

Viruses, Bacteriophages – Lytic and Lysogenic cycles; Genetic recombination – Transformation, Conjugation and Transduction.

UNIT IV Soil Microbiology

Microbial interactions; Rhizosphere: Plant growth promoting rhizobacteria; Biological nitrogen fixation; Types and importance of biofertilizers.

UNIT V Applied Microbiology

Industrially important microorganisms, common microbial fermentations-silage, saurkraut. Mushroom-types and production.

PRACTICAL

Microscopy - light microscopes; Staining techniques - simple and differential staining; Sterilization – Principles and techniques, equipment and apparatus used for sterilization; Media preparation; Isolation and enumeration of soil microorganisms; Purification of microorganisms; Saurkraut production. Organic matter decomposition – measurement of CO₂ evolution; Demonstration of antibiosis. Isolation of N₂ fixing and phosphate solubilizing microorganisms; Mass production of bacterial biofertilizers and method of application. Mushroom cultivation techniques.

Course outcomes

1. Understand about the role of microorganisms in soil and their influence on the plant growth and industrial production with historical developments.
2. The students exposed to soil microbial diversity, their functions in soil and microbial transformation of nutrient and humus formation.
3. The students exposed to the role of soil microbes in Biogeochemical cycles such as Carbon cycle, Nitrogen cycle, Phosphorus cycle and Sulphur cycle
4. The students should know about the role of microbes in reclamation of problematic soils, solid waste management, Biodegradation of agricultural residues and chemicals and processes involved in remediation.
5. The students would expose to the beneficial and harmful relationships between soil microorganism and different parts of plants.

References

1. Prescott, M.J., Harley, J.P. and Klein, D.A. 2002. Microbiology. 5th Edition, WCB McGraw Hill, New York.
2. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. & Painter, P.R. 1987. General Microbiology, Fifth Edition. MacMillan: [i]-xiv, 1-689. [Reprinted 1989]
3. Pelczar MJ, Chan ECS and Kreig NR. 1998. Microbiology, 5th edition. Tata McGraw-Hill.
4. Singh, T. Purohit, S. S. and Parihar, P. Soil Microbiology. 2010. Mrs. SaraswatiPurohit. India.
5. SubbaRao, N.S. 2006. Soil Microbiology (4th Edition of Soil Microbiology and Plant Growth).Oxford & IBH, New Delhi.

E- Resources

1. <http://www.microbes.info>
2. <http://aem.asm.org>
3. <http://microbelibrary.com>
4. <http://www.rapidmicrobiology.com> Kenneth Todar, U. of Wisconsin-Madison, Department of Bacteriology.
5. URL ([http:// www.textbookofbacteriology.net/](http://www.textbookofbacteriology.net/)).

ENG 101 Communication Skills and Personality Development 2(1+1)

Course objectives

1. Enhance the learner's communication skills by giving adequate exposure in LSRW – Listening, Speaking, Reading, Writing skills and the related sub-skills.
2. Help the learners recognize and operate in various styles and registers in English.

THEORY

UNIT I Communication: Introduction, Functions, Process and Models

Communication: Meaning & definition of communication, classification of communication, functions of communication, process of communication, models of communication, elements of communication.

UNIT II Communication: Types, Barriers, Factors for Effective communication:

Types of communication: verbal communication- written, letter writing, types of letters, resume writing, report writing- Oral communication. Non-verbal communication- body language meaning, definition, use of body language gesture, posture, eye contact, facial expression. Barriers to communication, characteristics of successful communication.

UNIT III Introduction to Personality

The concept of personality - Dimensions of personality –Personality determinants, Self Awareness, Traits for building positive personality, Developing positive personality, Generating good ideas, Handling of ideas, Habits - forming good habits.

Unit IV: Personality Development-Attitude, Self Motivation

Attitude - Concept - Significance - components of attitude, attitude formation, factors affecting attitudes – types, steps for building positive attitude, steps for maintaining positive attitude, Concept of motivation – Significance, Internal and external motives , Importance of selfmotivation, Skills for increasing self motivation.

UNIT V Personality Development - Self Esteem, Time and Stress management

Self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self esteem – Symptoms. Conflict and Stress Management - Types of Stress, causes, Stress reduction/management. Time management - Work ethics –Good manners and etiquette.

PRACTICAL

Understanding Listening and note taking, writing skills, writing skills, field diary and lab record; indexing, footnote and bibliographic procedures. Understanding Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; Practice of Non-Verbal Communication Skills, Personality Traits, role play, group discussion skills, oral presentation skills, team building skills, public speaking skills.

Course outcomes

1. Understanding and differentiating the concept of comprehension and its types with enhancement of listening skills that helps interpret texts and its basic grammatical structure.
2. Describing the techniques involved in interpretation of content and enhancing the syntax structure gradually
3. Identifying the linguistic process and enabling the students to experiment on speaking English effectively with regular practice and exercises
4. Practicing the students to learn the convincing writing techniques and approaches that may help them in future aspect.
5. Experimenting and preparing the students compatible and competitive enough based on work place environment with sharing knowledge on interview skill and interpersonal skill

References

1. Balasubramanian T. 1989. A Textbook of Phonetics for Indian Students. Orient Longman, New Delhi.
2. Balasubramanyam M. 1985. Business Communication. Vani Educational Books, New Delhi.
3. Naterop, Jean, B. and Rod Revell. 1997. Telephoning in English. Cambridge University Press, Cambridge.
4. Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd. New Delhi.
5. Krishnaswamy, N and Sriraman, T. 1995. Current English for Colleges. Macmillan India Ltd. Madras.
6. Narayanaswamy V R. 1979. Strengthen your writing. Orient Longman, New Delhi.

E – References

1. https://oms.bdu.ac.in/ec/admin/contents/316_16SNMEVC2_2020052111292580.pdf
2. <https://agrimoon.com/wp-content/uploads/COMMUNICATION-SKILLS.pdf>

Basic principles of learning - binary terms viz., growth and development, education – for – life and life – long education, motivation and morale, Occupation and profession, training and education, lateral thinking and convergent thinking, teaching and learning – discussion, Bloom’s classification of educational objectives – cognitive, affective, psychomotor domain(s), Career development – opportunity for graduates of agriculture and allied sciences – discussion, Success story of a farmer / entrepreneur – factors involved – role – play, Brainstorming – demonstration, Simulation – Educational Simulation-Interactive Teaching - Business Simulation –Company’s annual report for analysis, Interpersonal communication – Transactional communication – ice breaker, The conduct of a symposium, Conferencing – the concept and presentation of a paper, Scientific Article Writing and Editing, Popular Article Writing, Editing and Blogging, Project proposal, Project Report – writing, Entrepreneur – intrapreneur – Managing an intrapreneur – motivation and entrepreneurship development – planning, monitoring and evaluation.

Course outcomes

1. Discovering the basic principles of learning and understanding the methodology involved in teaching-learning process.
2. Simulating the aspects of career development and enabling the students to apply them in their day-to-day life.
3. Explaining the terms of entrepreneurship and motivating the students to explore their ideas.
4. Describing communication and interpersonal skill development to help them build a healthy workplace atmosphere and to explore the opportunities through writing.
5. Illustrating the concept involved in teaching and its process using the modern techniques.

E-References

1. <http://www.e-booksdirectory.com/details.php?ebook=9481>
2. <https://www.engvid.com/>

NSS/NCC 101 National Service Scheme (0+1)

Course objectives

1. Enable the students to understand the community in which they work and to understand themselves in relation to their community
2. To engage the students in popularization of agro techniques

I Year

Orientation – NSS origin – motto – symbol – NSS administration at different levels – programme planning – Rural Projects – Urban projects – Government schemes – Career guidance – Self help groups – Environment protection – Use of natural energy – Conventional energy resources – Soil and Water conservation – Community health programmes – Women and child welfare – Education for all – National days – Commemorative days – NSS thematic programmes – literacy & computer awareness campaigns.

II Year

Popularization of agro techniques – Self employment opportunities – Animal health, Dairy and Poultry farming – Road safety – Training on First aid and emergency cell. Popularization of small savings – communal harmony and National integration – Care of Senior citizens – Personality development – meditation, Yoga Art of living – Activities on the preservation of National monuments, cultural heritage and folklore – special camp activities – National days – commemorative days – NSS thematic programmes – literacy & computer awareness campaigns.

Course outcomes

1. To evoke social consciousness among students through various activities.
2. To develop youth leadership in the students
3. To utilize their knowledge in finding practical solutions to individual and community problems
4. To create the awareness of all kinds of discipline to the students

5. To practice national integration and social harmony, To Gain skills in mobilizing community participation

National Cadet Corp (0+1)

General - Military History - Historical – geographical – Customs and Traditions of India - Defence services– Introduction to NCC – NCC Song-Aims of NCC – Principles of NCC- NCC organization Duties of good citizen – system of NCC training –Drill- Foot drill – Arms drill – Guard of Honour – Ceremonial Drill – Weapon Training & Equipment– Communication-types-National Integration Leadership-Civil affairs- Civil defense –Disaster management-Social service- Health & Hygiene Environment and Ecology/ Nature awareness - Self Defence-Camps & Adventure training-Changing trends in Technology -Personality development-Communication Skills -Specialised subjects-Army or Navy or Air force. Specialised subject-Navy-Naval Orientation -Naval communication-Navigation-Seamanship - Oceanic wealth-Gunnery-Fire Fighting and Damage control & Safety- Ship and Boat modeling, Submarine-Search and Rescue-Antisubmarine-Swimming.

Besides the above schedule, NCC cadets will be involved during important occasions during convocation, Independence Day, Republic day, College days, etc. Regular Classes will be conducted on the afternoon of Saturdays from I Year to III Year. Evaluation will be conducted during I, II, III and IV as detailed below. Class grade chart will be sent at the end of V semester.

I YEAR II SEMESTER

| Sl. No. | Course code | List of Courses | Credit hours |
|----------------------------------|--------------------|---|---------------------|
| 1. | FSC 103 | Tropical and Subtropical Fruits | 3(2+1) |
| 2. | VSC 101 | Tropical and Subtropical Vegetables | 3(2+1) |
| 3. | PBG 102 | Principles of Plant Breeding | 3(2+1) |
| 4. | SAC 102 | Soil Fertility and Nutrient Management | 2(1+1) |
| 5. | AGR 101 | Water Management in Horticultural Crops | 2(1+1) |
| 6. | PAT 101 | Fundamentals of Plant Pathology | 3(2+1) |
| 7. | ENS 101 | Environmental Studies and Disaster Management | 3(2+1) |
| 8. | CRP 102 | Growth and Development of Horticultural Crops | 2(1+1) |
| 9. | PHE 101 | Physical and Health Education | 1(0+1) (NC)* |
| 10. | COM 101 | Information and communication technology* | 2(1+1) (NC)* |
| 11. | NSS/ NCC 101 | National Service Scheme/National Cadet Corp | - |
| **NC: Non-gradual courses | | TOTAL | 24(14+10) |

FSC 103 Tropical and Subtropical Fruits 3(2 + 1)

Course objectives

1. To acquire knowledge on the production and postharvest techniques of tropical and subtropical fruit crops
2. To impart hands on experience on propagation techniques, special horticultural practices and harvesting of tropical and subtropical fruit crops

THEORY

UNIT I Scope and importance

Scope and importance- classification of tropical and sub-tropical fruits including genome classification - tropical and sub-tropical zones of India and Tamil Nadu – area and production and export potential

UNIT II Production technology of Mango, Banana and Guava

Composition and uses – origin and distribution – species and cultivars - climate and soil requirements - propagation techniques –rootstocks- main field preparation – spacing, planting density -cropping systems-after care - nutrients, water and weed management - training and pruning –special horticultural techniques including use of plant growth regulators - physiological disorders and remedies -maturity indices and harvesting, grading, packing and storage

UNIT III Production technology of Papaya, Sapota, Grape, Acid lime and Sweet orange

Composition and uses – origin and distribution – species and cultivars- climate and soil requirements - propagation techniques –rootstocks- main field preparation – spacing, planting density -cropping systems-after care - nutrients, water and weed management - training and pruning –special horticultural techniques including use of plant growth

regulators - physiological disorders and remedies -maturity indices and harvesting, grading, packing and storage

UNIT IV Production technology of Mandarin orange, Jack fruit, Avocado, Pineapple, Mangosteen, Litchi and Loquat

Composition and uses – origin and distribution – species and cultivars. climate and soil requirements - propagation techniques –rootstocks- main field preparation – spacing, planting density -cropping systems-after care - nutrients, water and weed management - training and pruning –special horticultural techniques including use of plant growth regulators -physiological disorders and remedies -maturity indices and harvesting, grading, packing and storage

UNIT V Production technology of Rambutan, Carambola, Durian, Bilimbi, Passion fruit, Breadfruit and Rose apple

Composition and uses – origin and distribution – species and cultivars - climate and soil requirements - propagation techniques –rootstocks- main field preparation – spacing, planting density -cropping systems-after care - nutrients, water and weed management - training and pruning –special horticultural techniques including use of plant growth regulators - physiological disorders and remedies -maturity indices and harvesting, grading, packing and storage

PRACTICAL

Description and identification of varieties based on flower and fruit morphology in above crops. Training and pruning of grapes, mango, guava and citrus. Selection of site and planting system, pre-treatment of banana suckers, desuckering in banana, sex forms in papaya. Use of plastics in fruit production. Visit to commercial orchards and diagnosis of maladies. Manure and fertilizer application including bio-fertilizer in fruit crops, preparation and application of growth regulators in banana, grapes and mango. Seed production in papaya, latex extraction and preparation of crude papain. Ripening of fruits, grading and packaging, production economics for tropical and sub-tropical fruits. Mapping of arid and semi-arid zones of India. Botanical description and identification of ber, fig, jamun, pomegranate, carissa, phalsa, wood apple, West Indian cherry, tamarind, aonla, bael and annona.

Course outcomes

1. Learn about the importance, nutrition and production status of tropical and subtropical fruits

2. Acquire knowledge and practical experience on production technology of tropical fruits
3. Gain knowledge and practical experience on production technology of subtropical fruit crops
4. Demonstrate various propagation methods, important cultural practices and harvesting of tropical and subtropical fruits
5. To gain practical experience on training and pruning in tropical and subtropical fruits

References

1. Bose, T. K. 1996. Fruits of India – Tropical and sub – tropical. Nayaprakash, Calcutta
2. Bose, T. K. S. K. Mitra, and D. S. Rathore. 1998. Temperate Fruits - Nayaprakash, Calcutta
3. Bose, T.K., S.K. Mitra and D. Sanyal 2001, Fruits: Tropical and Subtropical (2 volumes) NayaUdyog, Calcutta.
4. Chadha, K.L. 2001. Handbook of Horticulture. ICAR, Delhi
5. DewasishChoudary and Amal Mehta, 2010. Fruit crops, Oxford book company, USA
6. Prasad s and Kumar U 2010 A handbook on fruit production, Agrobios Publication (ISBN (13) 978-81-7754-393-3
7. David Jackson, Norman Looney, Michael Moorely, Bunker and Graham Thiele. 2011. 3rd edition. Temperate and Sub tropical fruit production, CABI Publishing, U.K.
8. Singh P, 2015. Fruit crops, Agrotech press (ISBN - 9789384568498)

E- References

1. www.actahort.org/
2. <http://agriportal.tnau.ac.in/>
3. <http://www.freshplaza.com>
4. <http://www.safj.co.za/>
5. <http://www.fruitlogistica.de/en/>
6. <http://mango.org/en/Home>
7. <http://www.promusa.org/>
8. <http://wineserver.ucdavis.edu/>

VSC 101 Tropical and subtropical vegetable crops 3(2 + 1)

Course objectives

1. To know basics on scope and importance, area and production and export potential of tropical and subtropical vegetable crops
2. To impart knowledge on the production technology of tropical and subtropical vegetable crops
3. To study the special cultural practices in tropical and subtropical vegetable crops

THEORY

UNIT I Scope and importance of tropical and sub-tropical vegetables

Scope and importance- area and production, - export potential - institutions involved in vegetable crops research - Classification of vegetable crops - vegetable production in nutrition garden, kitchen garden, truck garden, market garden, roof garden, floating garden - Types of vegetable farming - rice fallow vegetable production, river bed cultivation, rainfed cultivation, contract farming- Organic vegetable production - GAP for vegetable production, export standards of vegetables

UNIT II Production technology of Tomato, brinjal, chilli, capsicum and bhendi

Area and production - description of varieties and hybrid, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of vegetable crops and planting for directly sown/transplanted vegetable crops. Spacing, planting systems,

water and weed management; nutrient management and deficiencies, use of chemicals and growth regulators. Cropping systems, harvest, yield, post-harvest handling, economics and marketing

UNIT III Production technology of cucurbitaceous vegetables

Bitter gourd, snake gourd, ribbed gourd, bottle gourd, Ivy gourd, chow – chow, ash gourd, pumpkin, watermelon, musk melon, cucumber and gherkin - area and production - description of varieties and hybrid, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of vegetable crops and planting for directly sown/transplanted vegetable crops. Spacing, planting systems, water and weed management; nutrient management and deficiencies, use of chemicals and growth regulators. Cropping systems, harvest, yield, post-harvest handling, economics and marketing

Unit IV Production technology of cluster beans, cowpea, lab-lab and snap bean

Area and production - description of varieties and hybrid, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of vegetable crops and planting for directly sown/transplanted vegetable crops. Spacing, planting systems, water and weed management; nutrient management and deficiencies, use of chemicals and growth regulators. Cropping systems, harvest, yield, post-harvest handling, economics and marketing

Unit V Production technology of moringa, curry leaf, portulaca, basella, sorrel and roselle

Area and production - description of varieties and hybrid, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of vegetable crops and planting for directly sown/transplanted vegetable crops. Spacing, planting systems, water and weed management; nutrient management and deficiencies, use of chemicals and growth regulators. Cropping systems, harvest, yield, post-harvest handling, economics and marketing

PRACTICAL

Identification and description of tropical and sub-tropical vegetable crops; nursery practices and transplanting, preparation of field and sowing/planting for direct sown and planted vegetable crops. Herbicide use in vegetable culture; top dressing of fertilizers and intercultural; use of growth regulators; identification of nutrient deficiencies. Physiological disorder. Harvest indices and maturity standards, post-harvest handling and storage, marketing, seed extraction (cost of cultivation for tropical and sub-tropical vegetable crops), project preparation for commercial cultivation.

Course outcomes

1. Students gain knowledge on importance, nutrition and production status of tropical and subtropical vegetable crops
2. Attain practical experience on production technology of tropical vegetable crops
3. Students gain knowledge and practical experience on production technology of subtropical vegetable crops
4. Students get practical knowledge on propagation methods, important cultural practices and harvesting of tropical and subtropical vegetable crops
5. To obtain practical experience on training and pruning in tropical and subtropical fruits

References

1. Bose, T. K., Kabir, J., Maity, T. K., Parthasarathy V. A. and Som, M. G. 2002. Vegetable Crops Vol. I, II & III NayaProkash, Kolkata
2. Rai, N. and D. S. Yadav, 2005. Advances in Vegetable Production: Research co Book Centre, New Delhi.
3. Veeraraghavathatham, D., M. Jawaharlal and SeemanthiniRamdas. 1991. A guide on vegetable culture. A. E. Publication Coimbatore.

E- References

1. http://www.jnkvv.org/PDF/06042020111153sub_tr._vege.pdf
2. https://pdf.usaid.gov/pdf_docs/PNAAD524.pdf

PBG 102 Principles of Plant Breeding 3(2+1)

Course objectives

1. To expose the students to basic and applied principles of plant breeding, mode of pollination, reproduction and methods of plant breeding
2. To know practical experience on emasculation and pollination techniques of horticultural crops

THEORY

UNIT I Basis of plant breeding

Plant breeding as a dynamic science, genetic basis of Plant Breeding – classical, quantitative and molecular, Plant Breeding in India – limitations, major achievements, goal setting for future.

UNIT II Sexual and asexual reproduction

Sexual reproduction (cross and self-pollination), asexual reproduction, pollination control mechanism (incompatibility and sterility and implications of reproductive systems on population structure). Genetic components of polygenic variation and breeding strategies, selection as a basis of crop breeding and marker assisted selection

UNIT III Hybridization and selection

Hybridization and selection – goals of hybridization, selection of plants; population developed by hybridization – simple crosses, bulk crosses and complex crosses. General and special breeding techniques.

UNIT IV Heterosis breeding

Heterosis – concepts, estimation and its genetic basis. Calculation of heterosis, heterobeltosis, GCA, SCA, inbreeding depression, heritability and genetic advance.

UNIT V Emasculation and pollination techniques

Emasculation, pollination techniques in important horticultural crops. Breeding for resistance of biotic and abiotic stresses. Polyploidy breeding. Mutation breeding.

PRACTICAL

Breeding objectives and techniques in important horticultural crops. Floral biology – its measurement, emasculation, crossing and selfing techniques in major crops. Determination of mode of reproduction in crop plants, handling of breeding material, segregating generations (pedigree, bulk and back cross methods), Field layout, and maintenance of experimental records in self and cross pollinated crops. Demonstration of hybrid variation and production techniques. Hardy Weinberg Law and calculation, male sterility and incompatibility studies in horticultural crops. Calculation of inbreeding depression, heterosis, heterobeltioses, GCA, SCA, GA, heritability. Understand about the historical developments and contributions of some scientist in the field of Plant Breeding. Learning different plant breeding methodologies and applications employed for self, cross and vegetatively propagated crops will also be learned.

Course outcomes

1. Impart knowledge on basic and applied aspects of plant breeding
2. Students will learn pollination and reproduction methods
3. Students get practical knowledge on emasculation and hybridization techniques
4. Students will learn different breeding methods
5. Students will understand the seed production technology and IPR

References

1. R.W. Allard. Principles of plant breeding. John Wiley & Sons, New York.
2. V.L. Chopra. Plant breeding: Theory and Practice. Oxford & IBH Publishing CO. Pvt. Ltd., New Delhi.
3. Phundan Singh. Essentials of plant breeding. Kalyani Publishers
4. J.R. Sharma. Principles and practices of plant breeding. Tata McGraw Publishing Company Ltd., New Delhi

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1. <https://gcgldh.org/media/nd4oa4lu/plant-breeding-principles-and-methods.pdf>
2. <https://agrimoon.com/wp-content/uploads/Principles-of-Plant-Breeding.pdf>
3. http://eprints.stiperdharma.wacana.ac.id/105/1/%5BGeorge_Acquaah%5D_Principles_of_Plant_Genetics_and_%28BookFi%29.pdf
4. <https://www.davuniversity.org/images/files/study-material/Fundamentals%20of%20Plant%20Breeding%20AGS127.pdf>

SAC 102 Soil Fertility and Nutrient Management 2(1+1)

Course objectives

1. To impart knowledge about soil fertility management with application of manures and fertilizers.
2. To learn plant nutrient toxicity symptoms and remedies in horticultural crops

THEORY

UNIT I Soil fertility and productivity

Introduction to soil fertility and productivity- factors affecting. Essential plant nutrient elements- functions, deficiency systems, transformations and availability. Acid, calcareous and salt affected soils – characteristics and management.

UNIT II Soil organic content

Soil organic matter, Role of microorganisms in organic matter- decomposition – humus formation. Importance of C:N ratio and pH in plant nutrition, soil buffering capacity. Integrated plant nutrient management. Soil fertility evaluation methods, critical limits of plant nutrient elements and hunger signs.

UNIT III Macro nutrients

NPK fertilizers: composition and application methodology, luxury consumption, nutrient interactions, deficiency symptoms, visual diagnosis. Plant nutrient toxicity symptoms and remedies measures. Soil test crop response and targeted yield concept. Biofertilizer. Nutrient use efficiency and management.

UNIT IV Secondary and micronutrient

Secondary and micronutrient fertilizer. Fertilizer control order. Manures and fertilizers classification and manufacturing process. Properties and fate of major and micronutrient in soils.

UNIT V Fertilizer use efficiency

Fertilizer use efficiency and management. Effect of potential toxic elements in soil productivity.

PRACTICAL

Analysis of soil for organic matter, available N,P,K and Micronutrients and interpretations. Gypsum requirement of saline and alkali soils. Lime requirement of acid soils. Estimation of organic carbon content in soil. Determination of Boron and chlorine content in soil. Determination of Calcium, Magnesium and Sulphur in soil. Sampling of organic manure and fertilizer for chemical analysis. Physical properties of organic manure and fertilizers. Total nitrogen in urea and farmyard manure. Estimation of ammoniacal nitrogen and nitrate nitrogen in ammoniacal fertilizer. Estimation of water soluble P_2O_5 , Ca and S in SSP, Lime and Gypsum. Estimation of Potassium in MOP/SOP and Zinc in zinc sulphate. Visiting of fertilizer testing laboratory.

Course outcomes

1. To understand the plant nutrient functions, deficiency systems, transformations and availability
2. To obtain knowledge on soil organic content and integrated plant nutrient management
3. Students learn function and deficiency of macro, secondary and micro nutrients
4. To impart knowledge on bio-fertilizer application methods

5. Demonstrate the methods of fertilizer application and nutrient use efficiency.

References

1. Yawalkar K S, Agarwal JP and Bokde S, 1992. Manures and Fertilizers. Agri. Horticultural Publishing House, Nagpur.
2. Tandon HLS, 1994. Fertilizers Guide. Fertilizers Development Consultation Organization, New Delhi.
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2. <https://agrimoon.com/wp-content/uploads/Soil-Chemistry-Soil-Fertility-Nutrient-Management.pdf>

AGR 101 Water Management in Horticultural Crops 2(1+1)

Course objectives

1. To study about the various types of water conservation methods
2. To gain knowledge about various methods of irrigation and drainage methods
3. To enable the students on better understanding of various types of wells and problem-solving techniques for various types of conservation methods.

THEORY

UNIT I Water resources in India

Importance of water, water resources in India. Area of different crops under irrigation, function of water for plant growth, effect of moisture stress on crop growth.

UNIT II Soil moisture

Available and unavailable soilmoisture – distribution of soil moisture – water budgeting – rooting characteristics – moistureextraction pattern.

UNIT III Water requirement

Water requirement of horticultural crops – lysimeter studies – Plant waterpotential climatological approach – use of pan evaporimeter – factor for crop growth stages– critical stages of crop growth for irrigation.

UNIT IV Irrigation scheduling

Irrigation scheduling – different approaches –methods of irrigation – surface and sub-surface pressurized methods viz., sprinkler and dripirrigation, their suitability, merits and limitations, fertigation, economic use of irrigation water.

UNIT V Water management

Water management problem, soils quality of irrigation water, irrigation management practicesfor different soils and crops.Layout of different irrigation systems, drip, sprinkler.Layout ofunderground pipeline system.

PRACTICAL

Measurements of irrigation water by using water measuring devices, use of common formulain irrigation practices, practicing of land leveling and land shaping implements, layout fordifferent methods of irrigation. Estimation of soil moisture constants and soil moisture by usingdifferent, methods and instruments, scheduling of irrigation, different approaches, practicing useof instruments, estimation of irrigation efficiency and water requirements of horticultural crops,irrigation planning and scheduling, soil moisture conservation practices. This course gives various information related to erosion such as causes of soil erosion, its different types and different forms.

Course outcomes

1. Course gives the knowledge on critical stages of irrigationin horticultural crops
2. Students to learn about various agronomical measures to conserve water
3. Students get knowledge on soil moisture conservation practices
4. This course helps the students to get the knowledge on irrigation management system for different soils and crops
5. Students able to understand about the various types and needs of surface and sub-surface irrigation system.

References

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5. Michael, A.M. 2015. Irrigation Theory and Practices. Vikas publishing house Pvt., Ltd.

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PAT 101 Fundamentals of Plant Pathology 3(2+1)

Course objectives

1. To study the basic concepts of Plant Pathology and causes of plant diseases
2. To know about pathogenesis and plant defense mechanisms
3. To study the general characters and classification of fungal kingdom Protozoa
4. To study the general characters and classification of Phylum Ascomycota and basidiomycota
5. Study of general characters of bacteria, virus, virusoids, algae.

THEORY

UNIT I Introduction to Plant Pathology

Plant Pathology- Definition – Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Causes and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa and phanerogamic parasites.

UNIT II Pathogenesis

Koch's postulates- Types of parasitism- Pathogenesis - Mode of infection – pre-penetration, penetration and post penetration - Role of enzymes and toxins on disease development-Effect of pathogen on physiological functions of the plants

UNIT III General characters and taxonomy of protozoa, chromista and fungi

General characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Binomial system of nomenclature and rules of nomenclature of fungi. Classification of fungi. Key to divisions, sub-divisions, orders and classes based on Ainsworth and Bisby's dictionary of fungi 10th edition compiled by Kirk *et al.*, (2008). General characters and symptoms of **Kingdom: Protozoa, Phylum: Plasmodiophoromycota, Plasmodiophorabraceae. Kingdom: Chromista, Phylum: Oomycota-Pythium, Phytophthora, Sclerospora, Plasmopara and Albugo Kingdom: Fungi, Phylum: Chytridiomycota-Synchytrium, Phylum: Zygomycota -Mucor, Rhizopus**

UNIT IV General characters and taxonomy of fungi-Ascomycota and Basidiomycota

Phylum: Ascomycota: Classification, symptoms and taxonomy characters of *Taphrina, Capnodium, Mycosphaerella, Macrophomina, Cochliobolus, Lewia, Venturia, Eurotium, Talaromyces, Sclerotinia, Erysiphe, Leveillula, Phyllactinia, Claviceps, Gibberella, Ustilagoidea, Verticillium, Glomerella, Pestalotiopsis and Magnaporthe*

Phylum: Basidiomycota: Classification, symptoms and life cycle of *Puccinia, Uromyces, Hemileia and Ustilago*. Important taxonomic characters of *Ganoderma, Agaricus, Pleurotus and Calocybe*. Symptoms and Important taxonomic characters of *Athelium, Rhizoctonia and Exobasidium*

UNIT V Bacteria, phytoplasma, virus, viroid, algae, phanerogams and abiotic disorders

General characters and symptoms- phytopathogenic bacteria, *Candidatus Phytoplasma, Spiroplasma, Fastidious vascular bacteria, viruses, viroids, algae, Phanerogams* –Abiotic disorders.

PRACTICAL

Acquaintance with light microscope- Preparation of media for isolation and proving Koch's postulates- General characters of fungi – Types of mycelia -Types of vegetative, asexual and sexual spores- asexual and sexual fruiting bodies- Study of important taxonomic

characters and symptoms produced by *Plasmodiophora*, *Pythium* and *Phytophthora*- Study of important taxonomic characters and symptoms produced by *Sclerospora*, *Plasmopara*, and *Albugo*- Study of important taxonomic characters and symptoms produced by *Rhizopus*, *Taphrina*, *Capnodium*, *Cercospora*, (*Mycosphaerella*), *Botryodiplodia* (*Botryosphaeria*), *Drechslera* (*Helminthosporium*) and *Alternaria*- Study of important taxonomic characters and symptoms produced by *Eurotium*, *Talaromyces*, *Erysiphe*, *Leveillula*, *Phyllactinia*, *Uncinula*, *Podosphaera* and *Sphaerotheca*- Study of important taxonomic characters and symptoms produced by *Claviceps*, *Fusarium* (*Gibberella*, *Nectria*) and *Verticillium*- Study of important taxonomic characters and symptoms produced by *Colletotrichum* (*Glomerella*), *Pestalotia* (*Pestalosphaeria*), *Pyricularia* (*Magnaporthe*) *Sarocladium* and *Macrophomina*- Study of important taxonomic characters and symptoms produced by *Puccinia*, *Uromyces*, and *Hemileia*- Field visit for exposing students on different crop diseases- Study of important taxonomic characters and symptoms produced by *Ustilago*, *Sphacelotheca* (*Sporisorium*), *Tolyposporium* (*Moesziomyces*), and *Exobasidium*- Study of important taxonomic characters of *Agaricus*, *Pleurotus*, *Calocybe* and *Volvarella*- Study of important taxonomic characters and symptoms produced by *Athelium*, *Thanetophorus* and *Ganoderma*- Symptoms of bacterial diseases – leaf blight, leaf streak, canker, scab, crown gall, wilt and soft rot- Symptoms and vectors of viral diseases – mosaic, chlorosis, leaf curl, stem pitting, spotted wilt, necrosis, ring spot, vein clearing, leaf crinkle, rosette and bunched top- Symptoms of *Candidatus Phytoplasma*, Algae, Phanerogamic parasites and non-parasitic diseases

Course outcomes

1. Aware of basic principles of plant pathology, causes and importance of crop diseases.
2. Having knowledge of pathogenesis and plant defence mechanisms.
3. Having in depth knowledge of fungal kingdom protozoa.
4. Having in depth knowledge of phylum Ascomycota and Basidiomycota.
5. Knowing the general characters of bacteria, virus, virioids and algae

References

1. Alice D, and Jeyalakshmi C 2014. Plant Pathology. A.E Publications, Coimbatore
2. Agrios, G.N. 2005. Plant Pathology – (5th Edition). Academic Press, New York.
3. Kirk, P.M., P.F. Cannon, D.W. Minter and J.A. Stalpers, (2008). Ainsworth and Bisby's dictionary of fungi, 10th edition. CAB international Wallingford, UK.

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1. Agrios, G.N. 2005. Plant Pathology – (5th Edition). Academic Press, New York.
2. Richard N. Strange. 2003. Introduction of Plant Pathology - John Wiley & Sons Ltd, London

3. John Webster and Ronald Weber, 2007. Introduction to fungi by Cambridge University Press, UK.

ENS 101 Environmental Studies and Disaster Management 3(2+1)

Course objectives

1. To impart basic knowledge about natural resources, ecosystems, biodiversity, environmental pollution and disaster management.
2. To study the role of Information Technology in Environment and human health

THEORY

UNIT I Definition, scope and importance

Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources. Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ecosystems, Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem:- a. Forest ecosystem, b. Grassland ecosystem, c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT II Biodiversity and its conservation

Biodiversity and its conservation:- Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity - consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity - habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India.

UNIT III Conservation of biodiversity

Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environmental Pollution: definition, cause, effects and control measures of - Air, Water, Soil, Marine, Noise and Thermal pollution and Nuclear hazards. Solid Waste Management: causes,

effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocausts. Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air, Water, Wildlife and Forest Conservation Acts, Issues involved in enforcement of environmental legislation and Public awareness.

UNIT IV Human Population and Environment

Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Field work: Visit to a local area to document environmental assets river/forest/grassland/hill/mountain, visit to a local polluted site Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc. Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

UNIT V Disaster Management

Disaster Management-Effect to migrate natural disaster at national and global levels. 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 in disaster response; Disaster response; Police and other organizations.

PRACTICAL

Visit to local areas - river/forest/ grassland/catchment etc. to document components of ecosystem. Study of common plants, insects, birds and animals. Visit to industries to study pollution abatement techniques and case studies - solid waste management, Human population and the Environment. To learn about the basic concepts of environmental sciences and natural resources and its associated problems

Course outcomes

1. Students will learn about the natural resources and associated problems
2. Attain knowledge on social issues related to environment and environmental ethics
3. Students will learn the different types of environmental pollution and its management
4. Students gain Knowledge on biodiversity and its conservation methods
5. Gain knowledge on different forms of disaster management

References

1. Aswathanarayana, U. 1999. Soil resources and the environment. Oxford and IBH publishing Co., New Delhi. P. 173-195.
2. D. D. Misra. Fundamental Concepts in Environmental Studies.
3. Diwan, P. and P. Diwan. 1998. Environmental Management Law and Administration. Variety Books International, New Delhi.

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2. <https://courseware.cutm.ac.in/wp-content/uploads/2020/06/EVS-DM-E-Material.pdf>
3. <https://agrimoon.com/wp-content/uploads/ENVIRONMENTAL-SCIENCE.pdf>

CRP 102 Growth and Development of Horticultural Crops 2(1+1)

Course objectives

1. To impart knowledge on growth and development of horticultural crops and their management in relation to yield potential

2. To acquire knowledge on plant growth regulators and its application in horticultural crops

THEORY

UNIT I Growth physiology

Growth and development - Definitions, components, photosynthetic productivity, Canopy photosynthesis and productivity -leaf area index (LAI) - optimum LAI in horticultural crops, canopy development; different stages of growth, growth curves, Crop development and dynamics (Case studies of annual/perennial horticultural crops), growth analysis in horticultural crops.

UNIT II Plant growth regulators

Plant bio-regulators- auxin, gibberellin, cytokinin, ethylene inhibitors and retardants, basic functions, biosynthesis, role in crop growth and development, propagation, flowering, fruit setting, fruit thinning, fruit development, fruit drop, and fruit ripening. Physiology of seed development and maturation, seed dormancy and bud dormancy, causes and breaking methods in horticultural crops.

UNIT III Physiology of pruning and training

Physiological basis of training and pruning-source and sink relationship, translocation of assimilates

UNIT IV Physiology of flowering

Flowering-factors affecting flowering, physiology of flowering, photoperiodism-long day, short day and day neutral plants, vernalisation and its application in horticulture

UNIT V Physiology of fruiting

Physiology of fruit growth and development, fruit setting, factors affecting fruit set and development, physiology of ripening of fruits-climatic and non-climacteric fruits. Physiology of fruits under post-harvest storage.

PRACTICAL

Estimation of photosynthetic potential of horticultural crops, leaf area index, growth analysis parameters including harvest index, bioassay of plant hormones, identification of synthetic plant hormones and growth retardants, preparations of hormonal solution and induction of rooting in cuttings, ripening of fruits and control of flower and fruit drop. Important physiological disorders and their remedial measures in fruits and vegetables, seed dormancy, seed germination and breaking seed dormancy with chemicals and growth regulators.

Course outcomes

1. This course helps the students to learn about growth and development of horticultural crops
2. Students able to understand the basic concepts and physiology of training and pruning
3. This course helps the students to get the knowledge on function of plant growth regulators
4. Acquire basic knowledge of flowering physiology of horticultural crops
5. This course helps the students to get the knowledge on fruiting physiology of horticultural crops

References

1. Taiz, L. and Zeiger, E. 2010. Plant Physiology. 5 th Edition. Publishers: Sinauer Associates, Inc., Massachusetts, USA.
2. Salisbury, B., Frank and W.C. Ross. 1992. Plant Physiology, 4th Edition. Wadsworth Publishing Co., Belmont, CA.
3. Leopold, A.C. and P.E. Kriedermann. 1985. Plant growth and development. 3rd Edition. Mc.Graw–Hill, New York.
4. Hartman, T. H. and D. E. Kester. 1983 Plant propagation, principles and practices. Prentice Hall, New Jersey.
5. Klein, and Klein. 1970 Research methods in plant science. Natural History of Science. New York.
6. Garner, R. J. 1979 The Grafters handbook (4.ed.). Oxford University Press. New York.

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1. <http://6e.plantphys.net/index.html>
2. <http://www.plantphys.org>
3. <http://www.Biologie.Uni-hamburg.de/b-online>

PHE 101 Physical and Health Education (NC) 1(0+1)

PRACTICAL

Physical Education: Introduction to physical education. Posture, exercise for good posture, physical fitness exercises for agility, strength, coordination, endurance and speed.

Rules and regulations of important games, skill development in any one of the games – football, hockey, cricket, volleyball, ball badminton, throw ball, tennis. Participation in one of the indoor games– shuttle badminton, chess and table tennis. Rules and regulations of athletic events, participation in any one of the athletic events – broad jump, high jump, triple jump, javelin throw, discus throw, shot put, short and long distance running, Safety education, movement education, effective way of doing day-to-day activities. First-aid training, coaching for major games and indoor games. Asanas and indigenous ways for physical fitness and curative exercises. Exercises and games for leisure time, use and experience. Importance of Asanas and Surya namaskar. Free hand exercises and Yoga. Recreation: definition, agencies promoting recreation, camping and recreation.

Note: Warming up and conditioning exercises are compulsory before the commencement of each class.

References

1. O.P. Aneja. Encyclopedia of Physical education, sports and exercise science (4 volumes). Anil Sharma. Encyclopedia of Health and Physical Education (7 Volumes).
2. N V Chaudhery, R Jain. Encyclopedia of Yoga Health and Physical Education (7 Volumes).
3. Pintu Modak, O P Sharma, Deepak Jain. Encyclopedia of Sports and Games with latest rules and regulations (8 volumes).
4. Edwin F Bryant. Yoga sutra of Patanjali.

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1. <https://ncert.nic.in/pdf/publication/otherpublications/iehped101.pdf>

COM 101 Information and Communication Technology 2(1+1)

Course objectives

1. To enable the students in familiarization with basic ICT tools in horticulture
2. To impart knowledge on basic software useful in day to day life and research purpose

THEORY

UNIT I Information technology

IT and its importance; IT tools; IT-enabled services and their impact on society; Computer fundamentals; Hardware and software; Input and output devices; Word and character representation.

UNIT II Languages

Features of machine language, assembly language, high-level language and their advantages and disadvantages; Principles of programming - algorithms and flowcharts.

UNIT III Operating systems (OS)

Operating systems (OS) - definition, basic concepts; Introduction to WINDOWS and LINUX Operating Systems; Local area network (LAN); Wide area network (WAN); Internet and World Wide Web; HTML and IP.

UNIT IV MS Office

Introduction to MS Office - Word, Excel, Power Point; Audio visual aids - definition, advantages, classification and choice of A.V. aids; Criteria for selection and evaluation of A.V. aids; Video conferencing; Communication process, Berlo's model, feedback and barriers to communication.

PRACTICAL

Exercises on binary number system; Algorithm and flow chart; MS Word; MS Excel; MS PowerPoint; Internet applications: web browsing, creation and operation of email account; Analysis of data using MS Excel; Handling of audio visual equipments; Planning, preparation, presentation of posters, charts, overhead transparencies and slides; Organization of an audio visual programme.

Course outcomes

1. Know the basic components of the computer and working of each device
2. Understand the representation of data in computer
3. Know the fundamentals of Computer Networking and Database
4. Performing common basic functions like editing, formatting, printing, scanning etc using tools
5. Gain practical knowledge on handling of audio visual equipments

References

1. Gurvinder Singh, Rachhpal Singh & Saluja KK. 2003. Fundamentals of Computer Programming and Information Technology. Kalyani Publishers.
2. Harshwardhan P. Bal. 2003. Perl Programming for Bioinformatics. Tata McGraw-Hill Education.
3. Kumar A. 2015. Computer Basics with Office Automation. IK International Publishing House Pvt Ltd.
4. Rajaraman V & Adabala N. 2015. Fundamentals of Computers. PHI
5. Recommended Latest Online Tutorials (over Internet).

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1. https://www.researchgate.net/publication/325087961_Information_Communication_Technology_in_Education
2. https://www.hzu.edu.in/csit/IV.1_information_and_communication_technology.pdf

II YEAR III SEMESTER

| Sl. No | Course code | List of Courses | Credit hours |
|---------------|--------------------|----------------------------|---------------------|
| 1. | AEN 201 | Fundamentals of Entomology | 3(2+1) |
| 2. | VSC 202 | Temperate Vegetable Crops | 2(1+1) |

| | | | |
|----------------------------------|----------------|---|----------------------|
| 3. | AEN 202 | Nematode pests of horticultural crops and their Management | 2(1+1) |
| 4. | PAT 202 | Diseases of fruit, Plantation, Medicinal and Aromatic Crops | 3(2+1) |
| 5. | PHT 201 | Fundamentals of Food Technology | 2(1+1) |
| 6. | FSC 203 | Temperate Fruit Crops | 2(1+1) |
| 7. | AGR 202 | Weed Management in Horticultural Crops | 2(1+1) |
| 8. | FLG 201 | Commercial Floriculture | 3(2+1) |
| 9. | BIT 201 | Elementary Plant Biotechnology | 2(1+1) |
| 10. | NCC/NSS 101 | National Service Scheme/National Cadet Corp | 1 (0+1)(NC)* |
| **NC: Non-gradual courses | | TOTAL | 22 (12+10) |

AEN 201 Fundamentals of Entomology 3(2+1)

Course objectives

1. To study about basics, history and importance of entomology in different fields

2. To impart knowledge on insects morphology, physiology and detailed taxonomy of different insect orders

THEORY

UNIT I Introduction to entomology

Introduction to phylum arthropoda. Importance of class Insecta. Insect dominance. History of entomology in India, Importance of entomology in different fields. Definition, division and scope of entomology.

UNIT II Insect morphonology

Comparative account of external morphonology-types of mouth parts, antennae, legs, wings and genitalia. Structure, function of cuticle and moulting and body segmentation, Anatomy of digestive, Circulatory, Sensory, respiratory, glandular, excretory, nervous and reproductive systems.

UNIT III Reproduction

Types of reproduction. Postembryonic development-eclosion. Matamorphosis. Types of egg larvae and pupa.

UNIT IV Classification of insects

Classification of insects upto orders, sub-order and families of economic importance and their distinguished characters.

UNIT V Plant mites

Plant mites – morphological features, important families with examples.

PRACTICAL

Insect collection and preservation. Identification of important insects. General body organization of insects. Study on morphology of grasshopper or cockroach. Preparation of permanent mounts of mouth parts, antennae, legs and wings. Dissection of grasshopper and caterpillar for study of internal morphology. Observations on metamorphosis of larvae and pupae. Dissection of cockroaches.

Course outcomes

1. To get knowledge about history of entomology and also learn about insects relation with other classes of Athropoda

2. To get knowledge on digestive, excretory, circulatory, respiratory, nervous system reproductive system, exocrine and endocrine gland function of insect.
3. Students expose to practical observations on external features of grasshopper / cockroach and other members of phylum Arthropoda and also learn methods of insect collection, preservation, display and storage
4. Students gain knowledge on taxonomic characters of Apterygota and Exopterygota insect orders by practical Observing and theoretical learning.
5. Students gain knowledge on taxonomic characters of Entopterygota in insect orders by practical Observation and Theoretical learning

References

1. Richards O.W. and R.G. Davies. 1977. Imm's General Text Book of Entomology. Vol.I and II. Chapman and Hall Publication, London.
2. Chapman, R.F. 1998. The Insects: Structure and Function. Fourth Edition. Cambridge University Press.
3. Snodgrass, R.E. 1994. Principles of Insect Morphology. CBS publishers and distributors, New Delhi.
4. David, B.V. and V.V. Ramamurthy. 2011. Elements of Economic Entomology, NamruthaPublications, Chennai.
5. Srivastava, P. D. and R. P. Singh. 1997. An Introduction to Entomology. Concept Publishing Company, New Delhi.

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2. www.zin.ru/animalia
3. <https://courses.cit.cornell.edu/ent201/content/anatomy2.pdf>
4. www.insectsexplained.com/03external.htm
5. www.earthlife.net/insects/anatomy.html
6. www.insectidentification.org/orders_insect.asp

VSC 202 Temperate Vegetable Crops 2(1+1)

Course objectives

1. To know basic knowledge on scope and importance, area and production and export potential of temperate vegetable crops
2. To learn the special cultural practices in temperate vegetable crops

THEORY

UNIT I Cole crops

Importance of cool season vegetable crops in nutrition and national economy- Area, production and export potential – Origin – climate – soil -description of varieties and hybrids - production technology - physiological and nutritional disorders - post harvest technology and marketing

Crops: Cabbage, cauliflower, knol-khol, Brussel's sprout, sprouting broccoli, Chinese cabbage

UNIT II Leafy and salad vegetables

Origin – climate – soil - description of varieties and hybrids - production technology - physiological and nutritional disorders - post harvest technology and marketing

Crops: Lettuce, palak, spinach, rhubarb, asparagus, globe artichoke, Zucchini

UNIT III Bulbous vegetables

Origin – climate – soil - description of varieties and hybrids, production technology, physiological and nutritional disorders, post harvest technology and marketing

Crops: Garlic and leek

UNIT IV Root and tuber vegetables

Origin, climate, soil, description of varieties and hybrids, production technology, physiological and nutritional disorders, post harvest technology and marketing

Crops: radish, turnip, carrot, beet root, potato, Jerusalem artichoke

UNIT V Legume vegetables

Origin, climate, soil, description of varieties and hybrids, production technology, physiological and nutritional disorders, post harvest technology and marketing

Crops: Peas, French beans, butter beans

PRACTICAL

Identification and description of varieties/hybrids; propagation methods, nursery management; preparation of field, sowing/transplanting; identification of physiological and nutritional disorders and their corrections; post-harvest handling; cost of cultivation and field visits to commercial farms.

Course outcomes

1. Learn about the importance, nutrition and production status of temperate vegetable crops
2. Acquire knowledge and practical experience on production technology of temperate vegetable crops
3. Demonstrate various propagation methods, important cultural practices and harvesting of temperate vegetable crops
4. Gain knowledge on postharvest management practices of temperate vegetable crops
5. To gain practical knowledge on cost of cultivation

References

1. S. Thamburaj. 2014. Text book of vegetable, tuber crops and Spices. ICAR, New Delhi.
2. B.R.Choudhary 2009. A Text book on production technology of vegetables. Kalyani Publishers. Ludhiana.
3. T.K.Bose. 2002. Vegetable Crops. Nayaprakash. Kolkata
4. P.Hazra. 2011. Modern Technology in Vegetable Production. New India Publishing Agency. New Delhi.
5. T.R.Gopal Krishnan, 2007. Vegetable Crops. New India Publishing Agency. New Delhi.
6. K.V.Kamath. 2007. Vegetable Crop Production. Oxford Book Company. Jaipur
7. M.S.Dhaliwal, 2008. Handbook of Vegetable Crops. Kalyani Publishers. Ludhiana

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1. <https://www.iaritoppers.com/2019/06/temperate-vegetables-icar-e-course-pdf-download-e-krisshi-shiksha.html>
2. <https://agrimoon.com/wp-content/uploads/Production-Technology-of-Vegetables.pdf>

AEN 202 Nematode Pests of Horticultural Crops and their Management 2(1+1)

Course objectives

1. To impart knowledge about morphology, taxonomy, classification, biology, symptomatology and control of nematodes
2. To know about the symptoms and management of plant parasitic nematodes

THEORY

Unit I History & development and economic importance

Introduction to Nematology –brief history and development of Nematology at National and International level – Nematodes definition, economic importance - Beneficial nematodes (as predatory, entomopathogenic, entomoparasitic, bioindicators, biological model and decomposers).

Unit II Morphology, taxonomy and classification

General characters of plant parasitic nematodes, their morphology (cuticle, cephalic region, sense organs and musculature) and anatomy (digestive, excretory, nervous and reproductive system of nematodes). Taxonomy (nematodes up to super family by De Ley and Blaxter, 2002) and classification of nematodes based on parasitism/ feeding habits.

Unit III Biology, lifecycle, symptoms and disease complex

Biology of nematodes (egg, moulting and hatching) – Life cycle of important nematodes – *Meloidogyne*, *Globodera*, *Rotylenchulus**Tylenchulus*, *Radopholus* and *Pratylenchus*. Symptoms of nematode damage caused by above ground feeder and below ground feeder – role of nematodes in plant disease complex (with fungi, bacteria and viruses).

Unit IV Nematode management & INM

Methods of nematode management - legislative (plant quarantine); physical methods (soil solarisation, hot water treatment, seed cleaning, rabbing); cultural methods (deep ploughing, fallowing, flooding, crop rotation, antinemic plants, trap crop); host plant resistance (resistant gene and varieties); biological control (nematode trapping fungi, egg parasitic fungi, antagonistic fungi, micorrhizal fungi, bacterial obligate parasite, PGPR); chemical control (fumigant and non fumigant). Integrated nematode management – Principles and INM for important horticultural crops.

Unit V Nematode pests of crops and their management

Plant parasitic nematode of fruits (banana, papaya, guava, pomegranate, citrus, grapevine, strawberry, and peach) - vegetables (tomato, brinjal, capsicum, bhendi, chilli,

beans, gourds, melons, cabbage and cauliflower)- tuber (carrot, potato, beetroot, yams and sweet potato) – ornamental (crossandra, rose, jasmine, tuberose, chrysanthemum, gerbera, and carnation) spices (garlic, turmeric, pepper, cardamom, ginger) plantation crops (tea, coffee, betelvine, coconut and arecanut) – medicinal (coleus, aswagandha, senna, *Rauvolfia* and noni) and aromatic plants (davanam, mint, thyme and rosemary) -Nematodes management in mushroom&protected cultivation.

Practical

Methods of sampling and extraction of nematodes from soil and plant parts, killing, fixing and preparation of temporary and permanent nematode mounts. Nematicides and their use. Collection and preservation of 20 plant species/parts damaged by plant parasitic nematodes.

Course outcome

1. Students will learn about morphology, taxonomy, classification, biology and symptomatology of plant parasitic nematodes
2. To get knowledge on plant disease complex
3. To get knowledge on observation and identification different species of nematode and their life stages in horticultural crops
4. Learn about damage caused by plant parasitic nematodes
5. To get knowledge on integrated nematode management

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2. House Aman publishing house, Meerut
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PAT 202 Diseases of Fruit, Plantation, Medicinal and Aromatic Crops 3(2+1)

Course objectives

1. To expose the students on etiology, symptoms, mode of spread, survival, epidemiology and integrated management of important diseases of horticultural crops.
2. To impart knowledge on postharvest diseases of fruit, plantation and medicinal and aromatic crops and their management

THEORY

UNIT I Diseases of tropical and sub-tropical fruit crops

Etiology, symptoms, mode of spread, survival, epidemiology and integrated management of important diseases of mango, banana, grape, citrus, guava, sapota, papaya, jack fruit, pineapple, pomegranate and ber

UNIT II Diseases of temperate fruit crops

Etiology, symptoms, mode of spread, survival, epidemiology and integrated management of important diseases of apple, pear, peach, plum, almond, Walnut and strawberry

UNIT III Diseases of plantation crops

Etiology, symptoms, mode of spread, survival, epidemiology and integrated management of important diseases of areca nut, coconut, oil palm, coffee, tea, cocoa, cashew and rubber

UNIT IV Diseases of medicinal plants and aromatic crops

Etiology, symptoms, mode of spread, survival epidemiology and integrated management of important diseases of senna, neem, hemp, belladonna, pyrethrum, camphor, costus, crotalaria, datura, dioscorea, mint, opium, *Solanum khasianum* and Tephrosia.

UNIT V Disease management

Important post-harvest diseases of fruit, plantation and medicinal and aromatic crops and their management.

PRACTICAL

Observations of disease symptoms, identification of casual organisms and host parasiterelationship of important diseases. Examination of scrapings and cultures of important pathogensof fruits, plantation, medicinal and aromatic crops.

Course outcome

1. Students learn about symptoms, mode of spread, survival, epidemiology and integrated management of diseases

2. The students will come out with the experience on identifying the diseases of fruit crops
3. Students get knowledge on disease management in plantation and aromatic crops
4. Get practical knowledge on disease management in medicinal plants
5. Students get experience on postharvest diseases of fruit, plantation and medicinal and aromatic crops and their management

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5. L.DarwinChristdhar Henry and H. LewinDevasahayam. Crop diseases: Identification, Treatment and Management. An Illustrated Handbook, New India publishing. Agency.
6. Anna L A colour atlas of Post Harvest Diseases and Disorders of fruits and vegetables -. Snowdon, CRC Press.
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PHT 201 Fundamentals of Food Technology 2(1+1)

Course objectives

1. To impart knowledge about the functions, physico-chemical properties and preparation techniques
2. To impart hands on experience to analyze the mineral nutrition and vitamins

THEORY

UNIT I basics of food technology

Food and its function, physico-chemical properties of foods, food preparation techniques, nutrition, relation of nutrition of good health. Characteristics of well and malnourished population.

UNIT II Energy

Energy, definition, determination of energy requirements, food energy, total energy needs of the body.

UNIT III Mineral nutrition

Mineral nutrition: macro and micro-minerals (Ca, Fe and P), function, utilization, requirements, sources, effects of deficiency.

UNIT IV Vitamins

Vitamins: functions, sources, effects of deficiency, requirements of water soluble and fat-soluble vitamins.

UNIT V Balanced diet

Balanced diet: recommended dietary allowances for various age groups, assessment of nutritional status of the population.

Practical

Methods of measuring food ingredients, effect of cooking on volume and weight, determination of percentage of edible portion. Browning reactions of fruits and vegetables. Microscopic examination of starches, estimation of energy, value proteins and fats of foods. Planning diet for various age groups.

Course outcomes

1. Acquire wide knowledge on functions of physico-chemical properties of foods
2. Learn about the function of macro and micro-minerals

3. Acquire wide knowledge on vitamins and minerals in food
4. Gain knowledge on food preservation techniques
5. To get knowledge on recommended dietary

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2. Srivastava, R.P., and Sanjeevkumar. S. 2013. Fruit and Vegetable preservation. International Book Distributing Co. Lucknow.
3. Srilakshmi .B. 2015. Nutrition Science. New Age International Pvt. Ltd. New Delhi.

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FSC 203 Temperate Fruit Crops 2(1+1)

Course objectives

1. To impart knowledge about the scope, importance, classification, area and production of temperate fruits
2. To study the cultivation practices of temperate fruit crops

THEORY

Unit I Crops: apple, pear, peach, apricot, plum

Scope, importance, classification, area and production of temperate fruits -areas, production, varieties, climate and soil requirements, propagation, planting density, cropping systems, after care training and pruning, self-incompatibility and pollinisers, use of growth regulators, nutrient and weed management, harvesting, post-harvest handling and storage, physiological disorders, important insect – pests and diseases and their control measures.

Unit II Crops: Strawberry, sweet and sour cherry, black and raspberry and currants

Areas, production, varieties, climate and soil requirements, propagation, planting density, cropping systems, after care training and pruning, self-incompatibility and pollinisers, use of growth regulators, nutrient and weed management, harvesting, post-harvest handling and storage, physiological disorders, important insect – pests and diseases and their control measures.

Unit III Crops: Apricot, kiwi and persimmon

Areas, production, varieties, climate and soil requirements, propagation, planting density, cropping systems, after care training and pruning, self-incompatibility and pollinisers, use of growth regulators, nutrient and weed management, harvesting, post-harvest handling and storage, physiological disorders, important insect – pests and diseases and their control measures.

Unit IV Crops: Olive, Almond, walnut, pecan nut, pistachio nut

Areas, production, varieties, climate and soil requirements, propagation, planting density, cropping systems, after care training and pruning, self-incompatibility and pollinisers, use of growth regulators, nutrient and weed management, harvesting, post-harvest

handling and storage, physiological disorders, important insect – pests and diseases and their control measures.

Unit V Crops:Macadamia nut, chest nut and hazel nut.

Areas, production, varieties, climate and soil requirements, propagation, planting density, cropping systems, after care training and pruning, self-incompatibility and pollinisers, use of growth regulators, nutrient and weed management, harvesting, post-harvest handling and storage, physiological disorders, important insect – pests and diseases and their control measures.

PRACTICAL

Nursery management practices, description and identification of varieties of above crops,manuring and fertilization, planting systems, preparation and use of growth regulators, trainingand pruning in apple, pear, plum, peach and nut crops. Visit to private orchards to diagnosealadies. Working out economics for apple, pear, plum and peach.

Course outcome

1. Learn about the Scope, importance, classification, area and production of temperate fruits
2. Acquire knowledge and practical experience on production of temperate fruits
3. Learn about the postharvest technology of temperate fruit crops
4. Gain knowledge and experience on HDP and UHDP in temperate fruits
5. Demonstrate various propagation methods, important cultural practices and processing techniques of temperate fruit crops

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2. Bose, T. K. S. K. Mitra, and D. S. Rathore. 1998. Temperate Fruits - Nayaprakash, Calcutta
3. Chadha, K.L. 2001. Handbook of Horticulture. ICAR, Delhi
4. DewasishChoudary and Amal Mehta, 2010. Fruit crops, Oxford book company,USA
5. David Jackson, Norman Looney, Michael Moorely, Bunker and Graham Thiele.2011.3rd edition. Temeperate and Sub tropical fruit production, CABI Publishing, U.K.
6. Chattopadhyay T K, 2013. A text book on Pomology-IV-Temeperate fruits (Reprinted), Kalyani publishers

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- 4 www.nutgrowing.org

AGR 202 Weed Management in Horticultural Crops 2(1+1)

Course objectives

1. Students will learn classification, biology and ecology of weeds
2. To impart knowledge on methods of weed control

THEORY

Unit I Weeds introduction

Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination; Weed biology and ecology, crop weed association, crop weed competition and allelopathy concepts of weed prevention, control and eradication;

Unit II Methods of weed control

Methods of weed control: physical, cultural, chemical and biological methods.
Integrated weed management

UNIT III Herbicides

Advantages and limitation of herbicide usage in India, Herbicide classification, formulations, methods of application

UNIT IV Adjuvants

Introduction to Adjuvants and their use in herbicides; Introduction to selectivity of herbicides; Compatibility of herbicides with other agro chemicals

UNIT V Weed management

Weed management in major field and horticultural crops, shift of weed flora in cropping systems, aquatic and problematic weeds and their control.

PRACTICAL

Identification of weeds; Survey of weeds in crop fields and other habitats; Preparation of herbarium of weeds; Calculations on weed control efficiency and weed index; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipment

and calibration; Demonstration of methods of herbicide application; Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops; Biology of nut sedge, bermuda grass, parthenium and celosia; Economics of weed control practices; Tours and visits of problem areas.

Course outcome

1. To create knowledge on weed biology and ecology
2. To acquire knowledge on methods of weed control
3. To synthesise idea about various herbicides, formulations and adjuvants
4. To get knowledge on methods of herbicide application
5. To construct information regarding management of weeds in horticultural crops

References

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FLG 201 Commercial Floriculture 3(2+1)

Course objectives

1. To impart knowledge on scope and importance of commercial floriculture in India
2. Commercial cultivation, post-harvest handling and value addition of loose and cut flowers
3. To know about the post-harvest handling and value addition of loose and cut flowers

THEORY

UNIT I Major loose flowers

Crops: Rose, Jasmine, Chrysanthemum, Tuberose and Marigold

Scope and importance of commercial floriculture in India – domestic and export potential – agencies involved in promotion of floriculture. Introduction and uses – varieties - soil and climate and planting systems - weed, nutrition and irrigation management – training and pruning – special horticultural practices - role of growth regulators- harvest index and yield.

UNIT II Minor loose flowers

Crops: Crossandra, Nerium, Celosia, Gomphrena, Ixora, Hibiscus and Lotus

Introduction and uses – varieties - soil and climate and planting systems - weed, nutrition and irrigation management – training and pruning –role of growth regulators- harvest index and yield.

UNIT III Cut flowers

Crops: Protected cut flowers – Dutch Rose, Carnation, Gerbera, Chrysanthemum, Orchids, Anthurium, Liliium, Lisianthus

Open field cut flowers – Gladiolus, China Aster, Dahlia, Bird of Paradise, Alstroemeria, Heliconia, Ornamental Gingers (torch ginger and ginger lily)

Introduction and uses – varieties – media and environment- Fumigation - field preparation - planting systems – nutrition and fertigation - weed management – training and pruning – special horticultural practices - role of growth regulators- flower forcing techniques - physiological disorders and its control measures- harvest index and yield.

Unit IV – Cut foliage, flowering and foliage fillers

Crops:

Foliage fillers: Asparagus, Dracaena, Cordyline, Spathiphyllum, Baby eucalyptus, Ivy, Podophyllum and Box wood

Flowering fillers: Golden rod, Blue aster, Gypsophila and Limonium

Introduction and uses – varieties – propagation - planting systems and methods – nutrition and water management - role of growth regulators- harvest index and yield.

Unit V – Post harvest technology of commercial flower crops

Crops: Cut flowers and loose flowers

Postharvest techniques of loose and cut flowers – precooling, pulsing and holding of cut flowers – grading, packaging and storage techniques, essential oil extraction – concrete and absolute - methods of floral concrete extraction – export potential – international and national floral industry –value addition – tinting of cut flowers – dyeing – scope and importance – production – dyes for flower industry – methods of dye extraction from flower crops

PRACTICAL

Description and identification of species and varieties in rose, jasmine, crossandra, chrysanthemum, tuberose, marigold, nerium, gomphrena, celosia, ixora, hisbiscus, lotus, Dutch rose, carnation, gerbera, gladiolus, orchids, anthurium, liliiums, lisianthus and alstroemeria – propagation – seed treatment and sowing – lay out and planting of rose and jasmine – media preparation and potting orchids and anthurium – special horticultural practices in rose, jasmine, chrysanthemum, marigold and dahlia – harvesting, post harvest handling and storage – extraction of floral concrete from rose, jasmine and tuberose, visit to commercial fields, cut flower units, flower markets and extraction units – preparation of project reports for fresh and cut flower production and floral concrete extraction.

References

1. Bhattacharjee, S.K., 2004 – Advanced commercial floriculture. Vol. I and II.
2. Bhattacharjee, S.K., 2004 – Post harvest technology of flowers and ornamental plants.
3. Jawaharlal, M. M. Kannan, M. Ganga and P.Ranchana.2016.A guide on protected and open field cut flower cultivation. Jaya publishing house. New Delhi
4. Kannan, M. and P. Ranchana 2016. Objective floriculture 2016. Jaya Publishing House, New Delhi
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1. www.wikihow.com
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4. www.theflowerexpert.com

BIT 201 Elementary Plant Biotechnology 2(1+1)

Course objectives

1. To impart knowledge on basic and applied aspects of plant biotechnology and various aspects of Plant Tissue culture.
2. To familiarize recent strides in molecular biology

THEORY

UNIT I Concepts of Plant Biotechnology

History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement: Totipotency and Morphogenesis, Nutritional requirements of in-vitro cultures; Techniques of In-vitro cultures, Micropropagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture, Factors affecting above in-vitro culture; Applications and Achievements;

UNIT II Somaclonal variation

Somaclonal variation, Types, Reasons: Somatic embryogenesis and synthetic seed production technology; Protoplast isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids, Applications in crop improvement.

UNIT III Genetic engineering

Genetic engineering; Restriction enzymes; Vectors for gene transfer – Gene cloning – Direct and indirect method of gene transfer – Transgenic plants and their applications.

UNIT IV Blotting techniques

Blotting techniques – DNA finger printing – DNA based markers – RFLP, AFLP, RAPD, SSR and DNA Probes – Mapping QTL – Future prospects. MAS, and its application in crop improvement.

UNIT V Nanotechnology

Nanotechnology: Definition and scope, types of nano material and their synthesis, green synthesis. Tools and techniques to characterize the nano particles. Nanobiotechnological applications with examples, Nano toxicology and safety.

PRACTICAL

Requirements for Plant Tissue Culture Laboratory; Techniques in Plant Tissue Culture; Media components and preparations; Sterilization techniques and Inoculation of various explants; Aseptic manipulation of various explants; Callus induction and Plant Regeneration; Micro propagation of important crops; Anther, Embryo and Endosperm culture;

Hardening / Acclimatization of regenerated plants; Somatic embryogenesis and synthetic seed production; Isolation of protoplast;

Demonstration of Culturing of protoplast; Demonstration of Isolation of DNA; Demonstration of Gene transfer techniques, direct methods; Demonstration of Gene transfer techniques, indirect methods; Demonstration of Confirmation of Genetic transformation; Demonstration of gelelectrophoresis techniques. Green synthesis of nano particles and their size characterization.

Course outcome

1. Understand about the historical developments and contributions of some scientist in the plant tissue and basic biotechnology
2. Discuss the mother plant or explants for initiation of tissue culture
3. Classify the DNA and RNA , Replication and DNA Sequencing Methods
4. Explain the development of pathogen and Virus free plant
5. Students gain knowledge on biotechnological principle like genetic recombination, mutation etc.

References

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2. Gupta, P.K., 2015. Elements of Biotechnology 2nd Edn. Rastogi and Co., Meerut.
3. Razdan M K, 2014. Introduction to plant Tissue Culture 2nd Edn. Science Publishers, inc. USA.
4. Gautam V K, 2005. Agricultural Biotechnology. Sublime Publications
5. Thomar, R.S., Parakhia, M.V., Patel, S.V. and Golakia, B.A., 2010. Molecular markers and Plant
6. Biotechnology, New Publishers, New Delhi.
7. Purohit, S.S., 2004. A Laboratory Manual of Plant Biotechnology 2nd Edn. Agribios, India.
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II YEAR IV SEMESTER

| Sl. No | Course code | List of Courses | Credit hours |
|-----------------------------|--------------|---|------------------|
| 1. | SAC 203 | Soil, Water and Plant Analysis | 2(1+1) |
| 2. | PSM 201 | Spices and Condiments | 3(2+1) |
| 3. | FLG 203 | Ornamental Horticulture | 2(1+1) |
| 4. | PSM 202 | Plantation Crops | 3(2+1) |
| 5. | FSC 204 | Breeding of Fruit and Plantation Crops | 3(2+1) |
| 6. | AEG 201 | Farm Power and Machinery | 2(1+1) |
| 7. | AEN 203 | Insect Pests of Fruit, Plantation, Medicinal & Aromatic Crops | 3(2+1) |
| 8. | VSC 203 | Precision Farming and Protected Cultivation | 3(2+1) |
| 9. | FSC 205 | Dry land Horticulture | 2(1+1) |
| 10. | HOR 201 | Short Tour* | 1(0+1) |
| 11. | NSS/ NCC 101 | National Service Scheme/National Cadet Corp* | - |
| *Non-gradual courses | | Total | 24(14+10) |

SAC 203 Soil, Water and Plant Analysis 2(1+1)

Course objectives

1. To impart knowledge on soil and plant sampling and estimation of oxygen
2. To study the soil micro-organisms and their importance

THEORY

UNIT I Methods of soil and plant sampling

Methods of soil and plant sampling and processing for analysis. Characterization of hydraulic mobility – diffusion and mass flow. Renewal of gases in soil and their abundance.

UNIT II Estimation of oxygen

Methods of estimation of oxygen diffusion rate and redox potential. Use of radio tracer techniques in soil fertility evaluation.

UNIT III Soil micro-organisms

Soil micro-organisms and their importance. Saline, alkali, acid, waterlogged and sandy soils, their appraisal and management. Chemical and mineral composition of horticultural crops.

UNIT IV Leaf analysis

Leaf analysis standards, index tissue, interpretation of leaf analysis values. Quality of irrigation water. Radio tracer technology application in plant nutrient studies. Rapid tissue tests for soil and plant.

UNIT V Soil and Water management

Management of poor quality irrigation water in crop management. Soil and Water pollution.

PRACTICAL

Introduction to analytical chemistry, Collection and preparation of soil, water and plant samples for analysis. Determination of pH, electrical conductivity, sodium adsorption ratio and exchangeable sodium percentage of soils. Estimation of available macro and micronutrient elements in soils and their contents in plants. Irrigation water quality analysis. Determination of pH and EC in irrigation water samples, Determination of Carbonates and bicarbonates in soil and irrigation water, Determination of Calcium and Magnesium in soil and irrigation water. Determination of N, P, K, Ca, Mg, Sand micronutrients in plant samples. Determination of Sodium, Potassium, Chlorine and Boron in irrigation water.

Course outcome

1. To get knowledge about methods of soil and plant sampling and processing
2. To impart knowledge to student about
3. To get knowledge on methods of estimation of oxygen diffusion rate and redox potential
4. Students expose to practical observations on chemical and mineral composition
5. Students gain knowledge on soil and water pollutions

References

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2. Yawalkar, K.S. Agarwal, J.P. and Bokde, S. 1977. Manures and Fertilizers. Agricultural Publishing House, Nagpur.
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PSM 201 Spices and condiments 2(1 + 1)

Course objectives

1. To impart knowledge on the production technologies of spices and condiments
2. To get practical experience on processing and value addition of spices and condiments

THEORY

UNIT I Scope and importance of spice crops

Status, scope and importance of spice crops – area and production - National and State scenario - export and import – Role in national economy - GAP – organic production - IPR - classification of spices.

UNIT II Commercial production of major spices

Origin, importance and uses - climate and soil - propagation – planting methods – nutrient, irrigation and weed management – mulching and cover cropping - special horticultural practices- role of growth regulators- shade regulation- maturity indices – harvest and yield – handling, grading - processing -value addition.

Crops: Black pepper, Cardamom, Turmeric and Ginger

UNIT III Commercial production of seed spices

Origin, importance and uses - climate and soil - propagation - seeds and sowing- nutrient, irrigation and weed management- special horticultural practices- role of growth regulators - maturity indices - harvest, yield and grading - processing -value addition.

Crops: Coriander, Fenugreek, Fennel, Cumin, Dill, Celery and Bishops weed

UNIT IV Commercial production of tree spices

Origin, importance and uses - climate and soil - propagation - planting - irrigation, nutrition and weed management- cropping systems- multitier cropping- cover cropping- shade regulation - training and pruning practices- maturity indices - harvest, yield and grading - processing and value addition.

Tree Spices: Nutmeg, Clove, Cinnamon, All spice and Tamarind

UNIT V Commercial production of other spices

Origin, importance and uses - climate and soil - propagation - planting/sowing - irrigation, nutrition and weed management- cropping systems - training and pruning practices- maturity indices - harvest, yield and grading - processing and value addition.

Other Spices: Curry leaf, Vanilla, Saffron, Betelvine, Paprika, Kokum, Rosemary and Thyme

PRACTICAL

Identification of varieties – propagation - rapid multiplication technique - seed treatment – nursery management – sowing/planting – Intercultural operations – special horticultural practices - maturity indices - harvesting - processing - extraction of essential oils and oleoresins - visit to commercial spice plantations, commodity boards and processing units.

Crops: Black pepper, Cardamom, Turmeric, Ginger, Coriander, Fenugreek, Fennel, Cumin, Curry leaf, Tamarind, Nutmeg, Allspice, Cinnamon, Clove, Thyme and Rosemary

Course outcome

1. Learn about scope and importance, export and import, organic production of spices and condiments
2. Learn about commercial production of major spices
3. Acquire knowledge on production technology of condiments
4. Gain knowledge and practical experience on processing and value addition of spices and condiments
5. Demonstrate various propagation methods, special practices and post harvest practices of major spices and condiments

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FLG 203 Ornamental Horticulture 2(1 + 1)

Course objectives

1. To educate students on ornamental horticulture, types and styles of gardens and identification of ornamental plants suitable for landscaping
2. To impart practical knowledge on bonsai making and flower arrangements

THEORY

UNIT I History, definitions, scope of ornamental horticulture

History, definitions, scope of ornamental horticulture, aesthetic values, Floriculture industry, Importance, area and production, industrial importance of ornamental plants and flowers.

UNIT II Importance and classification of ornamental crops

Importance, classification, design values and general cultivation aspects for ornamental plants viz. Annuals, biennales herbaceous perennials, grasses and bulbous ornamentals.

UNIT III Garden components

Shrubs, climbers, trees, indoor plants, palms and cycads, ferns and sellagenellas, cacti and succulents, Importance, design and establishment of garden features/components viz. hedge, edge, borders, flower beds, bridges, paths, drives, fences, garden walls, gates, carpet bed, arbour, Patio, decking, retaining walls

UNIT III Types of garden

Shade garden, sunken garden, roof garden, terrace garden, pebble garden, rockery, pools, waterfalls, fountains, bog garden, avenue planting, children garden, vertical garden, bottle garden and terrariums

UNIT IV Lawn and garden adornments

Lawn types, establishment and maintenance. Importance of Garden adornments viz. floral clock, bird bath, statutes, sculptures, lanterns, water basins, garden benches etc.,

UNIT V Flower arrangement and bonsai making

Importance of flower arrangement, Ikebana, techniques, types, suitable flowers and cut foliage, uses of, art of making bonsai, culture of bonsai and maintenance.

Practical

Identification and description of annuals, biennials, herbaceous perennials, climbers, shrubs, trees, indoor plants, ferns and sellagenellas, Palms and cycads and Cacti and succulents. Planning and designing and establishment of garden features viz. lawn, hedge and edge, rockery, water garden, carpet bedding, shade garden, roof garden, Study and creation of terrariums, vertical garden, study and practice of different types of flower arrangements, preparation of floral bouquets, preparation of floral rangoli, veni etc., Study of Bonsai techniques, Bonsai practicing and training. Visit to nurseries and floriculture units.

Course outcome

1. To learn about the history, definitions, scope of ornamental horticulture
2. Students will learn about the different garden components
3. Students will learn the different types of garden
4. Attain knowledge on lawn making and maintenance
5. Gain practical knowledge on different types of flower arrangements and bonsai making

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2. www.indiaagronet.com
3. www.intuxford.tripod.com

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5. www.personal.psu.edu
6. www.sunny.crk.umn.edu/courses

PSM 202 Plantation Crops 3(2+1)

Course objectives

1. To impart knowledge on the production technologies and production constraints in commercial cultivation of plantation crops
2. To acquire knowledge on processing of plantation crops

THEORY

UNIT I Scope and importance of plantation crops

History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance and products utilization

UNIT II Commercial production of beverage crops

Soil and climate – varieties – propagation – seed and vegetative propagation and planting systems - methods – irrigation and nutrient management - weed control – training - pruning - mulching - shade regulation – application of growth regulators – soil management – liming - Special horticultural practices – handling – harvest and yield - post harvest handling - processing – value addition and storage.

Crops: Coffee, Tea and Cocoa

UNIT III Commercial production of cash crops

Soil and climate – varieties – propagation – seed and vegetative propagation and planting systems - methods – gap filling - irrigation and nutrient management - weed control – training - pruning - mulching - cover cropping - shade regulation – application of growth regulators - Special horticultural practices – top working – HDP in cashew - handling – harvest and yield - post harvest handling - processing – value addition and storage.

Crops: Rubber and Cashew

UNIT IV Commercial production of major palms

Soil and climate – varieties – propagation – nursery management - planting systems and methods – multi-tier cropping systems - gap filling – irrigation, nutrient and micronutrient management - weed control – soil & water conservation measures - mulching -

intercropping - application of growth regulators – harvest and yield - post harvest handling - processing – value addition and storage.

Crops: Coconut and Arecanut

UNIT V Commercial production of other palms

Soil and climate – varieties – propagation– seed and vegetative propagation - planting systems and methods –gap filling - irrigation and nutrient management - weed control – training - pruning - mulching -application of growth regulators –harvest and yield - post harvest handling - processing – value addition and storage.

Crops: Oil palm and Palmyrah

PRACTICAL

Description and identification of varieties - mother palm and seed nut selection - nursery management - vegetative propagation – micro propagation - planting - manuring – nutritional disorders – training and pruning - top working – harvesting – processing - working out the economics and project preparation for coconut, cashew and rubber – visit to Plantation farm, commodity boards and processing units

Crops: Coconut, Arecanut, Cashew, Rubber, Oil palm, Palmyrah, Coffee, Tea, Cocoa

Course outcomes

1. Students will learn about scope and importance of plantation crops
2. To get knowledge on production technology of plantation crops
3. Acquire knowledge on propagation, training and pruning in beverage crops
4. Learn the techniques of top working in cashew
5. Gain advance knowledge on processing of plantation crops

References

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FSC 204 Breeding of Fruit and Plantation Crops 3(2+1)

Course objectives

1. To impart comprehensive knowledge on improvement of major fruit and plantation crops through breeding approaches
2. To study the methods of breeding in fruit and plantation crops

Theory

Historical perspectives, challenges and approaches in improvement of fruit and plantation crops - Centres of origin and diversity- floral biology-objectives and problems in breeding - breeding strategies-achievements through different breeding methods - introduction, selection, hybridization, mutagenesis, ploidy manipulations and biotechnological approaches in improvement of major fruit and plantation crops

UNIT I Historical perspectives, approaches and challenges in improvement of fruit crops; Centres of origin and diversity of major fruit crops Breeding of fruit crops- Mango, Banana, Acid lime, Sweet orange and Mandarin

UNIT II Breeding of fruit crops- Grapes, Guava, Sapota and Papaya

UNIT III Breeding of fruit crops - Aonla, Pomegranate, Apple and Pear

UNIT IV Historical perspectives, approaches and challenges in improvement of plantation crops; Centres of origin and diversity of major plantation crops

Breeding of plantation crops-Tea, Coffee, Cashew and Cocoa

UNIT V Breeding of plantation crops -Coconut, Arecanut, Oilpalm and Rubber

PRACTICAL

Exercises on floral biology, pollen viability; emasculation and pollination procedures; hybrid seed germination; raising and evaluation of segregating populations; use of mutagens to induce mutations and polyploidy in major crops like Mango, Banana, Citrus, Grapes, Guava, Sapota, Papaya, Custard apple, Aonla, Ber, Litchi, Pomegranate, Jamun, Arecanut, Coconut, Pistachonut, Apple, Pear, Plum, Peach, Apricot and Strawberry.

Course outcomes

1. Comprehensive understanding of floral biology, breeding goals, strategies and achievements made in fruit and plantation crops
- 2.
3. Get knowledge on methods of breeding in fruit crops
4. Get knowledge on breeding methods in plantation crops
5. Impact knowledge on biotechnological approaches in improvement of major fruit and plantation crops
6. Students learn practical experience on emasculation techniques in major fruit and plantation crops

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3. Kumar. N.. 2006. Breeding of horticultural crops - Principles and practices. New India Publishing Agency, New Delhi, India.
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2. <http://ecoursesonline.iasri.res.in/course/view.php?id=147>
3. <http://eagri.org/eagri50/GPBR212/lec22.pdf>

AEG 201 Farm Power and Machinery 2(1+1)

COURSE OBJECTIVES

1. To enable the students for better understanding on the availability of farm power resources and have a clear understanding about the working and components of engine.
2. To gain knowledge about various tillage, sowing, intercultural, plant protection and harvesting equipments.

THEORY

UNIT I Farm power

Basic concepts of various forms of energy, unit and dimensions of force energy and power, calculations with realistic examples.

UNIT II IC Engines and electric motors

IC Engines: Basic principles of operation of compression, ignition and spark ignition engines, two stroke and four stroke engines, cooling and lubrication system, power transmission system, broad understanding of performance and efficiency, tractors, power tillers and their types and uses. Electric motors: types, construction and performance comparison. Tillage: objectives, method of ploughing.

UNIT III Tillage implements

Primary tillage implements: construction and function of indigenous ploughs, improved indigenous ploughs, mould board ploughs, disc and rotary ploughs. Secondary tillage implements: construction and function of tillers, harrows, levelers, ridgers and bund formers.

UNIT IV Sowing and transplanting equipments

Sowing and transplanting equipment: seed drills, potato planters, seedling transplanter. Grafting, pruning and training tools and equipment.

UNIT V Inter-culture equipment and harvesting equipments

Inter-culture equipment: sweep. Junior hoe, weeders, long handle weeders. Crop harvesting equipments: potato diggers, fruit pluckers, tapioca puller and hoists.

PRACTICAL

Calculation on force, power and energy. IC engines – showing the components of dismantled engines and motors. Primary and secondary tillage implements, hitching, adjustments and operations. Spraying equipment, calibration and operation. Plant protection equipment, calculation of dilution ratio and operation.

Course outcomes

1. Students will be able to know about the importance and contribution of various sources of farm power and their availability in India
2. Students will learn about the different components of IC Engines
3. Student gains information about primary and secondary tillage systems
4. Gives information related to sowing and various plant protection equipments
5. It also gives brief knowledge about various harvesting and threshing equipments

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- 2) www.farmmachineryshow.org

AEN 203 Insect Pests of Fruit, Plantation, Medicinal & Aromatic Crop 3(2+1)

Course objectives

1. To impart knowledge about classification of insects, ecology symptoms of damage and management strategies of insect pests of fruit, plantation, medicinal and aromatic crops
2. To inculcate the knowledge on insecticide residue problems in fruit, plantation, medicinal and aromatic crops

THEORY

UNIT I Economic classification of insects and host plant resistance to insect pests

General economic classification of insects; ecology and insect-pest management with reference to fruit, plantation, medicinal and aromatic crops; pest surveillance and assessment of insect damage; Legal methods of pest control

UNIT II Pests of fruit crops and management

Distribution, host range, bio-ecology, injury, integrated management of important insect pests affecting tropical, sub-tropical and temperate fruit crops (mango, sapota, citrus, papaya, guava, banana, grapevine, jack, pomegranate, pineapple, aonla, jamun, apple, pear, peach and plum)

UNIT III Pests of plantation crops and management

Distribution, host range, bio-ecology, injury, integrated management of important insect pests affecting plantation crops (coconut, arecanut, oil palm, palmyrah, cashew, cocoa, tea, coffee, rubber and cinchona)

UNIT IV Pests of medicinal and aromatic crops and management

Distribution, host range, bio-ecology, injury, integrated management of important insect pests attacking medicinal crops (senna, neem, hemp, belladonna, gloriosa, dioscorea, coleus, stone breaker, pyrethrum, camphor, costus, *Crotalaria*, *Datura*, aswagantha, mint, *Solanum khasianum*, noni and *Tephrosia*)

UNIT V: Storage pests of fruit, plantation, medicinal and aromatic crops

Distribution, host range, bio-ecology, injury, integrated management of important insect pests attacking stored dry fruits, nuts and other processed products of fruit, plantation, medicinal and aromatic crops - Insecticide residue problems in fruit, plantation, medicinal and aromatic crops and their maximum residue limits (MRLs).

PRACTICAL

Types of injury and symptoms of damage caused by insects and assessment of insect population and damage in fruit, plantation, medicinal and aromatic crops - Collection, identification, preservation, assessment of damage and population of important insect pests affecting fruits, plantation, medicinal and aromatic crops in field and storage. Non- insect pests attacking fruit, plantation, medicinal and aromatic crops.

Course outcomes

1. Students will learn about symptoms of damage and management in fruit and plantation crops
2. Students will learn about symptoms of damage and their management in medicinal and aromatic crops
3. To get knowledge on insecticide residue problems in fruit, plantation, medicinal and aromatic crops
4. Learn about storage pests of fruit, plantation, medicinal and aromatic crops
5. To get knowledge on integrated management of important insect pests

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2. <http://www.nbaii.res.in/insectpests/pestsearch.php?cropname=Mango>
3. http://www.ncipm.org.in/data_bases.htm

VSC 203 Precision Farming and Protected Cultivation 3(2 + 1)

Course objectives

1. To impart knowledge on scope, importance, principles and concepts of precision horticulture
2. To inculcate the knowledge on scope, importance and methods of protected cultivation

THEORY

UNIT I Concepts and introduction to precision horticulture

Scope and importance of precision horticulture - principles and concepts –laser leveling, mechanized direct seed sowing - seedling and sapling transplanting – Soil mapping and plant attributes, remote sensing, sensors, role of Geographic Information Systems (GIS), Global Positioning Systems (GPS), thematic maps, spatial variability, mobile mapping system and its application in precision farming -Site Specific Nutrient Management (SSNM), weed management, insect pests and disease management, yield mapping in horticultural crops.

UNIT II Precision farming techniques for horticultural crops

Crops: Mango, banana, guava, tomato, chilli, bitter gourd, turmeric and marigold

Precision farming techniques -protray seedlings - field preparation - raised bed formation -row planting - drip irrigation - mulching- fertigation system - training systems – growth regulators – plant protection – harvesting – grading and packing system.

UNIT III: Scope, importance and methods of protected cultivation

Scope and importance - different growing structures of protected culture *viz.*, green house, poly house, net house, poly tunnels - Influence of environmental factors on green house production –planning, design and materials of construction for traditional and low cost green house –Heating, cooling systems, passive and hot air and drying and CO₂ enrichment- Growing media- different types, soil culture, pasteurization of media, drainage, flooding and leaching - Irrigation systems in green house -Cost estimation and economic analysis - Constraints of green house cultivation and future strategies -Nutrient film technique / hydroponics / aeroponic culture

UNIT IV Protected cultivation technology for vegetable and fruit crops

Crops: Tomato, capsicum, cucumber, melons, strawberry

Hi-tech protected cultivation techniques - soil sterilization - growing media preparation - bed formation - special horticultural practices -drip and fertigation –mulching- plant growth regulators - harvest and yield - storage - postharvest management

UNIT V Protected cultivation technology for flower crops

Crops: Dutch rose, chrysanthemum, carnation, gerbera, anthurium, orchids

Hi-tech protected cultivation techniques - soil sterilization - growing media preparation - bed formation - special horticultural practices - drip and fertigation –mulching- plant growth regulators - harvest and yield - storage - post harvest management

PRACTICAL

Study of different types of greenhouses based on shape, construction and cladding materials; Calculation of air rate exchange in an active summer winter cooling system; Calculation of rate of air exchange in an active winter cooling system; Estimation of drying rate of agricultural products inside green house; Testing of soil and water to study its suitability for growing crops in greenhouses; The study of fertigation requirements for greenhouses crops and estimation of E.C. in the fertigation solution; The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization / sterilization; Visit to commercial greenhouses; Economics of protected cultivation.

Course outcomes

1. Learn about the scope, importance, principles and concepts of precision horticulture
2. Acquire knowledge and practical experience on Precision farming techniques for horticultural crops
3. Acquire knowledge and practical experience on protected cultivation of horticultural crops
4. Gain knowledge and experience on Site Specific Nutrient Management
5. Demonstrate various cultural practices of protected vegetable crops

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2. Joe.J.Hanan. 1998. Green houses: Advanced Technology for Protected Horticulture, CRC Press, LLC. Florida.
3. Paul V. Nelson. 1991. Green house operation and management. Ball publishing USA.

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- www.icar.org.in/ciphet.html

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- www.lasercladding.com

FSC 205 Dryland Horticulture 2(1 + 1)

Course objectives

1. To impart knowledge on techniques and management of dry land horticulture
2. To study cultivation practices of dryland fruit crops

THEORY

UNIT I Dryland Horticulture

Definition, importance and limitation of dry land horticulture, present status and futurescope. Constraints encounter in dry lands. Agro-climatic features in rain shadow areas, scarcewater resources, high temperature, soil erosion, run-off losses etc.

UNIT II Soil and water conservation

Techniques and management of dry land horticulture. Watershed development, soil andwater conservation methods-terraces, contour bunds,etc. Methods of control and impoundingof run-off water-farm ponds, trenches, macro catch pits,etc.,in-situ water harvesting methods,micro catchment, different types of tree basins etc.

UNIT III Water use efficiency

Methods of reducing evapotranspiration, useof shelter belts, mulches, antitranspirants, growth regulators, etc. water use efficiency-need based,economic and conjunctive use of water, micro systems of irrigation etc.

UNIT IV Dry land fruit crops (Aonla, ber, pomegranate, date palm, fig, phalsa and Custard apple)

Composition and uses - origin and distribution - climate and soil requirements – varieties -spacing and planting patterns - cropping systems - management of nutrients, water, weeds – special horticultural practices – use of plant growth regulators – harvest and yield-production constraints - post harvest handling.

UNIT V Dry land fruit crops (Jamun, bael, wood apple, west Indian cherry, Carissa and manila tamarind)

Composition and uses - origin and distribution - climate and soil requirements – varieties -spacing and planting patterns - cropping systems - management of nutrients, water,

weeds – special horticultural practices – use of plant growth regulators – harvest and yield-production constraints - post harvest handling.

PRACTICAL

Study of rainfall patterns. Contour bunding/trenching, micro catchments, soil erosion and its control. Study of evapotranspiration, mulches and micro irrigation systems. Special techniques of planting and aftercare in dry lands. Study of morphological and anatomical features of drought tolerant fruit crops.

Course outcome

1. Students will be able to know about the dry land cultivation in India.
2. Students will learn about the methods of water and soil conservation
3. Student gains information about antitranspirants
4. This course also gives information related selection of fruit crops suitable for cultivation in dry land region
5. It also gives brief knowledge about the cultivation of fruit crops in dry land region

References

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2. MohamadShahid and MohamadRaza (1987). Dry land Agriculture in India. Rawa Publications, Jaipur.
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4. www.fruits.com
5. www.hort.purdue.edu/newcrop/morton

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III YEAR V SEMESTER

| Sl. No | Course code | List of Courses | Credit hours |
|--------------|---------------------|---|-------------------|
| 1. | AGR 303 | Organic Farming | 3 (2+1) |
| 2. | AGR 304 | Introduction to Major Field Crops | 2 (1+1) |
| 3. | PSM 303 | Medicinal and Aromatic crops | 3 (2+1) |
| 4. | FOR 301 | Introductory Agro-forestry | 2 (1+1) |
| 5. | VSC 304 | Breeding of Vegetable, Tuber and Spice Crops | 3 (2+1) |
| 6. | PAT 303 | Diseases of Vegetables, Ornamentals and Spice Crops | 3 (2+1) |
| 7. | FSC 305 | Orchard and Estate Management | 2(1+1) |
| 8. | AGR 305 | Agro-meteorology and Climate Change | 2 (1+1) |
| 9. | VSC 305 | Potato and tuber crops | 2 (1+1) |
| 10. | FLG 204 | Principles of Landscape Architecture | 2(1+1) |
| 11. | ELC 301- ELC 314 | Elective Course | 2(1+1) |
| TOTAL | | | 26 (15+11) |

AGR 303 Organic Farming 3(2+1)

Course objectives

1. To impart knowledge on production of organic manures, vermicomposting, green manuring, biofertilizers and other inputs
2. To study the biological intensive nutrient management and non-chemical weed, insect and disease management in organic farming

THEORY

UNIT I: Organic farming

Introduction - definition, scope and concept relevance in present context- History of organic farming - global scenario. Biodiversity - importance and measure to preserve biodiversity. Organic production requirements - basic steps for organic farming - Soil organic carbon: status and improvement strategies.

UNIT II Biological intensive nutrient management

Organic sources of nutrients - organic manures, vermicomposting, green manuring, biofertilizers and other inputs - On farm resources- FYM, green manures, crop residues, poultry manure, sheep and goat manures, biogas slurry and vermicompost - Off farm sources - coir pith, press mud, oilcakes, fly ash, bio compost, minerals, bone meal, bio fertilizers, traditional preparations Methods and techniques of recycling of organic residues - composting, vermicomposting, *in situ* composting - system approach - Soil improvement and amendments - Crop management - inter cropping, crop rotation, cover crops, mulching.

UNIT III: Non-chemical weed, insect and disease management

Non-chemical weed management methods - preventive, physical, cultural, mechanical and biological measures. Non-chemical diseases and pest management – use of biocontrol agents, biopesticides, pheromones, trap crops, bird perches.

UNIT IV: Indigenous Technical Knowledge (ITK)

Indigenous Technical Knowledge (ITK) in organic farming - scientific rationale - soil, nutrient, weed, water, management - prospects and problems in organic farming. Panchagavya and other organic solutions – Preparation and usage.

UNIT V Certification and labelling

Organic certification - NPOP guidelines - Certification agencies in India - crop production standards - Quality considerations - labeling and accreditation processors. Benefits and problems in organic farming. Marketing and export opportunities of organic

farming produces; Promotional activities; role of government and NGO's - action plan - policy considerations.

PRACTICAL

Raising of vegetable crops organically through nutrient, diseases and pest management; vermicomposting; vegetable and ornamental nursery raising; macro quality analysis, grading, packaging, postharvest management - hands on experience on bio composting, ITK based biological preparations, bio-inoculants - quality analysis of inputs and products - visit to organic farms, market outlets and organic certification centers.

Course outcome

1. To learn about definition, scope and concept of organic farming
2. Get knowledge on organic manures, vermicomposting, green manuring, biofertilizers and other inputs
3. Concepts of marketing and export potential, certification and labeling in organic farming
4. Knowledge on non-chemical weed, insect and disease management
5. Understand the Technical Knowledge (ITK) in organic farming

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AGR 304 Introduction to Major Field Crops 2(1 + 1)

Course objectives

1. To impart knowledge on importance, area, production and productivity of Cereals, Millets, Pulses. Oilseeds, Commercial, Green manure and fodder crops
2. To study definitions and concept of multiple cropping, mixed cropping, intercropping, relay and alley cropping, cover, multitier cropping and crop rotation.

THEORY

UNIT I Crops and cropping system classification

Agronomic classification and distribution of field crops – Importance, Area, production and productivity of Cereals, Millets, Pulses. Oilseeds, Commercial, Green manure and fodder crops-definitions and concept of multiple cropping, mixed cropping, intercropping, relay and alley cropping, cover, multitier cropping and crop rotation.

UNIT II Cereals and millets

Season – Varieties / hybrids – Nursery management – Main field preparation – Seed rate, seed treatment and sowing/ planting – Nutrient management – Weed management – Water management – Intercultural operations – Harvesting and yield.

Crops: Rice, Maize, Sorghum, Pearl millet, Finger millets and Minor millets

UNIT III Pulses and oil seeds

Season – Varieties / hybrids – Field preparation – Seed rate, seed treatment and sowing – Nutrient management – Weed management – Water management – Intercultural operations – Harvesting and yield.

Pulses: Red gram, Black gram, Green gram, Cowpea and Soybean.

Oilseeds: Groundnut, Sunflower and Gingelly

UNIT IV Commercial crops

Season – Varieties / hybrids – Field preparation – Seed rate, seed treatment and sowing – Nutrient management – Weed management – Water management – Intercultural operations – Harvesting and yield.

Crops: Cotton and Sugarcane

UNIT V Fodder and green manure crops

Season – Varieties / hybrids – Field preparation – Seed rate, seed treatment and sowing – Nutrient management – Weed management – Water management – Intercultural operations – Harvesting and yield.

Fodder crops: Sorghum, maize, cumbu Napier, Lucerne and Stylosanthus

Green manure crops: Sunnhemp and daincha.

PRACTICAL

Identification of cereals, millets, pulses, oilseeds, commercial, forage and green manure crops and seeds - nursery preparation and management for field crops - main field preparation; Seed treatment techniques - Sowing and manuring - Seeding equipment's - Estimation of population - Application of herbicides in field crops. After cultivation practices - Study of growth and yield parameters and yield estimation, harvesting of above crops; Cost and returns - Preparation of cropping scheme. Farmers' fields.

Course outcome

1. Students will get knowledge on concept of multiple cropping, mixed cropping, intercropping, relay and alley cropping, cover, multitier cropping and crop rotation
2. Course content will help the students to learn about field cropscultivation
3. To get practical knowledge on field preparation, seed treatment and sowing of field crops
4. Students will learn about nutrient management, water management and intercultural operations followed in field crops
5. Course help to learn importance and cultivation of fodder and green manure crops

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PSM 303 Medicinal and Aromatic Crops 3(2 + 1)

Course objectives

1. To gain basic knowledge on importance, scope, opportunities and constraints in cultivation of medicinal and aromatic crops
2. To impart knowledge on production technology of medicinal and aromatic crops

THEORY

UNIT I Introduction to medicinal crops

History-importance – scope- opportunities and constraints –area and production - imports and exports - classification of medicinal plants - GAP, GMP guidelines, institutions for promotion of medicinal plants- extraction techniques- Marketing

UNIT II Medicinal crops

Uses - soil and climate - varieties - propagation - nursery practices - planting and after care - nutrient management- irrigation-harvest - post harvest management-storage techniques- Chemical composition

Crops:Senna, Periwinkle, Glory lily, Ashwagandha, Medicinal coleus, Aloe, Long pepper, Isabgol , Medicinal solanum

UNIT III Medicinal crops

Uses - soil and climate - varieties - propagation - nursery practices - planting and after care - nutrient management- irrigation - harvest - post harvest management-storage techniques -Chemical composition

Crops: Medicinal dioscorea, Rauwolfia, Sweet flag, belladonna, Cinchona, Pyrethrum

UNIT IV Introduction to aromatic crops

History-importance – Scope- opportunities and constraints – exports and imports - Origin, distribution- area and production-distillation

Uses - soil and climate - varieties - propagation - nursery practices - planting and after care - nutrient management- irrigation - harvest - post harvest management -storage techniques-Chemical composition

Crops:Ocimum, Davana, Mentha, Lemon grass, Citronella, Palmarosa, Vetiver

UNIT V Aromatic crops

Uses - soil and climate - varieties - propagation - nursery practices - planting and after care - nutrient management- irrigation - harvest - post harvest management-storage techniques-Chemical composition

Crops: Geranium, Patchouli, Lavender, bursera, Musk

PRACTICAL

Identification – major medicinal crops – aromatic crops –morphological description- nursery techniques– harvesting-processing techniques- -senna – periwinkle – ashwagandha – glory lily – medicinal coleus – aloe -Mentha- ocimum – davana – lemon grass, palmarosa, citronella, vetiver - extraction- distillation- visit to commercial medicinal and aromatic plantations.

Course outcomes

1. Learn about importance, nutritive value and classification of spices and condiments
2. Acquire knowledge on production technology of spices
3. Acquire knowledge on production technology of condiments
4. Gain knowledge and practical experience on processing and value addition of spices and condiments
5. Demonstrate various propagation methods, special practices and post harvest practices of major spices and condiments

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FOR 301 Introductory Agroforestry 2(1 + 1)

Course objectives

1. To study about definition, objectives and potential of agroforestry
2. To impart knowledge about the facts of agroforestry and familiarize the students with important trees suitable for agroforestry and various agroforestry systems.

THEORY

UNIT I Introduction to Agroforestry

Agroforestry – definition, objectives and potential. Distinction between agroforestry and social forestry.

UNIT II Agroforestry concept and systems

Status of Indian forests and role in India farming systems. Agroforestry system, subsystem and practice

UNIT III Agroforestry practices

Agri-silviculture, silvipastoral, horti-silviculture, horti-silvipastoral, shifting cultivation, taungya, home gardens, alley cropping, intercropping, wind breaks, shelterbelts and energy plantations.

UNIT IV Planning for agroforestry

Planning for agroforestry – constraints, diagnosis and design methodology, selection of tree crop species for agro-forestry.

UNIT V Agroforestry projects

Agroforestry projects – national, overseas, MPTS – their management practices, economics of cultivation – nursery and planting (*Acacia catechu*, *Dalbergiasissoo*, *Tectona*, *Populus*, *Morus*, *Grewia*, *Eucalyptus*, *Quercus* spp. and bamboo, tamarind, neem etc.).

Practical

Identification and seeds and seedlings of multipurpose tree species. Nursery practices for poplar, *Grewiaoptiva*, *Morusalba*, *Acacia catechu*, *Dalbergiasissoo*, robinia, leucaena etc. Visit to agro-forestry fields to study the compatibility of MPTS with agricultural crops: silvipastoral, alley cropping, horti-silviculture, agro-silvipasture, fuel and fodder blocks. Visit to social forestry plantations – railway line plantations, canal plantations, roadside plantations, industrial plantations and shelterbelts. Rapid assessment of farmers needs for green manure, fodder, fuel wood in selected villages. Economics and marketing of products raised in agroforestry systems.

Course outcomes

1. The students will gain knowledge on concepts of Agroforestry, and Agroforestry systems.
2. The students will also learn about the silviculture and nursery technology of important Agroforestry tree species
3. Students get practical knowledge on agroforestry projects
4. Students understand the agri-silviculture, silvipastoral, horti-silviculture, horti-silvipastoral, shifting cultivation, taungya, home gardens, alley cropping, intercropping, wind breaks, shelterbelts and energy plantations
5. Students learn selection of tree crop species for agro-forestry

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**VSC 304 Breeding of Vegetable, Tuber, Spice, Flower and medicinal
crops3(2 + 1)**

Course objectives

1. To impart knowledge on the breeding strategies and methods of breeding of vegetable, tuber, spice and flower crops
2. To understand the basic concepts and methods of breeding in sexual and asexually propagated vegetable crops

THEORY

UNIT I Self / often cross pollinated vegetable crops

Centres of origin, plant bio-diversity and its conservation. Mode of reproduction, pollination mechanism and genetics of important vegetable, tuber, spice and flower crops. Self-incompatibility and male sterility, its classification and application in vegetable crop improvement.

Principles - floral biology - objectives – methods of breeding - pure line selection, mass selection, heterosis breeding, hybridization, pedigree method, mass pedigree method, bulk method, modified bulk method, single seed descent method, back cross method - mutation and polyploidy breeding and achievements - application of biotechnology in crop improvement.

Crops: Tomato, brinjal, chilli, bhendi, Lab lab, vegetable cowpea, peas, french bean, cluster beans, amaranthus

Unit II Cross pollinated vegetable crops

Principles - floral biology - objectives - methods of breeding - mass selection, recurrent selection, heterosis breeding, synthetics and composites- mutation and polyploidy breeding and achievements - application of biotechnology in crop improvement.

Crops: Bitter gourd, bottle gourd, ribbed gourd, snake gourd, pumpkin, ash gourd, water melon, musk melon, cucumber, cabbage, cauliflower, radish, beetroot, carrot, onion, moringa

Unit III Asexually propagated vegetable crops

Principles of breeding – objectives - methods of breeding – clonal selection, polyploidy breeding, mutation breeding and achievements - application of biotechnology in crop improvement

Crops: Potato, cassava, sweet potato, dioscorea, major Yam, Ivy gourd

Unit IV Spices

Principles of breeding - floral biology - objectives - methods of breeding and achievements

Crops: Ginger, turmeric, black pepper, cardamom, nutmeg, cinnamon, tamarind, coriander, fennel, fenugreek

Unit V Flower crops

Principles of breeding - floral biology- objectives - methods of breeding and achievements.

Loose Flower Crops: jasmine, rose, chrysanthemum, marigold, tuberose.

Cut Flower Crops: Gladiolus, carnation and tropical orchids.

Medicinal & Aromatic Crops: mint and periwinkle.

PRACTICAL

Floral biology and pollination mechanism – study of wild relatives – practices in selfing and crossing techniques in tomato, brinjal, chilli, lablab, cluster bean, peas, French bean, vegetable cow pea, bitter gourd, ribbed gourd, cucumber, watermelon, musk melon, bhendi, onion, amaranthus, moringa, coriander, nutmeg, cinnamon, tamarind and marigold - working out phenotypic and genotypic heritability, genetic advance - GCA, SCA, combining ability, heterosis, heterobeltosis, standard heterosis, GxE interactions (stability analysis) - preparation and uses of physical and chemical mutagens - polyploidy breeding and chromosomal studies - techniques of F1 hybrid seed production - maintenance of breeding records.

Course outcomes

1. To know the basic concepts of breeding in vegetable, tuber, spice and flower crops
2. To understand the pollination mechanism in vegetable, tuber, spice and flower crops
3. To study breeding achievements in vegetable, tuber, spice and flower crops
4. To get knowledge on methods of breeding in sexual and asexually propagated vegetable crops
5. Practical experience on emasculation and hybridization in vegetable, tuber, spice and flower crops

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PAT 303 Diseases of vegetable, ornamental and spice crops 3(2 + 1)

Course objectives

1. To expose the students on etiology, symptoms, mode of spread, survival and epidemiology of important diseases of vegetable, ornamental and spice crops.
2. To understand the integrated disease management diseases of vegetable, ornamental and spice crops.

THEORY

UNIT I Diseases of vegetable crops-I

Etiology, symptoms, mode of spread, survival epidemiology and integrated management of important diseases due to fungi, bacteria, viruses, phytoplasma, non-parasitic diseases of vegetable crops tomato, chillies, brinjal, bhendi, beans, peas, onion, garlic and cucurbits.

UNIT II Diseases of vegetable crops-II

Etiology, symptoms, mode of spread, survival epidemiology and integrated management of important diseases due to fungi, bacteria, viruses, phytoplasma, non-parasitic diseases of cabbage, cauliflower, beet root, radish, knol - khol, chow- chow, carrot, potato, sweet potato, cassava, yam and colocasia. Important post-harvest diseases of vegetables.

UNIT III Diseases of spices and condiments

Etiology, symptoms, mode of spread, survival epidemiology and integrated management of important diseases due to fungi, bacteria, viruses, phytoplasma, non-parasitic diseases of turmeric, ginger, black pepper, betel vine, cardamom, fenugreek, cumin, coriander, clove, nutmeg and cinnamon.

UNIT IV Diseases of flower crops and ornamental crops

Etiology, symptoms, mode of spread, survival epidemiology and integrated management of important diseases due to fungi, bacteria, viruses, phytoplasma, non-parasitic diseases of rose, jasmine, crossandra, chrysanthemum, marigold, tuberose, carnation, liliun, gerbera, anthurium, and geranium.

Unit V Disease management under protected cultivation

Etiology, symptoms, mode of spread, survival epidemiology and integrated management of important diseases due to fungi, bacteria, viruses, phytoplasma of poly house crops: tomato, capsicum, cucumber, rose, carnation, liliun and gerbera. Closed quarantine measures for imported crops cultivated under protected condition.

PRACTICAL

Symptom diagnosis and host parasitic relationship of important diseases of tomato, chillies, brinjal, onion, garlic, bhendi, cucurbits, crucifers, beans, peas, potato, sweet potato, beet root, radish, cassava, yam, colocasia, turmeric, ginger, pepper, betel vine, cardamom, fenugreek, cumin, coriander, clove, nutmeg, cinnamon, rose, jasmine, crossandra, chrysanthemum, marigold, tuberose, carnation, lillium, gerbera, anthurium and geranium.

Course outcomes

1. Students learn about etiology, symptoms, mode of spread and survival epidemiology
2. The students will come out with the experience on identifying the diseases of vegetable, ornamental and spice crops
3. Students get practical experience on major diseases in protected cultivated crops and their management
4. Students able to suggest suitable management practices to the farming community.
5. Students learn about post-harvest diseases of vegetable, ornamental and spice crops

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FSC 305 Orchard and Estate Management 2(1+1)

Course objectives

1. To impart knowledge on importance, objectives, merits and demerits, clean cultivation, sod culture, Sod mulch, herbicides and inorganic and organic mulches.
2. To study cropping systems and soil management practices

THEORY

UNIT I Orchard and estate management

Orchard and estate management, importance, objectives, merits and demerits, clean cultivation, sod culture, Sod mulch, herbicides and inorganic and organic mulches.

UNIT II Cropping systems in horticulture

Tropical, sub-tropical and temperate horticultural systems, competitive and complimentary effect of root and shoot systems. Biological efficiency of cropping systems in horticulture, systems of irrigation.

UNIT III Soil management

Soil management in relation to nutrient and water uptake and their effect on soil environment, moisture, organisms and soil properties.

UNIT IV Fruitfulness and unfruitfulness

Factors influencing the fruitfulness and unfruitfulness. Rejuvenation of old orchards, top working, frame working, Integrated nutrient and pest management. Utilization of resources constraints in existing systems.

UNIT V Crop regulation

Crop model and crop regulation in relation to cropping systems. Climate aberrations and mitigation measures of Horticultural crops.

PRACTICAL

Layout of different systems of orchard and estate, soil management, clean, inter, cover and mixed cropping, fillers. Use of mulch materials, organic and inorganic, moisture conservation, weed control. Layout of various irrigation systems.

Course outcomes

1. To learn orchard and estate management practices
2. To study clean cultivation, sod culture, sod mulch, herbicides and inorganic and organic mulches.
3. To get knowledge on cropping system and planting

4. To study factors influencing the fruitfulness and unfruitfulness
5. Practical experience on rejuvenation of old orchards, top working and frame working

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AGR 305 Agro-meteorology and Climate Change 2 (1+1)

Course objectives

1. To know about the basic about agro meteorology and agroclimatology
2. To impact knowledge about weather, climatechange and precipitation

THEORY

UNIT I Weather and climate

Agricultural Meteorology- Introduction, definition of meteorology, scope and practical utility of Agricultural meteorology. Composition and structure of atmosphere and definition of weather and climate, aspects involved in weather and climate, atmospheric temperature, soil temperature, solar radiation, atmospheric pressure, atmospheric humidity, evaporation and transpiration, monsoons, rainfall, clouds, drought, weather disasters and their management atmospheric pollution and role of meteorology.

UNIT II Climate change

Basics of weather forecasting. Climate change-causes. Global warming-causes and remote sensing. Effect of climate change on horticulture Past and future changes in greenhouse gases within the atmosphere. Sources and sinks for greenhouse gases. Atmospheric chemistry. Plants sense and respond to changes in CO₂ concentration. Measurement of short-term effects and mechanisms underlying the observed responses in C3 and C4 species. Plant development affected by growth in elevated CO₂.

UNIT III Atmospheric pressure and precipitation

Physiology of rising CO₂ on nitrogen use and soil fertility, its implication for production. Methodology for studying effect of CO₂. Change in secondary metabolites and pest disease reaction of plants. The mechanisms of ozone and UV damage and tolerance in plants.

UNIT IV Ozone and UV

The mechanisms of ozone and UV damage and tolerance in plants. Increased temperature and plants in tropical/sub-tropical climates- effect on growing season, timing of flowering, duration of fruit development and impacts on crop yields and potential species ranges, interaction of temperature with other abiotic/biotic stress.

UNIT V Genetic manipulation of crops

Mitigation strategies and prospects for genetic manipulation of crops to maximize production in the future atmosphere. Modifying Rubisco, acclimation, metabolism of oxidizing radicals, and sink capacity as potential strategies.

PRACTICAL

Site selection for Agromet observatory; Measurement of temperature; Measurement of rainfall; Measurement of evaporation (atmospheric/soil); Measurement of atmospheric pressure; Measurement of sunshine duration and solar radiation; Measurement of wind direction and speed and relative humidity; Study of weather forecasting and synoptic charts. Visit to Meteorological observatory, Visit to IMD meteorological observatory-Lay out plan of standard meteorological observatory. Recording of air and soil temperature.Measurement of radiation and components, Measurement of rainfall-different types of raingauges, Measurement of wind speed and direction and atmospheric humidity, Recording of evaporation.Synoptic charts and weather reports, symbols, etc.

Course outcomes

1. To know about the importance of meteorology and its impact on crop production
2. To get knowledge about various weather factors and its effect on crops
3. This course gives information about weather and climate change
4. Weather forecasting and impact of climate and weather on crop production
5. To learn about ozone and UV damage and tolerance in plants

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VSC 305 Potato and Tuber Crops 2(1+1)

Course objectives

1. To impart knowledge on area, production, economic importance and export potential of potato and tropical sub-tropical and temperate tuber crops
2. To study practical aspects of propagation, planting, harvesting and postharvest handling of potato and tuber crops

THEORY

UNIT I Importance and export potential

Origin, area, production, economic importance and export potential of potato and tropical, sub-tropical and temperate tuber crops

UNIT II Production technology of potato and sweet potato

Origin, area, production, description of varieties and hybrids. Climate and soil requirement, season; seed rate; preparation of field; planting practices; spacing; water, nutrient and weed management; nutrient deficiencies. Use of chemicals and growth regulators; cropping systems. Harvesting practices, yield; economic of cultivation. Post-harvest handling and storage, field and seed standards, marketing.

UNIT III Production technology of arrow root, cassava and colocasia

Origin, area, production, description of varieties and hybrids. Climate and soil requirement, season; seed rate; preparation of field; planting practices; spacing; water, nutrient and weed management; nutrient deficiencies. Use of chemicals and growth regulators; cropping systems. Harvesting practices, yield; economic of cultivation. Post-harvest handling and storage, field and seed standards, marketing.

UNIT IV Production technology of xanthosoma, amorphophallus, dioscorea and Jerusalem

Origin, area, production, description of varieties and hybrids. Climate and soil requirement, season; seed rate; preparation of field; planting practices; spacing; water, nutrient and weed management; nutrient deficiencies. Use of chemicals and growth regulators; cropping systems. Harvesting practices, yield; economic of cultivation. Post-harvest handling and storage, field and seed standards, marketing.

UNIT V Production technology of horse radish and other under exploited tuber crops.

Origin, area, production, description of varieties and hybrids. Climate and soil requirement, season; seed rate; preparation of field; planting practices; spacing; water, nutrient and weed management; nutrient deficiencies. Use of chemicals and growth regulators; cropping systems. Harvesting practices, yield; economic of cultivation. Post-harvest handling and storage, field and seed standards, marketing.

Practical

Identification and description of potato and tropical, sub-tropical and temperate tuber crops; planting systems and practices; field preparation and sowing/planting. Top dressing of fertilizers and interculture and use of herbicides and growth regulators; identification of nutrient deficiencies, physiological disorders; harvest indices and maturity standards, post-harvest handling and storage, marketing. Seed collection, working out cost of cultivation, project preparation of commercial cultivation.

Course outcome

1. To acquire skill in cultivation of potato
2. To gain hands on experience in cultivation of tuber crops
3. To obtain knowledge on propagation of potato and tuber crops
4. To learn methods of planting and harvesting of potato and tuber crops
5. To experience on storage of potato and tuber crops

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FLG 204 Principles of landscape Architecture 2(1+1)

COURSE OBJECTIVES

1. To inculcate the basic principles and components of landscaping
2. To impart knowledge and hands on training on preparation of garden design in different situations

THEORY

UNIT I History and style of gardening

Importance of Indian gardens, Gardens of ancient world, Definitions, Famous gardens of India and abroad, formal, informal, free style and wild gardens, basic themes of gardens viz. circular, rectangular and diagonal themes

UNIT II Importance and features of various gardens

Importance, features and establishment of English garden , Japanese gardens , Mughal, gardens, French and Persian garden, Italian gardens, Hindu gardens and Buddhist gardens, Xeriscaping, definition, principles and practice.

UNIT III Garden designing and principles of landscape design

Steps in preparation of garden design. Use of Auto CAD and Arch CAD in designing gardens. Factors affecting landscape design viz. initial approach, view, human choice, simplicity, topography etc., Principles of Landscape gardens viz. Axis, rhythm, balance, time and light, space, texture, form, mass effect, focal point, mobility, emphasis, unity and harmony etc.

UNIT IV Elements of landscape design and planning of urban garden

Elements of landscape gardens viz. tangible and intangible elements. Bio-aesthetic planning, definition, objectives, planning and designing of home gardens, colonies, country planning, urban landscape

UNIT V Gardening for different situations

Development of institutional gardens, planning and planting of avenues, beautifying schools, railway lines, railway stations, factories, bus stands, air ports corporate buildings, dams, hydro electric stations, river banks, play grounds, Gardens for places of religious importance viz. temples, churches, mosques, tombs etc.

PRACTICAL

Study of garden equipments. Study of Graphic language, Use of drawing equipments, graphic symbols and notations in landscaping designing, Study and designing of different styles of gardens, Study and designing of gardens based on different themes, Designing gardens using Auto-cad/ archi-cad, Designing gardens for home, traffic islands, schools and colleges, public buildings, factories, railway stations, air ports, temples, churches, play grounds, corporate buildings/ malls. Designing and planting of avenues for state and National highways, Design and establishment of Japanese, English and Mughal gardens. Visit to public, institutional and botanical gardens.

Course outcomes

1. Learn about the importance of landscaping design, principles and types of garden
2. Acquire knowledge and experience on designing different types of garden
3. To get practical experience on using CAD
4. Gain knowledge on bio aesthetic planning in urban areas
5. Acquire knowledge and experience on designing of landscape for different situations

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4. Rajesh Srivastava. 2014. Fundamentals of Garden designing. Agrotech press, Jaipur, New Delhi

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2. [http://www.rlbcau.ac.in/pdf/Horticulture/HFL-121%20%20Principles %20of%20Landscape%20 Architecture.pdf](http://www.rlbcau.ac.in/pdf/Horticulture/HFL-121%20%20Principles%20of%20Landscape%20Architecture.pdf)
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ELC 301- Production Technology of Underexploited Vegetable Crops 2(1+1)

COURSE OBJECTIVES

1. To educate production technology of underutilized vegetable crops.
2. Students acquire knowledge on special practices in underexploited vegetable crops

THEORY

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures and seed production.

UNIT I Asparagus, artichoke and leek

UNIT II Brussels's sprout, Chinese cabbage, broccoli, kale and artichoke.

UNIT III Amaranth, celery, parsley, parsnip, lettuce, rhubarb, spinach, basella, bathua (chenopods) and chekurmanis.

UNIT IV Elephant foot yam, lima bean, winged bean, vegetable pigeon pea, jack bean and sword bean.

UNIT V Sweet gourd, spine gourd, pointed gourd, Oriental pickling melon and little gourd (kundru).

PRACTICAL

Identification of seeds; botanical description of plants; layout and planting; cultural practices; short-term experiments of underexploited vegetables.

COURSE OUTCOMES

1. Learn the importance of underexploited vegetable crops
2. Students will acquire theoretical knowledge on underexploited vegetable crops
3. Students get practical skills on production of underexploited vegetable crops
4. Students understand the special horticultural practices in underexploited vegetable crops
5. Students will learn seed production of underexploited vegetable crops

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2. <https://justagriculture.in/files/newsletter/2021/july/36.%20Underutilized%20and%20underexploited%20vegetable%20crop.pdf>
3. <https://www.ttp.in/book-info/production-technology-of-underexploited-vegetables>

ELC 302- AGROCHEMICALS 2(1+1)

COURSE OBJECTIVES

1. Main objective of this subject is familiarize the students about the different types of agro chemicals used in the form of insecticides, pesticides and fertilizers.
2. Analysis and interpret the results of agrochemicals.

THEORY

UNIT I Introduction

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture. Herbicides-Majorclasses, properties and important herbicides. Fate of herbicides.

UNIT II Fungicides

Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action- Bordeaux mixture and copper oxy chloride. Organicfungicides-Modeofaction-Dithiocarbamates-characteristics, preparation and use of Zinebandmaneb. Systemic fungicides-Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.

UNIT III Insecticides

Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Bio pesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

UNIT IV Fertilizers

Fertilizersandtheirimportance.Nitrogenousfertilizers:FeedstocksandManufacturin
gofammoniumsulphate,ammoniumnitrate,ammoniumchloride,urea.SlowreleaseN-

fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility—preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing.

UNIT V Biopesticides

Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

PRACTICAL

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available in market. Estimation of nitrogen in Urea. Estimation of water soluble P_2O_5 and citrate soluble P_2O_5 in single super phosphate. Estimation of potassium in Murexite of Potash/Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiuram. Determination of ziram content.

Course outcomes

1. Students will understand the agrochemicals, their type and role in agriculture.
2. Students will learn about herbicides-major classes, properties and important herbicides.
3. Students will learn different fertilizers and their importance
4. Students will acquire knowledge on various types of agrochemicals and their effect on environment, soil, human and animal health
5. Students will learn agrochemical efficient management for sustainable agriculture.

References

1. Agro Chemical Industries -EIRI
2. Manures, Fertilizers and Agrochemicals, ECourse -ICAR ICA.

ELC 303 - Turfing and Turf Management 2(1+1)

Course objectives

1. Students are expected to know the properties of soil for turfing, types of turf grasses, turf establishment methods and management of turf
2. Students learn about establishment and management of turf for play grounds etc.

THEORY

UNIT I Prospects of landscape industry

History of landscape gardening, site selection, basic requirements, site evaluation, concepts of physical, chemical and biological properties of soil pertaining to turf grass establishment.

UNIT II Turf grasses

Turf grasses - Types, species, varieties, hybrids; Selection of grasses for different locations; Grouping according to climatic requirement- Adaptation; Turfing for roof gardens.

UNIT III Preparatory operations; Growing media used for turf grasses – Turf establishment methods, seeding, sprigging/dibbling, plugging, sodding/turfing, turf plastering, hydro-seeding, astroturfing.

UNIT IV Turf management

Irrigation, nutrition, special practices, aerating, rolling, soil top dressing, use of turf growth regulators (TGRs) and micronutrients, Turf mowing: mowing equipments, 135 techniques to minimize wear and compaction, weed control, biotic and abiotic stress management in turfs.

UNIT V Establishment and maintenance

Establishment and maintenance of turfs for playgrounds, viz. golf, football, hockey, cricket, tennis, rugby, etc.

PRACTICAL

Identification of turf grasses, Preparatory operations in turf making, Practices in turf establishment, Layout of macro and micro irrigation systems, Water and nutrient management; Special practices: mowing, raking, rolling, soil top dressing, weed

management; Biotic and abiotic stress management; Project preparation for turf establishment, visit to IT parks, model cricket and golf grounds, airports, corporates, Govt. organizations; Renovation of lawns; Turf economics.

Course outcomes

1. Students will gather the detail knowledge on physical properties of soil for turfing
2. Students will gather the detail knowledge on biological properties of soil for turfing,
3. Students learn about different types and characters of turf grasses
4. Students will understand turf establishment methods and management of turf
5. Gain practical knowledge on establishment and management of turf for play grounds etc.

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ELC 304 - FOOD SAFETY AND STANDARDS 2(1+1)

Course objectives

1. The main objective of this subject is to know about the food safety and standards.
2. To know about the original and adulteration of food and its products.

THEORY

UNIT I Introduction

Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control.

UNIT II Food storage

Food storage. Product design. Hygiene and Sanitation in Food Service Establishments Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene.

UNIT III Food safety measures

Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.

UNIT IV Food laws

Food laws and Standards Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens.

UNIT V Food packaging

Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products

PRACTICAL

Estimation of CFU of water, Estimation of TDS in water. Estimation of Listeria and E. Coli/ Salmonella /Shigella/ Staphylococcus from food samples. Estimation of fungal toxins from food samples. Heavy metal detection (lead), Estimation of any one commonly

used pesticide, HACCP for food industries by taking few models, Study of national and international microbial quality standards, Visit to export oriented food processing industry,

Course outcomes

1. Understand the importance of Food Safety Management, Packaging.
2. Develop ability to identify of the sources of food contamination and Product and Nutritional labeling, Scope, Factors, Hazards and Risks of Food Safety.
3. Interpret the food laws and Standards- Indian Food Regulatory and their control.
4. Follow safe practices Surface Sanitation and Personal Hygiene and Regime, FSSA.
2. Global Scenario CAC and Other laws and standards newer approaches to food safety

References

1. Food Microbiology. W.C. Frazier and D.C. Westhoff, 4 thEdn. Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Food Safety Handbook. Ronald H. Schmidt and Gary E. Rodrick. 2003. John Wiley & Sons, Inc., Hoboken. New Jersey, USA.
3. Food Safety and Food Quality. R.E. Hester and R.M. Harrison. 2001. Royal Society of Chemistry, Cambridge, UK.
4. The Safety of Foods (Sicherheit von Lebensmitteln). GrahamGraham, H. D. (Edit.) 2. Auflage. AVI Publishing Co., Inc., Westport, Connecticut (USA)
6. Food Chemistry (New Edition).Owin R. Fenema
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III YEAR VI SEMESTER

| Sl.No. | Course No | Title | Credit hours |
|--------|---------------------|--|-------------------|
| 1. | AEN 304 | Apiculture, Sericulture and Lac culture | 2(1+1) |
| 2. | AEN 305 | Insect Pests of Vegetable, Ornamental and Spice Crops | 3(2+1) |
| 3. | PHT 301 | Postharvest Management of Horticultural Crops | 3(2+1) |
| 4. | SST 301 | Seed production of Vegetable, Tuber and Spice Crops | 3(2+1) |
| 5. | SST 302 | Breeding and Seed Production of Flower and Ornamental Plants | 3(2+1) |
| 6. | PHT 302 | Processing of Horticultural Crops | 3(1+2) |
| 7. | ABM 301 | Horti-Business Management | 2(2+0) |
| 8. | ABM 302 | Entrepreneurship Development and Business Management | 2(1+1) |
| 9. | AEX 302 | Fundamentals of Extension Education | 2 (1+1) |
| 10. | ELC 301- ELC 314 | Elective Course | 2(1+1) |
| | | Total | 25 (15+10) |

AEN 304 Apiculture, Sericulture and Lac culture 2(1 + 1)

Course objectives

1. To impart knowledge about apiculture, moriculture, sericulture and lac culture
2. To study mass production and use of natural enemies

THEORY

UNIT I Economic entomology

Economic classification of insects; beneficial insects, productive insects and harmful insects

UNIT II Apiculture

Honey bee species, castes, social biology and communication in honey bees - Site selection for apiary, bee pasturage, crop pollination and seed production - Hive inspection, maintenance of hive records, general and seasonal management of honey bees. Protecting bees from pesticides - Mass queen rearing - Insect, mite and bird enemies of honeybees, brood and adult diseases - Bee products- specification and uses of honey, bees wax, bee pollen, propolis, bee venom, royal jelly

UNIT III Sericulture

History, development and importance of sericulture. Moriculture - Mulberry varieties, package of practices. management of pests, diseases and nutritional disorders. Silkworms - kinds and their hosts, systematic position, distribution, lifecycles. Mulberry silkworm - races, morphological features, silk glands, rearing house and equipments, disinfection and hygiene. Grainage, packing and transportation of eggs, incubation, black boxing, hatching of eggs. Cocoon characters - colour, shape, hardness and shell ratio. Defective cocoons and stifling of cocoons. Uses of silk and by-products.

UNIT IV Lac culture

History of lac culture in India - Lac growing areas in India - Lac insects, biology, ecology and behavior - host plants of lac insects – lac culture and harvest methods - kinds of lac and lac products - Enemies of lac insects and their management

UNIT V Mass production and use of natural enemies

Culturing of host insects *Corcyra*, pumpkinmealy bug – mass culturing of predators; *Chrysoperla* and *Cryptolaemus* – mass culturing of egg parasitoids *Trichogramma*, larval parasitoids; *Goniozus* and *Bracon* – parasitoids for Uzi fly management.

PRACTICAL

Honey bee colony, different bee hives and apiculture equipment. Summer and Wintermanagement of colony. Honey extraction and bottling. Study of pests and diseases of honeybees.Establishment of mulberry garden.Preparation of mulberry cuttings, planting methods underirrigated and rainfed conditions.Maintenance of mulberry garden-pruning, fertilization, irrigationand leaf harvest.Mulberry pests and diseases and their management and nutritional disorders.Study of different kinds of silkworms and mulberry silkworm morphology, silk glands.Sericultureequipments for silkworm rearing.Mulberry silkworm rearing room requirements.Rearing of silkworms-chalky rearing. Rearing of silkworms late age silkworm rearing and study of mountages.Study of silkworm pests and their management.Study of silkworm diseases and its management.Lac insects-biology, behaviour, lac cultivation, food plants, pruning, inoculation, cropping, kinds of lac. Enemies of lac insects.

Course outcomes

1. Students will learn about identification, morphology and structural adaptations in honey bees
2. To get knowledge about moriculture, sericulture and lac culture
3. Acquire knowledge practically about symptoms and types of damage caused by insect pests
4. Student learn about pest categories, economic threshold level , economic injury level and history and principles of IPM
5. To get knowledge about identification and mass culturing of different types of parasitoids, predators and entomo pathogens

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4. David, B.V. and V.V. Ramamurthy. 2011. Elements of Economic Entomology, Namrutha Publications, Chennai, 386 p.

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2. <http://www.rlbcu.ac.in/pdf/Horticulture/HPP-327%20Apiculture,%20Sericulture%20and%20Lac%20culture.pdf>

AEN 305 Insect Pests of Vegetable, Ornamental and Spice Crops 3(2 + 1)

Course objectives

1. To impart knowledge about distribution, bionomics, symptoms of damage and management strategies of insects and non-insect pests of vegetable, ornamental and spice crops
2. To impart knowledge on storage pests and non-insect pests of vegetables, spices and ornamentals

THEORY

UNIT I Introduction to types of pests and pest management

Pest– Definition, categories and causes of outbreak, Economic Injury Level (EIL) and Economic Threshold Level (ETL) - Role of biotic and abiotic factors on pest abundance - Importance of pest surveillance - Principles and different components of integrated pest management.

UNIT II Pests of Vegetables

Distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting vegetable crops (brinjal, bhendi, tomato, chilli, onion, amaranthus, moringa, cucurbits, crucifers, potato, sweet potato and tapioca).

UNIT III Pests of spice crops

Distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting spice crops (garlic, ginger, turmeric, coriander, tamarind, curry leaf, cardamom, black pepper, betel vine).

UNIT IV Pests of ornamental crops

Distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting ornamental crops (jasmine, rose, Crossandra, chrysanthemum, tuberose, cut flowers, lawn and turf).

UNIT V Storage pests and non-insect pests of vegetables, spices and ornamentals

Pests of stored and processed vegetables, spices and dry flowers and their management - Non-insect pests and their management - Insecticidal residue problems in vegetables, ornamental crops and tolerance limits

PRACTICAL

Types of injury and symptoms of damage caused by insects and assessment of insect population and damage in vegetables - Methods of pest management in vegetables, spices and ornamentals - Biocontrol agents for use in vegetables, spices and ornamentals - Pesticide formulation, plant protection appliances and application techniques - Study of symptoms, damage, collection, identification, preservation, assessment of damage/population of important insect-pests affecting vegetable, ornamental and spice crops in field and during storage.

Course outcomes

1. Students learn about Economic Injury Level and Economic Threshold Level
2. To learn distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting vegetable, spice and ornamental crops
3. Get knowledge on biotic and abiotic factors on pest abundance
4. Student can able to understand principles and different components of integrated pest management.
5. Knowledge on pests of stored and processed vegetables, spices and dry flowers and their management

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2. <http://www.nbaii.res.in/insectpests/pestsearch.php?cropname=Mango>
3. http://www.ncipm.org.in/data_bases.htm
4. ipm.illinois.edu

PHT 301 Postharvest Management of Horticultural Crops 3(2 + 1)

Course objectives

1. To teach the principles of postharvest technology, postharvest physiology and postharvest handling techniques in horticultural crops.
2. To impart knowledge on packaging methods and types of packages

THEORY

UNIT I Principles and importance of postharvest technology

Importance of postharvest technology in horticultural crops – structure of fruits, vegetables and cut flower - Quality parameters and specifications Maturity indices, harvesting, handling, grading of horticultural crops. Pre and post harvest factors affecting the postharvest quality, deterioration, physiological and biochemical changes during ripening. Ripening methods - ethylene in postharvest technology.

UNIT II Post harvest handling and physiology

Pre-cooling – cooling methods - cool chain – Sorting, grading and washing - machineries – waxing packing and packinghouse operations – pre and postharvest treatments to enhance shelf life physiological changes after harvest – Physiological changes in spices and plantation crops during storage. Physiological changes in cut flowers during storage.

UNIT III Packaging methods and types of packages

Packaging methods – vacuum packaging – poly shrink packaging, grape guard packing treatment. Types of packaging – recent advances in packaging - types of containers and cushioning materials

UNIT IV Storage

Methods of storage for domestic and export market – Different systems of storage - *In situ* storage-storage using sand and coir - storage in pit - storage using windbreaks - storage in barns - storage in cellars - bulk storage of dried bulb crops - storage in *clamps* -

storage using evaporative coolers - night ventilation storage - refrigerated storage - low temperature storage - hypobaric storage - controlled atmosphere (C.A.) storage - modified atmospheric storage - compatibility of horticulture produce for storage - pre-storage treatments.

UNIT V Postharvest disorders and transport and export

Postharvest disorders - Modes of transportation for horticultural produce – by air, road and sea - constraints-transit hazards - WTO guidelines for export of horticultural produces – CODEX standards and export standards for major fruits, vegetables and cut flowers - food safety practices – HACCP - minimal processing of fruits and vegetables - physiology - constraints and thrust areas.

PRACTICAL

Practice in judging maturity of various horticultural produce -determination of physiological loss in weight and quality - sorting, grading and washing of horticultural produce - Post-harvest treatments to enhance the postharvest quality - assessment of physical, physiological and biochemical changes during ripening – Postharvest treatments to enhance the postharvest life – packaging of fruits, vegetables, spices and cut flowers. Vase life of cut flowers - waxing - methods of storage – drying technology of medicinal plants – postharvest disorder - Visit to markets, packaging house and cold storage.

Course outcomes

1. Learn about the importance of post harvest technology of horticultural crops
2. Acquire knowledge on the physiological and biochemical changes occur during ripening of horticultural crops
3. Learn about the value addition principles and preservation methods of horticultural crops
4. Acquire knowledge on different packaging and storage methods of horticultural crops
5. Gain knowledge on the drying, canning and food product standards of horticultural crops

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SST 301 Seed Production of Vegetable, Tuber and Spice Crops 3(2+1)

Course objectives

1. To impart knowledge on importance and scope of vegetable seed production in India
2. To make students understand the principles of vegetable, tuber and spice crops seed production

THEROY

UNIT I Introduction and history

Introduction and history of seed industry in India. Definition of seed, classes-types of seed. Differences between grain and seed.

UNIT II Vegetable crops seed production

Importance and scope of vegetable seed production in India. Principles of vegetable seed production. Role of temperature, humidity and light in vegetable seed production, land requirements, climate, season, planting time, nursery management, seed rate, rouging, seed extraction and storage of cole crops, root vegetables, solanaceous vegetables, cucurbits, okra, leafy vegetables, bulb crops, leguminous vegetables and exotic vegetables.

UNIT III Tuber crops seed production

Role of temperature, humidity and light in vegetable seed production, land requirements, climate, season, planting time, nursery management, seed rate, rouging, seed extraction and storage

UNIT IV Spice crops seed production

Role of temperature, humidity and light in vegetable seed production, land requirements, climate, season, planting time, nursery management, seed rate, rouging, seed extraction and storage

UNIT V Seed germination and purity analysis

Seed germination and purity analysis. Field and seed standards. Seed drying and extraction. Seed legislation.

PRACTICAL

Study of seed structure, colour size, shape and texture. Field inspection of seed crops. Practices in rouging. Harvesting and seed extraction. Germination and purity analysis. Methods of seed production, Seed certification in cole crops, root vegetables, bulb crops, solanaceous vegetables, cucurbits, okra, leafy vegetables, leguminous vegetables and exotic vegetables. Seed processing machines. Visit to seed production units.

Course outcomes

1. Acquire knowledge on introduction and history of seed industry in India
2. To get knowledge on seed production methods in vegetable crops
3. To study the seed production of tuber and spice crops
4. Get practical experience on seed drying and extraction
5. Understand the seed germination and purity analysis

References

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SST 302 Breeding and Seed Production of Flower and Ornamental Crops 3(2+1)

Course objectives

1. To impart knowledge on basic and applied aspects of breeding and seed production of flower and ornamental crops
2. To understand the methods of breeding for disease resistance in flower and ornamental crops

THEROY

UNIT I History and centre of origin of flower crops

History of improvements of ornamental plants, Centre of origin of flower crops and ornamental crops, objectives and techniques in ornamental plant breeding.

UNIT II Breeding in major flower crops

Introduction, selection, hybridization, mutation and biotechnological technique for improvement of ornamental and flower crops

Crops: Rose, Jasmine, Marigold, Chrysanthemum, Tuberosa, Crossandra, Gerbera, Gladiolus, orchids, anthurium, carnation, Lilium

UNIT III Breeding in minor flower crops

Introduction, selection, hybridization, mutation and biotechnological technique for improvement of ornamental and flower crops

Crops: Dahlia, Heliconia, Gaillardia, Petunia, Hibiscus, Bouganvillea, Zinnia, Cosmos, Snapdragon, Pansy, geranium, antirrhinum, china aster, hibiscus etc.

UNIT IV Breeding for disease resistance

Breeding for disease resistance. Development of promising cultivars of important ornamentals and flower crops. Role of heterosis and its exploitation

UNIT V Male sterility

Production of F1 hybrids and utilization of male sterility, production of open pollinated seed. Harvesting processing and storage of seeds, seed certification.

PRACTICAL

Study of floral biology and pollination in important species and cultivars. Techniques of inducing polyploidy and mutation. Production of pure and hybrid seeds. Harvesting, conditioning and testing of seeds. Practice in seed production methods.

Course outcomes

1. Explain the basic concepts, history and centre of origin of flower crops
2. Get practical experience on hybridization in flower crops
3. To study the breeding methods in major and minor flower crops
4. To learn the role of heterosis breeding in crop improvement
5. To get knowledge on harvesting, processing and storage of seeds

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3. <https://iaritoppers.in/icar-paper/Breeding-and-Seed-Production-of-Ornamental-Plants.pdf>
4. <https://www.phytojournal.com/archives/2020/vol9issue5S/PartD/S-9-5-41-752.pdf>

PHT 302 Processing of Horticultural Crops 3(1+2)

Course objectives

1. To enlighten the students with the knowledge of microbial diversity in soils
2. To highlighten the role of soil microorganisms in soil fertility and plant growth promotion
3. To develop experimental skills in soil microbiology which includes isolation of beneficial microorganisms from soil and plant and their mass production
4. To make students gain expertise in practical aspects of production of industrial products

THEORY

UNIT I Scope of fruit and vegetables preservation

Importance and scope of fruit and vegetable preservation industry in India, food pipe line, losses in post-harvest operations, unit operations in food processing.Principles and guidelines for the location of processing units.

UNIT II Principles and methods of preservation

Principles and methods of preservation by heat - pasteurization,canning, bottling.Methods of preparation of juices, squashes, syrups, cordials and fermented beverages.Jam, jelly and marmalade.

UNIT III Value addition of fruits

Preservation by sugar and chemicals, candies, crystallized fruits, preserves chemical preservatives, preservation with salt and vinegar, pickling, chutneys and sauces, tomato and mushrooms

UNIT IV Preservation by Freezing

Freezing preservation – frozen orange slices and peas. Freeze drying of horticultural crops. Individual Quick Freezing.

UNIT V Processing of plantation crops and food laws

Processing of plantation crops, products, spoilage in processed foods, quality control of processed products, Govt. policy on import and export of processed fruits. Food laws.

PRACTICAL

Equipments used in food processing units. Physico-chemical analysis of fruits and vegetables. Canning of fruits and vegetables, preparation of squash, RTS, cordial, syrup, jam, jelly, marmalade, candies, preserves, chutneys, sauces, pickles (hot and sweet). Dehydration of fruits and vegetables – tomato product dehydration, refrigeration and freezing, cut out analysis of processed foods. Processing of plantation crops. Visit to processing units.

Course outcomes

1. To gain knowledge on importance and scope of fruit and vegetable preservation industry in India
2. Students will be imparted with the knowledge on principles and methods of preservation by heat
3. Students will acquire experimental skills in preparation of juices, squashes, syrups, cordials and fermented beverages.
4. Students will gain expertise in practical aspects of processing of plantation crops
5. Gain knowledge on preservation by sugar, chemicals and freezing

References

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ABM 301 Horti-Business Management 2(2 + 0)

Course objectives

1. To impart knowledge on farm management, planning and Budgeting
2. To acquire knowledge on functional areas of management

UNIT I Farm Management

Farm Management: Definition, nature, characteristics, and scope- objectives and relationship with other sciences – Production Economics Vs Farm Management – Farm management decisions – decision-making process. Scope of farm management. Types of farming: Specialized, Diversified, and Mixed farming – Systems of farming: Peasant Farming, State Farming, Capitalistic, Collective and Co – operative Farming.

UNIT II Factor-Product, Factor-Factor and Product-Product Relationships

Principles of farm management: Factor-Product relationship: Meaning – Definition – Laws of returns – Classical production function and three stages of production – Elasticity of production–Types/Forms of production functions – Linear, Cobb-Douglas and Quadratic - use of production function in decision-making. Cost concepts, cost curves and cost functions - shut down and break-even points – CACP cost concepts – cost of cultivation - cost of production - importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income. Economies of scale – Economies of size – Determination of optimum input and output – Physical and economic optimum.

Factor-Factor relationship: Meaning – isoquant – definition and types – MRTS - isocost line– Principle of factor substitution and least cost combination of inputs - expansion path – isocline –ridge line – Returns to scale - Elasticity of factor substitution – Effect of change in prices on least cost combination. Product-product relationship: Meaning – Production possibility curve – marginal rate of product transformation – Enterprise relationship: joint products – complementary –supplementary – competitive products – iso revenue line – optimum combination of products.Principle of Opportunity Cost – equi-marginal returns - Minimum Loss Principle. Law of Comparative Advantage. Time value of money – compounding and discounting.

UNIT III Farm planning and Budgeting

Farm planning: importance – characteristics of good farm plan – farm planning procedure –Budgeting: definition and types – complete budgeting – partial budgeting – enterprise budgeting –cash flow budgeting – limitations of budgeting. Risk and uncertainty: definition –types of risk and uncertainty – safeguards against risk and uncertainty.

UNIT IV Agri/Horti-business

Agribusiness – Definition – Structure of Agribusiness (input, farm and product sectors) –Agribusiness Management – Importance of Agribusiness in Indian Economy. Management –Definition and Importance – Management functions – Nature. Management – Roles, Skills, Levels and functional areas of management. Forms of Business Organisations: Sole Proprietorship –Partnership – Public and Private Limited, Cooperatives. Planning: meaning – Types of plans (Purpose or Mission, Goals or Objectives, Strategies,Policies, Procedures, Rules, Programmes, Budget). Steps in planning – characteristics of effective plans. Objectives – MBO. Organizing: meaning – Principles of organizing – Unity of command, scalar pattern, job design, span of control, responsibility, power, authority, and accountability.

Concept of Departmentation – Delegation – Centralization – Decentralization. Staffing – Concept – Human Resource Planning – Process. Directing – Concept – Principles– Techniques, Supervision. Motivation – Concept – Maslow’s Need Hierarchy Theory – Types –Techniques. Leadership – Definition – Styles – Difference between leadership and management. Controlling – Concept – Steps – Types – Importance – Process - Control system and Devices –Budgeting as a tool of planning and control – Record keeping as a tool of control.

UNIT V Functional areas of Management

Functional areas of management – Operations management – physical facilities, implementing the plan, scheduling the work, controlling production in terms of quantity and quality. Materials management – types of inventories, inventory costs, managing the inventories, economic order quantity (EOQ). Personnel Management – recruitment, selection and training, job specialization. Marketing management – definitions, planning the marketing programmes - 4Ps of marketing mix. Financial management – financial statements and ratios – capital budgeting.Project management – project preparation – evaluation measures.

PRACTICAL

Visits to study structure, functions, linkages and extension programmes of ICFRE institutes/ voluntary organizations/MahilaMandal, Village Panchayat, State Dept. of Horticulture /All India. Radio (AIR). Exercises on distortion of message, script writing for farm broadcasts and telecasts, planning, preparation & use of NPVA like poster, chart, flash cards, folders etc. and AVA like OHP & 35 mm slide projector transparencies. Identification of local leaders to study their role in extension work. Evaluation of some selected case studies of forestry extension programmes. Preparation of Village Agricultural productions plan.

Course outcomes

1. To explore horti-business opportunities that are commercially successful and the procedures involved in start-ups.
2. To learn definition, nature, characteristics and scope of farm management
3. To teach, steps and methods of planning, types of plan, characteristics of effective plans
4. To formulate business proposal for successful implementation of the business plan
5. To gain knowledge on project preparation evaluation measures

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4. Chitale, A.K. and R.C. Gupta (2009), "Materials Management – Text and Cases", PHI Learning Ltd., New Delhi.
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8. Price Gittinger, J., 1982. Economic Analysis of Agricultural Projects, The Johns Hopkins University Press, London.
9. Smith P. 1984. Agricultural Project Management: Monitoring and Control of Implementation, Elsevier Applied Science Publishers Ltd., London

10. Susan Nash, 2007. Starting and Running a Successful Consultancy: How to Market and Build Your Own Consultancy Business, How To Books, Oxford, London.

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ABM 302 Entrepreneurship Development and Business Management 2(1+1)

Course objectives

1. To conduct experiential learning programme by providing hands on training to make students become farm entrepreneurs
2. To study the supply chain management and communication skills

THEORY

UNIT I Entrepreneurship

Concept of entrepreneurship; entrepreneurial and managerial characteristics; Assessing overall business environment in the Indian economy. Globalisation and the emerging business /entrepreneurial environment. Overview of Indian social, political, and economic systems and their implications on agricultural entrepreneurs.

UNIT II Managing enterprise

Managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; SWOT analysis and Market Survey, Generation, incubation and commercialization of ideas and innovations.

UNIT III Programmes / Schemes for Entrepreneurship development

Entrepreneurship development initiatives of the Government – SSIB, SIDO, NSIC, KVIC, NISIET, NIESBUD, IIE, SSIDC, SDI, DIC, SIDBI, Commercial banks, SFC. Schemes and incentives for promotion of entrepreneurship - Agribusiness, Agri clinic, Agri Business Center, EXIM bank, Special Economic Zones, Food parks. Government policies related to horticulture and food processing sector. Export and Import policies of government of India.

UNIT IV Functional Areas of Management

Venture capital. Contract farming and joint ventures, public, private partnerships. Supply chain management and total quality management. Overview of horti inputs industry. Characteristics of Indian horticultural processing and export industries. Social Responsibility of Business.

UNIT V Business Communication

Communication skills for entrepreneurs – Meaning, definition, process and importance, types of communication skills. Leadership – Definition, styles, difference between leaders and Managers.

PRACTICAL

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; Conducting market survey to the demand for product, preparing advertisements for popularization of product, news writing, preparing project proposals, individual, group presentation, features of oral presentation, presentation, evaluation of presentation and evaluation of sheet, dyadic communication-face to face conversation, telephone conversation, rate of speech and clarity of voice, speaking and listening politeness, telephone etiquettes, organising general and group meeting, salient features of participation in seminars and conferences, conducting and participating in mock interviews.

Course outcomes

1. To impart knowledge about entrepreneurship development
2. To understand the roles and functions of institutions available for horti-business
3. To know about the supply chain management
4. To get knowledge about the marketing of horti-business products and pricing strategies
5. To know about the communication skills

References

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4. Hopkins J A and Baker C B Danville, Financial Management in Agriculture, Interstate Publishers. Kotler Philip and Armstrong, Principles of Marketing. Prentice-Hall.
5. Pandey U. K., An Introduction to Agricultural Finance.
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7. Somani, L. L., Extension Education and Communication, Agrotech, Publishing Academy, Udaipur.
8. A.K.Singh,2009.Entrepreneurship Development and Management. Lakshmi Publications Ltd.,
9. S. Anil Kumar, S.C Poornima, M.K. Abhraham and K. Jayashree, 2008; Entrepreneurship Development. New Age International Publishers

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5. www.nimsme.org/
6. www.nsic.co.in/
7. <https://www.nabard.org/>

AEX 302 Fundamentals of Extension Education2(1 + 1)

Course objectives

1. This course intends to expose students to the fundamentals of extension education, extension systems in India, programme planning and rural development efforts, extension administration.
2. To impart knowledge to the students on communication, different extension methods and approaches used for transfer of agricultural / horticultural technology.

THEORY

UNIT I Extension Education and Horticultural Extension

Extension education: meaning, definition, nature, scope, objectives, principles, approaches and history. Horticulture extension: process, principles and selected programmes of leading national and international forest institutes. People's participation in Horticulture programmes. Motivation of Farmers, rural youth and voluntary organizations for Horticulture extension work.

UNIT II Rural Development and TOT

Rural Development: meaning, definition, objectives, and genesis. Transfer of technology programmes like Lab to Land Programme (LLP) National Demonstration (ND), Front Line Demonstration (FLD) Krishi Vigyan Kendras (KVK), Technology Assessment and Refinement Programme (TARP) etc. of ICAR.

UNIT III Communication and Adoption

Communication: meaning, definition, elements, and selected models: Aristotle, Berlo, Leagan models. Audio – visual aids: importance, classification, and selection. Adoption and diffusion process, Teaching and learning-concepts and principles, teaching steps.

UNIT IV Programme Planning and PRA

Programming planning process – meaning, scope, principles, and steps. Evaluation: meaning, importance and methods. Scope and importance of Participatory Rural Appraisal (PRA) & Rapid Rural Appraisal (RRA).

UNIT V Management and ICT in Horticulture

Management and administration: meaning, definition, principles, and functions. Concepts of human resource development (HRD), rural leadership. ICT in Extension education, ICT use in rural India.

PRACTICAL

Visits to study structure, functions, linkages and extension programmes of ICFRE institutes/ voluntary organizations/MahilaMandal, Village Panchayat, State Dept. of Horticulture /All India. Radio (AIR). Exercises on distortion of message, script writing for farm broadcasts and telecasts, planning, preparation & use of NPVA like poster, chart, flash cards, folders etc. and AVA like OHP & 35 mm slide projector transparencies. Identification of local leaders to study their role in extension work. Evaluation of some selected case studies of forestry extension programmes. Preparation of Village Agricultural productions plan.

Course outcomes

1. To impart knowledge to the students on extension education and development programmes offered in India
2. To acquire knowledge on extension systems in India
3. To provide opportunity to students to visit organizations involved in extension activities
4. To gain knowledge on transfer of technology and innovations towards agricultural development
5. To enable students to develop practical skills on preparation of extension teaching methods to survey farmers

References

1. Adivi Reddy, A., 2001, Extension Education, Sree Lakshmi press, Bapatla.
2. Dahama, O. P. and Bhatnagar, O.P., 1998, Education and Communication for Development, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
3. Jalihal, K. A. and Veerabhadraiah, V., 2007, Fundamentals of Extension Education and Management in Extension, Concept publishing company, New Delhi.
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8. Supe, S. V., 2013 (2nd Edition), A Text Book of Extension Education, Agrotech Publishing Academy, Udaipur.
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3. https://www.researchgate.net/publication/354254553_Fundamentals_of_Agricultural_Extension_Education

ELC 311 - Biopesticides and Biofertilizers 2(1+1)

COURSE OBJECTIVES

1. Main objectives of this subject is to familiarize the students about the bio pesticides and bio fertilizers which are free from harmful chemicals and more environment friendly and future of the crop production.
2. Analysis and interpretation of the biopesticides and biofertilizers.

THEORY

UNIT I History and concept of biopesticides

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and bio rationales. Botanicals and their uses.

UNIT II Mass production technology of bio-pesticides

Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticides.

UNIT III Bio fertilizers

Introduction, status and scope. Structure and characteristic features of bacterial bio fertilizers- Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia; Cyanobacterial bio-fertilizers- Anabaena, Nostoc, Hapalosiphon and fungal bio fertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.

UNIT IV Production technology

Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid bio-fertilizers. FCO specifications and quality control of bio-fertilizers. Bio fertilizers -

Storage, shelf life, quality control and marketing. Factors influencing the efficacy of bio fertilizers.

UNIT V Methods of application

Methods of application of biopesticides. Application technology of biofertilizers for seeds, seedlings, tubers, sets etc.

PRACTICAL

Isolation and purification of important biopesticides: Trichoderma Pseudomonas, Bacillus, Metarhizium etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of Azospirillum, Azotobacter, Rhizobium. P-solubilizers and cyanobacteria. Mass multiplication and inoculum production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants

Course outcomes

1. Develop ability to Differentiate the structure and characteristic
2. Study the history, concept, quality control and application of biopesticides and bio-fertilizers, their importance, scope and potential.
3. Interpret storage, shelf life, quality control and marketing and features of various bacterial bio-fertilizers. Factors influencing the efficacy of Bio-pesticides.
4. Evaluate mechanism of Production technology of Bio-pesticides and Bio-fertilizers
5. Students will be aware about bio fertilizers its status and scope. Characteristic features of various bacterial bio fertilizers.

References

1. Biofertilizers and Biopesticides Channabasava A and Lakshman, H. C. Pointers Publishers.
2. Biofertilizers and Biopesticides Shalini Suri Aph Publishing Corporation.

ELC 312 - HI-TECH HORTICULTURE 2(1+1)

Course objectives

1. To learn about the present status of horticulture in India and abroad
2. To learn modern and innovative technologies used in horticulture field
3. Preservation and value addition in fruits and vegetables

To develop technical skills related to horticulture

THEORY

UNIT I - Introduction

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods.

UNIT II Protected cultivation

Protected cultivation: advantages, controlled conditions, method and techniques,

UNIT III Microirrigation

Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding,

UNIT IV Precision farming

Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA),

UNIT V Application of precision farming

Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

PRACTICAL

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

Course outcomes

1. Students will gather details knowledge on modern advanced technologies and their application in horticulture.
2. Students will gain detail knowledge on micro propogation in horticultural crops.
3. To Gain knowledge about precision farming.
4. To learn about the high density orchard in different horticultural crops.
5. To understand about importance and mechanism of precision farming in horticulture

References

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2. Patil M.T. & Patil,P.V.,2004 Commercial Protected
3. Floriculture. MPKV, Rahuri Commercial floriculture- Prasad &kumar
4. Green house operation & Management: Paul V. Nelson

ELC 313 - CAD for Outdoor and Indoor Scaping 2(1+1)

Course objectives

1. Students are expected to know the detail about application of CAD in 2D and 3D garden
2. Students acquire knowledge on plant and non-plant gardening component design using AUTOCAD, ARCHICAD, operation of AUTOCAD for 2D, basics and operation of ARCHICAD for 3D design etc.

THEORY

UNIT I Exposure to CAD (Computer Aided Designing) – Applications of CAD in landscape garden designing, 2D drawing by AUTOCAD, 3D drawing by ARCHICAD, 3D drawing by 3D MAX software, Creating legends for plant and non-plant components, Basics of Photoshop software in garden designing.

UNIT II 2D drawing methods, AUTOCAD Basics, Coordinate systems in AUTOCAD LT 2007, Point picking methods, Toolbars and Icons, File handling functions, Modifying tools, Modifying comments, Isometric drawings, Drafting objects.

UNIT III Using patterns in AUTOCAD drawing, Dimension concepts, Hyperlinking, Script making, Using productivity tools, e-transmit file, making sample drawing for outdoor and indoor garden by AUTOCAD 2D Drawing techniques, Drawing web format design, Making layout. 136 **UNIT IV** 3D drawing methods, ARCHICAD file system, Tools and Infobox, modification tools, structural elements, GDL objects (Grid Dimensional Linking), Creation of garden components through ARCHICAD.

UNIT V ARCHICAD organization tools, Dimensioning and detailing of designs, Attribute settings of components, Visualization tools for landscape preview, Data management, plotting and accessories for designing, Inserting picture using photoshop, Making sample drawing for outdoor and indoor gardens.

PRACTICAL

Practices in point picking methods, Using tool bars and icons, Using modifying tools and modifying comments, Isometric drawings, Using productivity tools, Drawing designs by AUTOCAD for home garden, institutional garden and special types of garden, Using tools and info-box for 3D drawing, Creation of garden components with ARCHICAD,

Organization, dimensioning, detailing and visualization tools with ARCHICAD, Using Photoshop package for 3D picture insertion, Drawing designs with ARCHICAD for home garden, interior garden designing, IT parks, Corporates, Theme parks and Ecotourism spots.

Course outcomes

1. Students will gather theoretical knowledge of application of CAD in 2D and 3D garden
2. Students will gather practical knowledge of application of CAD in 2D and 3D garden
3. Students learn about plant and non- plant gardening components
4. Gain practical knowledge on designing using AUTOCAD, ARCHICAD, operation of AUTOCAD for 2D, basics and operation of ARCHICAD for 3D design etc.

References

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ELC 314 - Agricultural Journalism 2(1+1)

Course objectives

1. Main objective of this subject is to acquaint the students about the agriculture journalism.
2. To know about the journalism knowledge resources and impacts.

THEORY

UNIT I Introduction

The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.

UNIT II Communication media

Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines.

UNIT III Agriculture stories

Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources.

UNIT IV Writing agricultural stories

Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures.

UNIT V Depicted agricultural stories

Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.

PRACTICAL

Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different Types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading, headline and title writing, proofreading, lay outing. Testing copy with a readability formula. Visit to a publishing office.

Course outcomes

1. To understand about agricultural journalism
2. To gain knowledge about newspapers and magazines as communication media
3. To understand writing the story: organizing the material, treatment of the story

References

1. B L Jana, Agricultural Journalism, ATPA.
2. C Bhaskaran, Farm Journalism and Media Management, Agrotech publishing Academy.

IV YEAR VII SEMESTER

| Rural Agricultural Work Experience and Agro-industrial Attachment (RAW & AIA) | | | | | | |
|--|--------------------|---|---------------------|------------------------|---------------------|-----------------|
| Sl. No | Course code | Activities | No. of weeks | Contact periods | Credit hours | |
| 1. | AEX 403 | General orientation & On campus training by different faculties | 1 | 320 | 20(0+20) | |
| | | Village attachment | 8 | | | |
| | | Unit attachment in Univ./College. KVK/research Station | 5 | | | |
| | | Plant Clinic | 2 | | | |
| | | Agro- Industrial Attachment | 3 | | | |
| 2. | HOR 402 | Project Report Preparation, Presentation and Evaluation | 1 | 40 | 1(0+1) | |
| 3. | AEX 404 | All India Tour* | | 40 | 1(0+1)* | |
| *Non-gradual compulsory courses | | | Total | 20 | 400 | 22(0+22) |

AEX 405 STUDENT READY (Rural Entrepreneurship Awareness Development Yojana)

Student Ready Programme is conceptualized to reorient graduates of Horticulture and allied subjects for ensuring and assuring employability and to develop entrepreneurs for emerging knowledge intensive horticulture by articulating knowledge, skill, ability and experiences.

Five components of student READY are:

1. Component I : Rural Agricultural Work Experience (RAW)
2. Component II : Internship/ In Plant Training/ Industrial attachment
3. Component III : Students Projects
4. Component IV : Experiential Learning with business mode

5. Component V : Hands-on training (HOT)/ Skill development training i.e. Experiential Learning without business mode

Component I - Rural Agricultural Work Experience (RAWE)

The Rural Agricultural Work Experience (RAWE) provides exposure to agricultural students to the natural setting of the village situations, work with the farm families, identify their problems and make use of various extension tools for transferring the latest agricultural technologies. The students also get opportunity to study the various on-going schemes related to horticulture and rural development and participate in their implementation. The students were given rigorous orientation and familiarization on various issues and problems expected on farmers' field and hence gain competence and confidence for solving problems related to horticulture and allied sciences. It has been implemented in adopted villages under the supervision of scientists. Activities focused on intensive observations/ analysis of socio-economic and technological profile of the farm families in rural areas, participatory extension approach and acquaintance with farming situations, farm practices and interaction with progressive farmers. Soil testing has become the integral part of RAWE. This helps orient our agricultural graduates for participation in various rural developmental programme. The students also gained first hand information on industries during attachment with identified agro based industries.

Component II - Internship/ In Plant Training/ Industrial attachment

Technology and globalization are ushering an era of unprecedented change. The need and pressure for change and innovation is immense. To enrich the practical knowledge of the students, in-plant training is mandatory. In this training, students will have to study a problem in industrial perspective and submit the reports to the university. Such in-plant trainings will provide an industrial exposure to the students as well as to develop their career in the high tech industrial requirements. In-Plant training is meant to correlate theory and actual practices in the industries with the following objectives:

- To expose the students to Industrial environment, this cannot be simulated in the university.
- To familiarize the students with various Materials, Machines, Processes, Products and their applications along with relevant aspects of shop management.
- To make the students understand the psychology of the workers, and approach to problems along with the practices followed at factory

- To make the students understand the scope, functions and job responsibility-ties in various departments of an organization.
- Exposure to various aspects of entrepreneurship during the program period.

Component III - Students Projects

There are number of students interested for higher education and study abroad. Keeping in view their future requirement a component of Student Project is placed to understand and identify problems of his/ her interest and field, experimental set up, taking observation and writing and documentation in the form of thesis. Project work provides several opportunities to students to learn various aspects that cannot be taught in a class room or laboratory. In order to provide such opportunities to the graduates of agricultural science, Students Project is proposed as one of the components of the Student READY. It may be adopted based on the interest of student and expertise and facilities available with the College. The Students Project are proposed with the following objectives:

- To impart analytical skills and capability to work independently.
- To conceptualize, design and implement the proposed work plan.
- Learn to work as a team- sharing work amongst a group, and learn leadership
- Learn to solve a problem through all its stages by understanding and applying project management skills.
- Learn to do various implementations, fabrication, testing and trouble shooting.
- Learn communication report writing skills.

Component IV – Experiential Learning with business mode

Experiential Learning (EL) with business mode helps the student to develop competence, capability, capacity building, acquiring skills, expertise, and confidence to start their own enterprise and turn job creators instead of job seekers. This is a step forward for “Earn while Learn” concept. Experiential Learning is an important module for high quality professional competence and practical work experience in real life situation to Graduates. The module with entrepreneurial orientation of production and production to consumption pattern is expected to facilitate producing Job Providers rather than Job Seekers. The EL provides the students an excellent opportunity to develop analytical and entrepreneurial skills, and knowledge through meaningful hands on experience, confidence in their ability to design and execute project work. The main objectives of EL are:

- To promote professional skills and knowledge through meaningful hands on experience.

- To build confidence and to work in project mode.
- To acquire enterprise management capabilities.

AEX405 STUDENT READY PROGRAMME (Rural Agricultural Work Experience and Agro-Industrial Attachment) 20(0+20)

Course objectives

To help students primarily to understand the rural situations, status of Agricultural technologies adopted by farmers, prioritize the farmer's problems and to develop skills and attitude of working with farm families for overall development in rural area.

WORK PLAN

UNIT I Village resource inventory and planning (using PRA tools, Rich pictures, GIS maps, secondary data, interview, etc.)

- Describe the Natural Resources - Village boundaries, topography, historical background, water resources (river, canal, tank, etc.), soil resources, vegetation (trees, crops, etc.), fodder, animal husbandry (milch cattle, poultry, goatery, fishery, etc.), wild animals, climate, land utilization pattern, etc.
- Describe the Agricultural scenario - Cropping pattern, cropping systems, farming systems, area, production and productivity of crops, adoption pattern of recommended varieties / hybrids,
- Technologies and machinery / implements, organic farming, contract farming, etc.
- Explain the Demographic details – population, literacy, land holdings, farmers, farm women, youth, caste, labour, etc.
- Analyze the Social factors – social structure, social stratification, social change, social groups, culture, social control, leadership, social processes, migration, social customs, social issues, etc.
- Study the Socio-psychological factors – group processes / dynamics, attitude towards innovations, etc.
- Assess the Village Infrastructure - Educational institutions, Government institutes / offices, private firms / offices, NGOs, Societies, Banks, Panchayat Union / Grama Panchayat, Clubs, SHGs, FPOs,

- Associations, Communication facilities, transport facilities, railway station, police station, hospitals, clinics, veterinary hospital, post office, markets, community centers, religious places of worship, etc.
- Analyze the Problems / Constraints – Problem / Constraints related to farming, marketing, processing, transport, communication, access to extension and other services, etc.
- Prepare village development plans in consultation with different stakeholders.

UNIT II: Farm resource inventory and planning (using maps, Rich pictures, far system modeling, family tree charts, flow diagrams, interview, etc.)

- Describe the Farm boundaries, topography, water resources, soil resources, vegetation, animal enterprises, etc.
- Describe the cropping pattern, cropping system, farming system, agri-business, etc.
- Explore Farmers Practices – Indigenous Technical Knowledge (ITK).
- Identify the constraints of the system environment (natural, economic, social, political, legal).
- Assess the linkages with Extension agencies, Markets, Input agencies, Media, Development departments, etc.
- Identify and describe all the people involved in the farm, their work, roles, visions, needs, values, interests and relationships.
- Analyze the system in terms of satisfying current needs. What are the critical factors that need to be managed to sustain the system are there opportunities for growth and development to satisfy the
- Future needs of the system? Are there threats that also need to be managed?
- Describe the different sub-systems viz., production sub-system, management sub-system, marketing sub-system, human activity sub-system, landscape and natural sub-system, etc., and their relationships.
- Identify the linkages with the Supra System viz., economic, political, legal and social.
- Find out the adoption pattern of recommended varieties / hybrids, technologies, machinery / implements, etc.
- Analyze the financial status and performance of the system - Economics of production (area, production, productivity, yield gaps, net returns, cost benefit ratio, etc).

- Prepare farm development plans for different types of farmers, by involving them so as to improve their systems.

UNIT III Studying activities of state department of horticulture

Visit to Office of Assistant Director of Agriculture to study the organizational structure, functions, duties and responsibilities of extension personnel, ATMA, schemes implemented, extension activities conducted, etc. Involve in different extension activities such as village meetings, demonstrations, campaigns, exhibition, radio / TV programmes and record observations and lessons learnt.

UNIT IV Studying activities of an NGO

Visit to an NGO to study the organizational pattern, functions, projects, duties and responsibilities of staff, extension activities, schemes implemented, funding sources, etc.

UNIT V: Studying activities of an Horti business firm

Visit to a Horti-business firm to study the business activities, projects, managerial functions viz., planning, supervision, delegation, communication, budgeting, and related aspects.

Course outcomes

1. To understand rural situation, institutions and organizations
2. To understand customs and value systems of the villagers.
3. To familiarize with cropping pattern and of adoption of horticultural practices
4. To undertake field visits, trainings, trails, research activities and horticultural demonstrations in rural area.
5. To disseminate horticultural technologies to the rural public

HOR 402 Project Report Preparation, Presentation and Evaluation 1(0+1)

Course objectives

Students will gain expertise for identification of research problem, planning and setting up experiments and writing of reports, etc.

WORK PLAN

Student Project is placed to understand and identify problems of his/ her interest and field, experimental set up, taking observation and writing and documentation in the form of thesis.

Course outcomes

1. Learn and differentiate the priority area of the project work
2. Develop the spirit of Team Work by a part of the team to complete any projects within stipulated time period
3. Learn the different statistical techniques to conduct scientific research precisely
4. Make them capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.
5. Demonstrate to synopsis preparation, presentation and submission

AEX 404All India Study Tour (0+1)*

Course objectives

The course will provide an opportunity to the students to study the functioning of important national institutes related to horticulture and allied fields.

WORK PLAN

Visit to important National and International institutes related to agriculture, horticulture, forestry and allied fields in various regions of the country. Exposure to varied agro-climatic zones, crops grown, cultivation practices, socio-economic and cultural features of the farming community in different parts of the country.

Course outcomes

1. To understand the functioning of important national institutes related to horticulture
2. To understand the functioning of important national institutes related to allied fields.
3. To get exposure on various agro climatic zones and their features.
4. To know about the functions of various research organizations running for horticulture
5. To understand the cultivation of various horticultural crops in different zones of the country and scope available for employment in National level institutes

IV YEAR VIII SEMESTER

| Sl. No | Course Code | List of Courses | Contact Periods | Credit hours |
|--------------|-------------|---|-----------------|-----------------|
| 1. | HEL 401 | Module I - Experiential Learning Programme/ | 160 | 10(0+10) |
| 2. | HEL 402 | Module II - Hands on training (HOT) | 160 | 10(0+10) |
| Total | | | 320 | 20(0+20) |

| Sl. No. | | Credit Hours |
|---|---|------------------|
| STUDENT READY: Experimental Learning programme | | 20(0+20) |
| 1. | Commercial Horticulture | 10(0+10) |
| 2. | Protective Cultivation of High Value Horticulture Crops | 10(0+10) |
| 3. | Processing of Fruits and Vegetables for Value Addition | 10(0+10) |
| 4. | Floriculture and Landscape Architecture | 10(0+10) |
| 5. | Bio-inputs: Bio-fertilizers and Bio-pesticides | 10(0+10) |
| 6. | Mass Multiplication of Plant And Molecules through Tissue Culture | 10(0+10) |
| 7. | Mushroom culture | 10(0+10) |
| 8. | Bee keeping | 10(0+10) |
| Total | | 20 (0+20) |

HEL 401 Commercial Horticulture

Course objectives

1. To impart skill oriented practical knowledge on commercial nursery techniques of fruit, vegetable, flower and ornamental crops through experiential learning.

Activities

Nursery production of fruit crops: Raising of rootstocks, grafting and budding of rootstocks, management of grafted plants, plant certification, packaging and marketing, quality control. Nursery production of ornamentals: Production of plantlets, production of potted plants, management and maintenance, sale and marketing. Protected cultivation of vegetables and flowers: Nursery raising/procurement and transplanting, management and maintenance of the crop, postharvest handling, quality control and marketing.

Course outcomes

1. Students who complete this course will gain practical knowledge and hands on experience in the all the aspects of nursery production and micro-propagation of fruit, vegetable, flower and ornamental crops

References

1. Hartmann, H.T., D.E. Kester, F.T. Davies and R.L. Greeneve. 2006 Plant Propagation. Principles and Practices. Prentice Hall of India Private Ltd., New Delhi.
2. Bose T.K.S.K. Mitra, M.K. Sadhu, B. Mitra., 2001 Propagation of tropical and subtropical horticultural crops, NayaPrakash 206, BidhanSarani, Calcutta, Six. India.
3. Parthasarathy, V. A. 2001. Biotechnology of Horticultural Crops vol. I, II & III. Nayaprakash, Calcutta.
4. Purohit, S. S. 1998. Biotechnology: Fundamentals and Applications II Edition; Agro Botanica Bikaner, India

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1. <http://www.horticulture/propagation.com>
2. <http://www.fruitcrops.propagation.com>
3. <http://www.micropropagation/propagationtechniques.com>
4. <http://www.biotech/tissue culture techniques.com>
5. <http://www.Agriculture-Horticulture/biotechnology.com>
6. <http://www.Biotech/horticultureal crops.com>

HEL 402 Protective Cultivation of High Value Horticulture Crops

Course objectives

1. Understanding the principles, theoretical aspects and developing skills in protected cultivation of cut flower.

Activities

Visit to commercial polyhouses, Project preparation and planning. Specialised lectures by commercial export house. Study of designs of green- house structures for cultivation of crops. Land preparation and soil treatment. Planting and production: Visit to export houses; Market intelligence; Marketing of produce; cost analysis; Visit to export houses; Market intelligence; Marketing of produce; cost analysis; institutional management. Report writing and viva-voce.

Course outcomes

Students will be able to design profitable location specific protected structures complete with all necessary attachments and provide technical consultancy and employment in all aspects of protected floriculture.

References

1. Bhattacharjee SK. 2006. *Advances in Ornamental Horticulture*. Vols. I-VI. Pointer Publ.
2. Bose TK & Yadav LP. 1989. *Commercial Flowers*. NayaProkash.
3. Bose TK, Maiti RG, Dhua RS & Das P. 1999. *Floriculture and Landscaping*. NayaProkash.
4. Chadha KL. 1995. *Advances in Horticulture*. Vol. XII. Malhotra Publ. House. Lauria
- A & Victor HR. 2001. *Floriculture – Fundamentals and Practices* Agrobios.
5. Nelson PV. 1978. *Green House Operation and Management*. Reston Publ.Co.

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2. www.jains.com
3. www.gisdevelopment.net
4. www.lasercladding.com
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HEL 403 Processing of Fruits and Vegetables For Value Addition

Course objectives

1. To enable students to gain hands on experience in commercial production of value added products and to train the students in establishing a commercial processing unit.

Activities

Planning and execution of a market survey, preparation of processing schedule, preparation of project module based on market information, calculation of capital costs, source of finance, assessment of working capital requirements and other financial aspects, identification of sources for procurement of raw material, production and quality analysis of fruits and vegetables products at commercial scale, packaging, labelling, pricing and marketing of product.

Course outcomes

1. Students who complete this course will gain enough confidence and technical skills to establish a commercial processing unit.

References

1. Giridharilal, Siddappa, G.S. and Tondon, G.L. 1986. Presentation of Fruits and Vegetables. Publications and Information Division, Indian Council of Agricultural Research, New Delhi.
2. Desrosier, N.W. and Desrosier, J.N. 1987. The technology of food preservation. CBS publishers and distributors, New Delhi.
3. Cruess, W.V. 1997. Commercial fruit and vegetables products, Agro Botanica, Bikaner, Rajasthan.
4. Srivastava, R.P. and Sanjeev Kumar. 1998. Fruits and Vegetable preservation principles and practices. International Book distributing Co. Chaman studio building 2nd floor, Charbagh Lucknow, UP.

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1. <http://www.fao.org/DOCKEP/005 Y4358E/Y4358e04.htm>
2. <http://home.att.net/~africantech/GhIE/QPLFood.htm>

HEL 404 Floriculture and Landscape Gardening

Course outcomes

1. To enable students to gain hands experience in landscape designing and dry flower production
2. To develop entrepreneurial skills and confidence among students to develop their own industry.

Activities

Preparation of project report, soil and water analysis, preparation of land and layout. Production and Management of commercial flowers. Harvesting and postharvest handling of produce. Marketing of produce, Cost Analysis, Institutional Management, Visit to Flower growing areas and Export House, Attachment with private landscape agencies. Planning and designing, site analysis, selection and use of plant material for landscaping. Formal and informal garden, features, styles, principles and elements of landscaping. Preparation of landscape plans of home gardens, farm complexes, public parks, institutions, high ways, dams and avenues. Making of lawns, use of software in landscape. Making of bouquets, button hole, wreath, veni and gazaras, car and marriage palaces. Dry flower Technology (identification of suitable species, drying, packaging and forwarding techniques).

Course outcomes

Students will be able to develop their own industries and also attend landscaping jobs with zeal and enthusiasm and confidence independently.

References

1. Auto CAD. 2004. A problem solving approach, Tickoo, ISBN 1-4018-51339
2. Bhattacharjee, S.K., 2004. Landscape gardening and design-with plants. Aav'ishkar Publishers and Distributors, Jaipur, India.
3. Chadha, K.L, 2001. Handbook of horticulture. ICAR, New Delhi
4. Nambisan, K.M.P., 1995. Elementary principles of landscaping. Oxford IBH Co.Ltd., New Delhi

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4. www.lawngrasses.com
5. www.spieFsonahpsu.edu

HOR 405 Bio-Inputs: Bio-Fertilizers and Bio-Pesticides

Course objectives

1. Understanding the principles of production of bio-inputs technology
2. To update the knowledge on the bio inputs technology with current scenario and to impart entrepreneurship to the undergraduate students

Activities

Isolation and pure culture establishment of fertilizers and bio-pesticides. Culture methods and substrates. Scale of methods for bio-fertilizers and bio-pesticides. Substrate preparation and mixing techniques. Quality analysis of bio-fertilizers and bio-pesticides. Testing the final product in small scale level. Storage, marketing and cost analysis of bio-fertilizers and pesticides.

Course outcomes

- To understand and to have practical knowledge on various techniques related to bio-inputs production and application.
- To build confidence on planning entrepreneurial tasks for bio-inputs production.

References

1. Motsara MR, Bhattacharyya P and BeenaSrivatsava (2004) Biofertilizer Technology, Marketing and Usage – A source book- Cum –Glossary.
2. SubbaRao NS (2006) Soil Microbiology (4th Edition). Oxford & IBH, New Delhi.
3. Deshmukh AM, Khobragade RM, Dixit Jaipur PP (2007) Handbook of Biofertilizers and Biopesticides. Oxford Book Company, xviii, p. 308.
4. NIIR (2012) The Complete Technology Book on Biofertilizer and Organic Farming (2nd Revised Edition). NIIR Project Consultancy Services, New Delhi. P. 608.
5. Rai MK (2006) Handbook of Microbial Biofertilizers. Food Products Press. New York. P. 543.
6. Trivedi PC (2008) Biofertilizers. Pointer Publications, New Delhi. P.374.

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2. gricoop.nic.in/Zconference11/DAC%20BIOFERTILISER.ppt
3. FNCA (2006) Biofertilizer Manual. Japan Atomic Industrial Forum. P. 135.
4. ncof.dacnet.nic.in/Training_manuals/...in.../BF_and_OF_in_FCO.pdf
5. gricoop.nic.in/seed/Fertiliser241209.pdf

HEL 406 Mass Multiplication Of Plants And Molecules Through Tissue Culture

Course objectives

To impart skill oriented practical knowledge on micropropagation techniques through experiential learning.

Activities

Preparation of stock solutions of tissue culture media. Preparation of solid media and liquid media. Initiation of in vitro culture and multiplication (preparation of explant, inoculation and culturing) (crop to selected). Sub-culturing, Hardening and establishment, Initiation of callus cultures – suspension cultures, Induction of selected biomolecules in callus, Harvesting and extraction of biomolecule, Marketing and cost analysis.

Course outcomes

Students who complete this course will gain practical knowledge and hands on experience in the all the aspects of nursery production and micro-propagation of fruit plants.

References

1. Hartmann, H.T., D.E. Kester, F.T. Davies and R.L. Greeneve. 2006 Plant Propagation. Principles and Practices. Prentice Hall of India Private Ltd., New Delhi.
2. Bose T.K.S.K. Mitra, M.K. Sadhu, B. Mitra., 2001 Propagation of tropical and subtropical horticultural crops, NayaPrakash 206, BidhanSarani, Calcutta, Six. India.
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2. <http://www.fruitcrops.propagation.com>
3. <http://www.micropropagation/propagationtechniques.com>
4. <http://www.biotech/tissue culture techniques.com>
5. <http://www.Agriculture-Horticulture/biotechnology.com>
6. <http://www.Biotech/horticultureal crops.com>

HOR 407Mushroom Culture: Construction Cultivation Room/Structure and Disinfection.

Course objectives

To enable students to gain experience in mushroom cultivation and to train them in establishing mushrooms unit.

Activities

Compost preparation & pasteurization. Procurement of mother culture and spawn preparation. Procurement of casing soil and preparation for production. Mushroom seeding, Casing with soil and maintenance, Harvesting, processing, Grading, packing, marketing and Cost economics of mushroom culture.

Course outcome

Students can gain confidence and technical skills to establish a mushroom unit after completing this course.

References

1. Peter Oei. 2000. Mushroom cultivation, III Edn. Backhuyes publishers, USA.
2. Tripathi., D.P.2005. Mushroom cultivation – Oxford and IBH publishing Co., Pvt., Ltd., New Delhi.
3. Krishnamoorthy, A.S., Marimuthu, T. and Nakkeran, S. 2005. Mushroom Biotechnology. TNAU Press, Coimbatore, India.
4. Marimuthu, T., Krishnamoorthy, A.G., Sivaprakasam, K. and Jeyarajan, R. 1989. Oyster mushroom production, Tamil Nadu Agricultural University, Coimbatore.
5. Chadha K.L. and Sharma J.R. 1995. Advances in Horticulture – Mushroom Vol. 13. Melhotra Publishing House, New Delhi.

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3. www.indiaagronet.com
4. www.icargoa.res.in
5. www.ficciagroindia.com

HEL 408Bee Keeping: Procurement and Arrangement of Bee Keeping Equipments

Course objectives

1. To develop entrepreneurs in scientific beekeeping and production of honey.

Activities

Location and collection of potent nectar yielding bee flora seeds from wild. Raising/enriching the high nectar yielding bee flora in the campus. Location and hiving the natural bee colony from the wild. Establishing the apiary with suitable/favourable necessities. Maintenance and multiplication of hived colonies. Management of natural enemies and diseases of bees. Maintenance of bee colonies during dearth and honey flow seasons. Harvesting and Processing of honey and bee wax. Marketing and cost analysis.

Course outcome

As the students complete the course, they will be enriched with knowledge and skill levels to take up scientific beekeeping on commercial scale.

References

1. Atwal, A.S. 2000. Essentials of Bee Keeping and Pollination. Kalyani Publishers, Ludhiana. 394 p.
2. Abrol D.P. 2011. Beekeeping – A comprehensive guide to bees and beekeeping. Scientific Publishers, Jodhpur, 896 pages.
3. Tina Ranjan Das. 2006. Beekeeping with Apisceranaindica (in Tamil) MegensJensens, Denmark, 130 p.
4. Wedmore E.B.1988. A manual of beekeeping. BBNO, Somerset, 389 p
5. Ted Hooper, 1991. Guide to Bees and Honey (Thrid Edition), BAS printers ltd. Over Wallop, Hampshire 271 p.
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