

PONDICHERRY UNIVERSITY



7th PG BOARD OF STUDIES IN AGRICULTURAL SCIENCES

DOCTORAL DEGREE PROGRAMME
REGULATIONS AND CURRICULUM
(Effective from 2023 - 24)

**PANDIT JAWAHARLAL NEHRU COLLEGE OF
AGRICULTURE
AND RESEARCH INSTITUTE (PAJANCOA&RI)
(A Government of Puducherry Institution)
KARAIKAL – 609 603**

**PONDICHERRY UNIVERSITY
PUDUCHERRY – 605 014**



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REGULATIONS

PONDICHERRY UNIVERSITY

PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAIKAL

DOCTORAL DEGREE PROGRAMME SEMESTER SYSTEM - RULES AND REGULATIONS 2023

01. SYSTEM OF EDUCATION

1.1 The rules and regulations provided herein shall govern Doctoral degree programme offered by Pandit Jawaharlal Nehru College of Agriculture and Research Institute (PAJANCOA&RI), Karaikal under Pondicherry University.

1.2 The duration of Doctoral programme is three academic years (6 semesters). The first year of study shall be the first and second semesters after admission. The second year of study shall be the third and fourth semesters. The third year of study shall be the fifth and sixth semesters.

02. COMMENCEMENT

These regulations shall come into force from the academic year 2023-24.

03. DEFINITIONS

- 3.1 **'PG Coordinator'** means a teacher of a department who has been nominated by the Head of the Department to coordinate the postgraduate programmes in the department. The coordinator looks after registration, time table preparation, regulation of credit load, maintenance of individual student's files, *etc.*,
- 3.2 **'Semester'** means a period consisting of 110 working days inclusive of practical examinations but excluding the study holidays and final theory examinations.
- 3.3 **'Academic year'** means a period consisting of two consecutive semesters including the inter-semester break as announced by the Dean.
- 3.4 **'Curriculum'** is a group of courses and other specified requirements for the fulfilment of the postgraduate degree programme.
- 3.5 **'Curricula and syllabi'** refer to list of approved courses for Ph.D programmes wherein each course is identified with a code, a course number, outline of the syllabus, credit assigned and schedule of classes.
- 3.6 **'Course'** is a teaching unit of a discipline to be covered within a semester having a specific number and credits as detailed in the curricula and syllabi issued by the University.
- 3.7 **'Major Course'** means the subject of Department or discipline in which the student takes admission. Among the listed courses, the core courses compulsorily to be registered shall be given '*' mark.

- 3.8** 'Minor Course' means the course closely related to a student's major subject.
- 3.9** 'Supporting Course' means the course not related to the major course. It could be any course considered relevant for student's research work or necessary for building his/her overall competence.
- 3.10** 'A credit' in theory means one hour of class room lecture and a credit in practical means two and half hours of laboratory or workshop or field work per week.
Explanation : A 1+1 course (2 credits) means 1 hour theory and 2.5 hours practical per week.
A 1+0 course (1 credit) means 1 hour theory per week
- 3.11** 'Credit Load' of a student during a semester is the total number of credits of all the courses including common courses, that a student register during that particular semester.
- 3.12** 'Grade Point' means the total marks in percentage obtained in a course divided by 10 and rounded to two decimals.
- 3.13** 'Credit Point' means the grade point multiplied by the credit load of the course.
- 3.14** 'Overall Grade Point Average (OGPA)' means the total credit point of the courses completed by the student divided by total credits of the courses studied. The OGPA is to be worked out by rounding to nearest two decimals.
- 3.15** 'Arrear examination' is an examination written for the failed course by a student without undergoing regular classes in that course.
- 3.16** 'Transcript Card' is the consolidated report of academic performance of a student issued by the University on completion of the curriculum fulfilment. The format of Transcript Card is furnished in *Annexure-1*.

04. DOCTORAL PROGRAMMES

The Doctoral programme offered in the College is as follows:

4.1 DOCTOR OF PHILOSOPHY [Ph.D.]

- Ph.D. Agricultural Economics
- Ph.D. Agronomy
- Ph.D. Genetics and Plant Breeding
- Ph.D. Soil Science
- Ph.D. Vegetable Science

05. ADMISSION

5.1. Eligibility for admission:

- i. Candidates seeking admission to Doctoral degree programme should have a two year Master's degree from State Agricultural Universities (SAU) or from other institutes accredited by NAEAB (ICAR) alone are eligible to apply for the doctoral program.

- ii. Candidate who has undergone the course credit system with an OGPA of 3.00 out of 4.00 or 7.00 out of 10.00 or 70 percent aggregate alone is eligible to apply for Doctoral degree programme in this Institute.
- iii. Prescribed minimum qualification from a recognized University for admission to Doctoral degree programme:

Requirement for Doctoral Degree

Sl. No.	Degree	Requirement for Doctoral degree programs
1.	Ph.D. Agricultural Economics	M.Sc. (Agri.) Agricultural Economics
2.	Ph.D. Agronomy	M.Sc. (Agri.) Agronomy
3.	Ph.D. Genetics & Plant Breeding	M.Sc. (Agri.) Plant Breeding and Genetics / M.Sc. (Agri.) Genetics and Plant Breeding / M.Sc. (Agri.) Plant Genetic Resources
4.	Ph.D. Soil Science	M.Sc. (Agri.) Soil Science / M.Sc.(Agri.) Soil Science and Agricultural Chemistry
5.	Ph.D. Vegetable Science	M.Sc. Vegetable Science/ M.Sc. (Hort.) Vegetable Science

5.2. Application for admission:

- i. Application for admission shall be made in the prescribed form to be downloaded from the website of the college (www.pajancoa.ac.in) after notification is issued to this effect.
- ii. The admissions shall be regulated and made in accordance with the admission rules and regulations in force.

5.3. Method of selection:

- i. The admission to the Doctoral Programme is based on the marks / rank obtained in ICAR's All India Entrance Examination (AIEEA) / ICAR's All India Competitive Examination (AICA-SRF (Ph.D.) /CUET.
- ii. Number of seats in each Ph.D. degree programme shall be decided as per availability of recognised Ph.D. guide.
- iii. Seats are reserved for candidates belonging to SC/ST, OBC as per the norms of Govt of Puducherry.

5.4. Admission procedure:

- i. All admissions made by this Institute are provisional and subject to the approval of the University.
- ii. The candidates who have offered admission should report to the college on or before the due date mentioned failing which their right of admission is forfeited.

06. LANGUAGE REQUIREMENT

The medium of instruction is English. The Doctoral students should have adequate knowledge in English to read, write and speak in English and able to prepare high quality research papers in English.

07. RESIDENTIAL REQUIREMENT

- i. The minimum and maximum duration of residential requirement for Ph.D. Programmes shall be as follows

Duration of Residential Requirement	
Minimum	Maximum
3 Academic Years (6 semesters)	7 Academic Years (14 Semesters)

Student may be allowed to discontinue temporarily only after completion of coursework

- ii. In case a student fails to complete the degree programme within the maximum duration of residential requirement, his/ her admission shall stand cancelled.

08. REGISTRATION

The list of courses offered to the student in each semester shall be sent by the Dean to the Controller of Examinations for Registration of examination as instructed by the University from time to time.

09. DISCONTINUANCE AND READMISSION

As per University Regulations.

10. ADVISORY COMMITTEE

10.1. Each Doctoral student shall have an advisory committee to guide the student in carrying out the programme. Only recognized teachers are eligible for teaching Ph.D. courses and guiding thesis research.

10.2. Chairperson/Guide:

- i. The approved guides by the University only can be the guide for the students.
- ii. Every student shall have a Chairperson of the Advisory Committee who will be from his/her major field of studies.
- iii. The appointment of chairperson shall be made by the Head of the Department.
- iv. The Head of the department will allot the Doctoral students among the recognized guides.
- v. A teacher should have a **minimum of three years** of service before retirement for allotment of Doctoral students.
- vi. At any given time, a PG teacher shall not be a Chairperson of Advisory Committee (including Master's and Ph.D. programmes) for more than five students.

10.3. Chairperson/ Co-guide/ Member from other collaborating University/ Institute/ Organization:

- i. In case the Chairperson has less than 3 years of service he can be allowed to act as Co-guide / Member of the Advisory Committee.
- ii. The University / Institute may enter into Memorandum of Understanding (MOU) with other Universities / Institutions / Organizations for conducting research. However, to

include faculty of Pondicherry University to act as Co-guide / Member of the Advisory Committee Memorandum is not required.

- iii. The proposed faculty member from the partnering institution can be allowed to act as Co-guide / Member of Student Advisory Committee

Note: In special cases the proposed faculty member from the partnering institution can be allowed to act as Chairperson.

10.4. Members:

- i. The advisory committee shall comprise of a chairperson and three members. One member will be from the concerned department and other members from the related field of thesis research from other departments / discipline of the Post-graduate faculty accredited for appropriate P.G. level research. However, in those departments where qualified staff exists but due to unavoidable reasons Post-graduate degree programmes are not existing, the staff having Post-graduate teaching experience of two years or more may be included in the Advisory Committee as member.
- ii. External experts may be included as member/co-guide in the advisory committee based on the need and expertise of the member, without any financial commitment to the College so as to improve the quality of the thesis. The external expert member proposed should meet the minimum qualification required and the proposal is to be approved by the Dean.

10.5. Formation of advisory committee:

- i. For Doctoral Programme the advisory Committee Chairperson and members will be in the cadre of Professors, Associate Professor and Assistant Professors.
- ii. A proposal for the formation of the advisory committee (**Form 1**) of the student, shall be forwarded by the Head of the Department to the Dean for approval within one month from the commencement of the first semester.

10.6. Changes in advisory committee:

- i. The proposal for changes in the advisory committee (**Form 1a**) is to be sent to the Dean for approval, if it is keenly felt that such changes are absolutely necessary. The reason for such change should be indicated.
- ii. The changes may be effected immediately, when the existing members are transferred elsewhere or resigned or retired.

10.7. Absence of member during qualifying/final viva-voce examination:

- i. Conducting qualifying and final viva voce examination in the absence of members is not allowed.
- ii. Under extra-ordinary circumstances if the qualifying/ final viva-voce examination to Doctoral student has to be conducted in the absence of one or two advisory committee members, permission to conduct the examination by co-opting another member in such contingencies should be obtained from the Dean in advance.
- iii. The co-opted member should be from the same department of the member who is not attending the examinations.
 - iv. In the absence of the Chairperson of advisory committee, respective Heads of Departments should act as Co-chairperson with prior permission of Dean.

10.8. Duties and responsibilities of the advisory committee:

- i. Drawing the student's academic plan for Doctoral programme.
- ii. Guidance throughout the programme of the student.
- iii. Guiding the student in selecting a topic for thesis research and seminar.
- iv. Evaluation of research and seminar credits.
- v. Correction and finalization of thesis draft
- vi. The members should meet together along with the student for all the above purposes and sign the appropriate documents.

11. PLAN OF COURSE WORK

The student's plan for Doctoral course work (**Form 2**) drawn up by advisory committee shall be sent to the Dean before 55th working day during the first semester.

12. PROGRAMME OF RESEARCH WORK

The proposal for research programme of the student, in the prescribed format (**Form 3**) and approved by the advisory committee, shall be sent for approval of the Dean before the end of the semester in which the research credits are registered for the first time or before taking up of the research work whichever is earlier.

13. CREDIT REQUIREMENTS

13.1. Minimum credit requirement: A Doctoral student should complete a minimum of 100 credits as detailed below for award of the degree.

Credit Requirements

Details	Credits
i) Course Work	
Major Courses	12
Minor Courses	06
Supporting Courses	05
Seminar-2 nos. each 0+1 credit	02
ii) Thesis Research	75
Total Credits	100

13.2. Maximum credit load: A Doctoral student can register a maximum of **22 credits per semester** including seminar and research. However, research credits registered per semester shall not exceed **20 credits**.

13.3. Comprehensive qualifying examination and thesis: A Doctoral student should successfully complete a comprehensive qualifying examination and thesis in the major field of study and submission of thesis thereon.

13.4. Extra Credits:

- i. Over and above the prescribed minimum credit requirements, extra course credits up to a maximum of six can be registered for Doctoral programme.
- ii. The extra credits registered will be accounted for calculation of OGPA.

14. ATTENDANCE REQUIREMENTS

14.1. A minimum of 80 per cent attendance separately in theory and practical of the concerned course is a must. However, the attendance may be condoned up to 10%, under extra-ordinary situation, by the Dean based on the genuineness of the case and upon the recommendation of the Advisory Committee and Head of the Department, failing which the student shall not be permitted to appear for both final theory and final practical examinations in the course concerned and grade 'E' (incomplete) will be awarded.

14.2. The student securing 'E' grade in a course must re-register the course when offered again with the permission of the University.

14.3. Calculation of Attendance

a) THEORY:

- i. Number of classes conducted for a course from the first instructional 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.

b) PRACTICAL:

- i. Number of practical classes conducted for a course from the first instructional day as per the time table to the last practical class of that semester is to be construed as the total number of practical classes conducted by the course teacher.
- ii. The final practical examination will be conducted after the completion of 96 working days as per the schedule.
- iii. The attendance for practical examination shall not be counted for calculating the attendance for practical.
- iv. For calculating 80 percent attendance the number of instructional days may be calculated only from the date of joining of the student for first year first semester only.
- v. The students failing to attend the classes / examinations on non-official ground will be treated as absent.
- vi. Students deputed for sports, cultural meets etc. with prior permission of the Dean of the college shall be given attendance for the period of absence. However, students under this category must have attended a minimum of 50 per cent classes in the total theory and practical classes conducted.

15. EVALUATION OF STUDENT'S PERFORMANCE

15.1. Distribution of marks:

- i. All students shall abide by the rules for evaluating the course work under the semester system of education, as prescribed from time to time by the university. The weightage of Theory and Practical shall be in the ratio of 80:20 respectively.
- ii. The student should secure a minimum of 50 per cent marks in theory as well as in practical with an aggregate of 70 per cent to secure a pass in a course.
- iii. In each course, examinations will be conducted for 100 marks as detailed below.

Examination	Courses with theory & practical	Courses with only theory
Term Paper	20	20
Final Theory Examination	60	80
Final Practical Examination	20	-
TOTAL	100	100

15.2. Final Theory Examination:

- i. An examination schedule prepared by the Dean for the final theory examinations shall be the final. The schedule of examinations shall be adhered strictly.
- ii. The duration of final theory examinations will be three hours.
- iii. The final theory examinations shall be **conducted and evaluated internally** by the course teacher.
- iv. Re-valuation/Re-totalling is not allowed for theory examinations.
- v. No re-examinations shall be allowed in the events of students' strike, boycott, walkouts, and medical grounds or what-so-ever may be the reason.

15.3. Postponement of Final Theory Examination:

Whenever the Government declares holidays on the dates of final examinations, the examinations that fall on the dates shall be postponed to the dates after the last examination as per the original examination schedule.

15.4. Final Practical Examination:

- i. The Head of the Department will announce the schedule of final practical examinations.
- ii. The final practical examinations shall be conducted after the completion of minimum of 96 working days.
- iii. Submission of bonafide practical records and term paper in complete form and certified by the Course Teacher is a pre-requisite for appearing in a practical examination failing which 'F' grade will be awarded.
- iv. The final practical examination of the course shall be conducted and evaluated by the course teacher.
- v. The duration of final practical examination shall be two and half hours.
- vi. The practical examination marks should be communicated to the Dean within ten days after the conduct of respective final practical examinations.

15.5. Arrear examination:

- i. Arrear examination is permitted for the final theory and final practical examination.
- ii. The students are permitted to write the arrear examinations along with the regular semester examination
- iii. The prescribed arrear examination fee should be paid on or before the specified date.
- iv. A student is permitted to write the final theory and practical examinations (Term paper marks shall be retained as such) only two times during 3 years duration excluding the regular final examination.
- v. In the event of a student failing to secure pass in the two arrear examinations permitted, he/she has to re-register the course along with juniors as and when the course(s) are

offered with the permission of the University on payment of the prescribed Re-registration fee.

- vi. The Registration for the arrear examination shall be done on the date specified by the Dean. Each registration is considered as an attempt even if the student is absent for the examination.

15.6. Late comer in Examinations:

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

15.7. All theory examinations shall be conducted in the Examination hall of the College. The student should necessarily come to the examination hall(s) with Identity card and hall tickets and produce the same to the examiner(s)/invigilator(s), failing which the student shall not be allowed to write the examinations.

15.8. Hall tickets:

- i. The students shall be issued with hall tickets for writing their final theory/practical examinations.
- ii. The PG coordinator of the concerned department shall prepare the hall tickets, get the approval of the Head of the Department and issue to the students.
- iii. In case of loss of hall tickets by the students, duplicate hall ticket shall be issued on payment of prescribed fine.
- iv. The students who have lost/missed their hall tickets shall apply to the Head of the Department for getting a duplicate hall ticket.

15.9. Evaluation of Course Work:

- i. Each course shall carry a maximum of 100 marks. The results of the course shall be indicated by the grade points ranging from 0 to 10.
- ii. The total marks in percentage obtained by the student in a course shall be divided by 10 and rounded to two decimal places to get the grade point.
- iii. The minimum Grade Point to be secured for the successful completion of a course shall be 7.00.
- iv. Securing a grade point less than 7.00 in a course will be treated as 'F' (Failed) and the Grade Point will be 0.00 for calculating the GPA/OGPA. The following symbols may be used
 - E - INCOMPLETE (Lack of 80 % Attendance)
 - F - FAILED
 - RR - RE-REGISTRATION
 - RE - RE- EXAMINATION
 - EE - INCOMPLETE FOR REASONS OTHER THAN ATTENDANCE

15.10. Question paper pattern for theory examinations:

15.10.1. The question paper pattern for final theory examinations are indicated below:

Part	Type of question	Number of question	Number of questions to be answered	Mark per question	Total marks
Courses with theory and practical (1+1 or 2+1 courses) (60 Marks & 3 hours duration)					
A	Definitions/Concepts	12	10	1.0	10
B	Paragraph answers	7	5	4.0	20
C	Essay type answers (EITHER OR type) - One main question from each unit shall have one choice	5	5	6.0	30
	TOTAL				60
Courses with only theory (1+0 or 2+0 courses) Final Theory Examination (80 Marks & 3.0 hours duration)					
A	Definitions/Concepts	18	15	1.0	15
B	Paragraph answers	7	5	5.0	25
C	Essay type answers (EITHER OR type) - One main question from each unit shall have one choice.	5	5	8.0	40
	TOTAL				80

15.10.2. **Question paper pattern for final Practical Examination:** The following distribution of marks shall be adopted in conducting the final practical examinations.

Details	Courses with Theory and Practical
Practical Field work / Lab Work / Written exam	20
Total	20

For conducting practical examinations, the type and number of questions can be decided by the course teacher.

15.11. Term Paper:

- i. Submission of a term paper by the students is a must.
- ii. The term paper topics shall be assigned by the course teacher. Term papers should cover a wide range of subjects within the course limits.
- iii. The term paper shall be evaluated by the course teacher.

15.12. Return of valued answer papers:

- i. The valued answer papers of final theory and practical examination 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.
- ii. The answer paper should be retained by the course teacher for six months and then disposed off.
- iii. The same is applicable to arrear examination also.

16. COMPREHENSIVE QUALIFYING EXAMINATION

16.1.

- i. Only those postgraduate students who successfully complete the comprehensive qualifying examination shall be admitted to candidacy of the degree.
- ii. The qualifying examination consists of written and oral examination in major subjects only and the students should be allowed after completion of 80 per cent of total course credit load including major and minor courses.
- iii. The qualifying examination shall be conducted only in the major courses as per the norms given below:

Question paper setting	-	External
Evaluation of answer book	-	External
Qualifying marks	-	60 per cent
Viva Voce	-	External
Grading	-	Satisfactory/Not Satisfactory

16.2. Selection of examiner:

- i. The Head of the concerned Ph.D. Department shall send a panel of three examiners for conducting the comprehensive qualifying examination (**Form 4**).
- ii. The Controller of Examinations, shall nominate the external member from the panel for conducting qualifying examination of all the students of the department. However, the University can draw its own panel of examiners.
- iii. The panel of examiners for qualifying examinations shall be given by the Head of the Department three months before the date of completion of the student's course work.

16.3. Written examination:

- i. Normally the qualifying examination shall be completed before the end of third semester of the doctoral programme.
- ii. The controller of examination shall conduct the qualifying written examination.
- iii. The written examination shall be conducted for major courses only.
- iv. The question paper for the written examination shall be of 3 hours duration and each question need not be restricted to any particular topic in a course but it should be a comprehensive of the syllabus of each course.

v. The question paper pattern for the written examination is given below.

Part	Type of question	Number of questions	Number of questions to be answered	Mark per question	Total marks
A	Paragraph answers	7	5	5	25
B	Essay type answers	7	5	15	75
TOTAL					100

16.4. Oral examination:

- i. Only those students who secure 'SATISFACTORY' grade in written qualifying examination shall be permitted to attend the oral qualifying examination
- ii. The advisory committee shall conduct the oral examination with one external examiner, who sets the question paper and evaluated the written qualifying examination.
- iii. The performance of the student(s) in the qualifying viva-voce examination shall be graded as "Satisfactory" or "Not satisfactory".
- iv. If the performance of the student is "Not Satisfactory" in the oral examination, he/she has to appear for the oral examination again.

16.5. Failure/absence in qualifying examination:

- i. A student is permitted to write the qualifying examination only three times including the regular attempt.
- ii. A student who fails or absents in the comprehensive qualifying written/viva-voce examination shall apply to the University with the recommendation of the Chairperson of the advisory committee, Head of the Department and the Dean for re-examination.
- iii. A student who applies for re-examination should attend written examination and viva-voce after paying the prescribed re-examination fee.
- iv. Re-examination shall not take place earlier than three months after the previous qualifying examination.
- v. If a student fails even in the second re-examination (third attempt), he/she cannot continue as a student in the University for Award of Doctoral degree in the University.
- vi. The research credits registered in the final semester shall not be evaluated unless he/she successfully completes the qualifying examination.

16.6. Communication of results of qualifying examination:

- i. The Chairperson of the advisory committee shall act as Chairperson for the examination committee.
- ii. The Chairperson of the advisory committee shall be responsible for communicating the results of the examination to the Controller of Examinations in the prescribed format (Form 5).

17. CREDIT SEMINAR

17.1. Seminar is compulsory for all the Doctoral students and each Doctoral student should register and present two seminars with 0+1 credit.

17.2. Registration of seminar credits is not allowed in the first year.

17.3. Seminar topic:

- i. The seminar topic should be only from the major field and should not be related to the area of thesis research.
- ii. The seminar topics are to be assigned to the students by the Chairperson at the beginning of the semester in which he/she registers seminar credits and the progress made by the student should be monitored.

17.4. Evaluation of seminar:

- i. The students should prepare a seminar paper after reviewing all the available literature and present the seminar after completion of 80% attendance in the semester in the presence of the Advisory committee, staff and Doctoral students of the concerned department.
- ii. The circular on the presentation of the seminars by the Doctoral students may be sent to other departments to enable those interested to attend the same.
- iii. After carrying out the corrections/suggestions, the student should submit two copies of the seminar papers, one to the Chairperson and the other to the department.
- iv. The performance of the student in the credit seminar has to be evaluated for 100 marks by the advisory committee. Grade Point may be given based on the following norms:

Particulars of Marks

Sl. No.	Description	Marks
1.	Synopsis of the Seminar	10.00
2.	Presentation	
	a) Introduction	05.00
	b) Style Clarity	10.00
	c) Sequence and Organization	05.00
	d) Topic Coverage	20.00
	e) Effective use of Audio Visual Aids	05.00
	f) Time Management	05.00
	g) Response to Question during discussion	10.00
3.	Report	30.00
	TOTAL	100

17.5. The students who fail to present the seminar must be awarded 'F' grade and the student should again register the seminar credits and present the seminar in the subsequent semester.

17.6. Presenting a seminar is a must for the award of the degree.

18. THESIS RESEARCH

18.1. Selection of topic:

- i. With the guidance of the advisory committee the students should identify the tentative area of research and include it in the plan of work.
- ii. The advisory committee should guide the students in selecting a specific topic in the identified area and preparing a detailed proposal. While selecting the topic for thesis research, the specialization and competency of teachers, thrust area identified by the department, external funded schemes operated in the department and also the aptitude of the student may be taken into consideration.

- iii. The topic for thesis research for the students of Doctoral programme should be of such a nature as to indicate a student's potentiality for conducting research and to train him in research.
- iv. The thesis shall be on a topic falling within the field of the major specialization and shall be the result of the student's own work.
- v. A certificate to this effect duly endorsed by the Chairperson of the Advisory Committee shall accompany the thesis.

18.2. Research Colloquium:

- i. The research proposal has to be presented by the student in a colloquium organized by the Head of the department/Dean to get the opinion/ suggestions of the scientists of the concerned/other departments for improving it and approved by the Dean
- ii. Three copies of the research proposal in the prescribed format (**Form 3**) should be sent to the Dean through the Head of the department for approval before the end of the semester in which the student has registered research credits for the first time or before taking up the field / laboratory experiments whichever is earlier.

18.3. Evaluation of thesis research:

- i. After assigning the research problem, for each semester the student has to submit a detailed programme of work to be carried out by him/ her during the semester in the prescribed proforma (**Proforma 1- Part A**). After scrutiny and approval, a copy of the programme has to be given to the student for carrying out the work during the semester.
- ii. Attendance register must be maintained in the department for all the students to monitor whether the student has 80% of attendance in research.
- iii. After completion of 80% attendance for research and on or before the last day of the semester, the advisory committee should evaluate the progress of research work as per the approved programme and monitoring register (**Proforma 6**) and award '**SATISFACTORY** or **NOT SATISFACTORY**' depending upon quantity and quality of work done by the student during the semester. The procedures of evaluating research credits under different situations are explained hereunder.

a. SITUATION I: The student has completed the research credits as per the approved programme and awarded '**SATISFACTORY**' by the advisory committee. Under the said situation the student can be permitted to register fresh block of research credits in the subsequent semester. If the student is awarded '**NOT SATISFACTORY**' he/she has to reregister the same block of research credits in the subsequent semester.

b. SITUATION II: If the student has not secured the minimum attendance of 80 percent, then the grade 'E' should be awarded. The student has to reregister the same block of research credits for which 'E' grade was awarded in the subsequent semester with prior permission from the University. Until the completion of re-registered credits, the student should not be allowed to register for fresh block of research credits.

- c. SITUATION III:** The student could not complete the research work as per the approved programme of work for reasons beyond his/her control such as,
- Failure of crop.
 - Incidence of pests or disease or lack of such necessary experimental conditions.
 - Non-availability of treatment materials like planting materials chemicals, etc.
 - Any other impeding/unfavorable situation for carrying out research.
- Under the said situations III, Grade 'E' shall be awarded. The student has to

reregister the same block of research credits for which 'E' grade was awarded in the subsequent semester with prior permission from the University. Until the completion of re-registered credits, the student should not be allowed to register for fresh block of research credits.

d. SITUATION IV: When the student failed to complete the work even in the 'Second time' registration, the student will be awarded '**NOT SATISFACTORY**' and he/she has to reregister the same block of research credits in the subsequent semester with the prior permission from the University.

e. SITUATION V: If a student cannot complete qualifying examination till the end of final semester, the research credits registered in the final semester shall not be evaluated unless he/she successfully completes the qualifying examination. The research credits registered by the student during the final semester shall be evaluated within 15 days from the date of declaration of result of the qualifying examination.

f. SITUATION VI: If a student secures 'F' grade in one or more course(s) and cannot complete the course(s) till the end of final semester, the research credits registered in the final semester shall not be evaluated unless he/she successfully completes the course(s) in which he/she secures 'F' grade. The research credits registered by the student in the final semester shall be evaluated within 15 days from the date of declaration of result of the failed course(s). If the student fails to complete the course even in 1+2 attempts, 'E' grade shall be awarded for the research credits registered in the final semester and the student has to re-register the same block of research credits along with the re-registration of failed courses, with the approval of the University.

18.4. Re-registration of research credits: Students have to obtain prior permission of the University for re-registering the research credits. However, the University can permit the registration of research credit only three times. Permission to register for the fourth time shall be given only by the Academic Council.

19. SUBMISSION OF THESIS

19.1.

- i. The research credits registered in the last semester of Doctoral programmes should be evaluated only at the time of the submission of thesis by the advisory committee. Students can submit the thesis at the end of the final semester. The list of enclosures to be submitted along with the thesis is furnished in **Annexure-4**.
- ii. If a Doctoral student has completed the thesis before the closure of the final semester, the Chairperson can convene the advisory committee meeting and take decision on the submission of the thesis provided the student satisfies 80 per cent attendance requirement.
- iii. During submission of thesis for external evaluation, it is mandatory to enclose certificate for plagiarism check under reference management (**Proforma 15**) as per UGC norms.
- iv. Copy of the thesis to be sent for evaluation should be submitted in paper pack.

v. After incorporating the suggestions of the examiners and those received at the time of viva-voce, the thesis should be submitted to the College/university in hard bound copies (four copies) and soft copies (in pdf format) in CDs (two copies).

19.2. Grace period:

- i. Students can avail a grace period up to three months for submission of thesis after the closure of final semester by paying prescribed fine.
- ii. If a student is not able to submit the thesis within three months grace period, the student has to re-register the credits in the forthcoming semester.
- iii. The student(s) who re-register the credits after availing the grace period will not be permitted to avail grace period for the second time.
- iv. The Heads of the Department can sanction the grace period based on the recommendation of advisory committee and a copy of the permission letter along with the receipt for payment of fine should accompany the thesis while submission.

19.3. Re-registration and submission of thesis: The minimum of 80% attendance requirement for submitting the thesis after re-registration need not be insisted for those students who have fulfilled the minimum academic and residential requirement i.e. 3 years (6 semesters) and completed the minimum credit requirements with 80% attendance.

19.4. Publication of articles: Part of thesis may also be published in advance with the permission of the Chairperson. If any part is published, the fact should be indicated in the certificate given by the Chairperson that the work had been published in part/ full in any scientific or popular journals, proceedings, etc.

- **It is encouraged to publish minimum two research articles from the Doctoral thesis work.**
- Publication of two research articles should be made in UGC listed journals. The chairperson can also encourage the scholars to publish in high impact factor journals.

20. EVALUATION OF THESIS

20.1. The thesis submitted in partial fulfilment of a Doctoral degree shall be evaluated by two external examiners nominated by the Controller of Examinations, upon recommendation of the Dean, from a panel of five names of specialists (**Form 6**) in the particular field in India.

20.2. An oral examination will be conducted by the Advisory Committee after the thesis is recommended by the external examiners and carrying out the corrections/suggestions made by the external examiners by the student.

20.3. An oral examination (public defence) will be conducted by the Advisory Committee after the thesis is recommended by the external examiners besides the student should have carried out the corrections/suggestions made by the external examiners (**Form 8**). Public defence for doctoral students shall be conducted by the Chairperson of the advisory committee with the addition of one of the External Examiners nominated by the University on the working days in the presence of a **Proctor** appointed by the Dean to oversee the entire proceedings as a part of internal quality monitoring. The Heads of the Department shall nominate one Professor as a 'Proctor' from any Departments other than his department and it shall be approved by the Dean. In addition, the proctor has to sign in the public defence report. The Chairperson shall send the recommendations of the advisory committee along

with necessary certificate/documents in duplicate to the Dean. The thesis shall be finally accepted for the award only after the student satisfactorily completes a public defence.

20.4. The aims of the Ph.D thesis defence are to evaluate the candidate's academic competence, performance and his/her ability to interpret and discuss the undertaken research independently. The candidate is obliged to give a short lecture supporting his/her PhD thesis, publications and future research outlines. The final evaluation determines the candidate's academic results and conclusions i.e how clearly does he/she achieved the research objectives, solved the problems and obtained solutions; how logically the results are interpreted and further research possibilities outlined. Questions posed and clarification provided by the candidate during the defence gives an impression about the candidate's ability in academic debate.

20.5. The Chairperson shall send the recommendations of the advisory committee (**Form 7**) along with necessary certificate/documents in duplicate to the Dean. On the unanimous recommendation of the committee and with the approval of the University, the degree shall be awarded to the candidate.

20.6. The result declaration proposal will be sent by the Dean to the Controller of Examinations.

20.7. i. In case of difference of opinion on the acceptability of thesis for the award, the Controller of Examination may on the special recommendation of the advisory committee, refer the thesis for scrutiny and independent judgment to a third external expert chosen by him.

ii. If the third external expert recommends the thesis for acceptance, this recommendation may be accepted.

iii. If however, the opinion is still not uniform the degree shall not be awarded.

iv. In the above case, the advisory committee shall send their recommendation to the Dean within one month from the date of receipt of the thesis for scrutiny.

21. REVISION OF THESIS

21.1. If an examiner recommends for revision of thesis the following norms will be adopted.

i. For revision of draft, the thesis should be resubmitted after a minimum of one month from the date of communication from Dean.

ii. If the revision is recommended for repeating lab experiments, field trial etc., resubmission must be after a minimum of six months.

21.2. At the time of resubmission, the advisory committee should give a certificate for having carried out the corrections/recommendations. The resubmitted copies of thesis should have incorporated the necessary corrections as indicated by the external examiners. (**Form 8**)

22. FAILURE TO APPEAR FOR PUBLIC DEFENCE/NON-SUBMISSION OF THESIS AFTER PUBLIC DEFENCE

22.1. If a candidate fails to appear for public defence on the date fixed by the Chairperson the following are the time-frame and penalty.

The defence must be completed within **seven years from the date of** first registration for the degree program. An amount of penalty/ fine of Rs.5,000/-shall be levied to the candidate.

22.2. After successful completion of public defence if a student fails to submit the corrected version of the thesis within 15 days he/she shall be levied a fine of Rs. 5,000/- at the time of sending the proposal for result declaration.

23. RESULT NOTIFICATION

23.1. After the completion of each semester, the student shall be given the Report Card by the University.

24. MALPRACTICES IN EXAMINATION AND MISCONDUCT OF STUDENTS

24.1. The Dean of the College shall be responsible for dealing all cases of unfair means by students in writing records, term papers and examinations.

24.2. The invigilator or the course teacher concerned shall report each case of unfair means with full details of evidence and written explanation of the student concerned to the Dean immediately.

24.3. The Dean shall take appropriate action on receipt of the report and the penalty may be as indicated below.

- i. Students found using unfair means during the final theory/practical examination will be deemed to have failed in all the courses in that semester and also debarred from the college for the next semester.
- ii. For using unfair means of a serious nature (which will be decided by committee nominated by the Dean) warranting higher penalties than those indicated in clauses **24.3 (i)** and **24.3 (ii)** the student may be debarred from the College for a period of two semesters or more or expelled permanently after obtaining the orders of the University. In such cases, the students concerned shall not be allowed to sit for the remaining examinations in the concerned course or other courses.
- iii. 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 **24.3 (i)**, **24.3 (ii)** and **24.3 (iii)** to the Registrar immediately.

24.4. Ragging rules: Students found involved in ragging or in any other misconduct, or on a report received from the affected student(s), the Dean shall immediately expel the concerned student(s) against whom the report is received from Hostel/College, for the current semester and the Dean shall further constitute a committee to probe and conduct enquiry into the matter and based on the report from the committee, shall pass the final orders on merit of the case within three working days. As per the order of the Supreme Court of India, the punishment for ragging may take the shape of (a) Withholding scholarships or other benefits (b) debarring from representation in events (c) withholding results (d) suspension or expulsion from hostel or mess and the like.

24.5. 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.

25. RECOGNITION OF DOCTORAL TEACHERS

25.1. The Dean normally recognizes teachers for offering courses to the students of Doctoral programme based on the request of teachers and the recommendation of Head of the department.

25.2. The recognized Ph.D. teachers shall offer courses to Doctoral students as required by the concerned Heads of departments, normally, in their own field of specialization unless extra-ordinary circumstances demand for offering other courses.

25.3. **Teachers for Doctoral programme:** The following faculty shall be recognized as PG teachers for Doctoral programme

- i. Professors
- ii. Associate Professors
- iii. Assistant Professors: Persons having a Doctoral degree with five years of active experience in the concerned field.

25.4. The Heads of departments will forward the proposals based on the qualification and experience of the teacher as given above. The proposals can be sent when there is acute need for teachers/guide in the prescribed format, given in the **Annexure-6**.

25.5. While forwarding the application, the Head of the Department should consider the seniority of the teacher, number of courses handled and number of research schemes operated.

26. APPROVAL OF FINAL RESULTS, AWARD OF DEGREE AND ISSUE OF PROVISIONAL CERTIFICATES AND TRANSCRIPTS

26.1. Award of Degree:

- i. The Degree will be awarded during Annual Convocation conducted by the University to candidates who have satisfactorily completed all the graduation requirements.
- ii. The University shall issue a Provisional Degree Certificate to a candidate after having passed all provisional examinations.
- iii. Date of completion of degree programme shall be the date of final viva-voce examination/ public defence.

26.2. Eligibility for the Award of the Degree: The successful completion of all the prescribed courses included in the Curricula and Syllabi shall be minimum requirement for the award of the Degree.

26.3. Percentage conversion: For obtaining the percentage equivalent to the OGPA, the OGPA secured by the student shall be multiplied by 10.

26.4. Transcript card:

- i. The Transcript Card shall contain entry of all the courses and the Grade Points and OGPA obtained by the candidates indicating the number of times appeared. This will have to be prepared for all the students by the Controller of Examinations.
- ii. For preparation of Transcript Card, the Dean should send recent passport size photograph of the students along with filled in proforma and the prescribed fee.

26.5. The Transfer Certificate and Conduct Certificate shall be issued by the Dean.

26.6. The Vice-Chancellor is empowered to withhold or cancel the Degree awarded when a mistake wilfully committed by the student is detected at a later date regarding the registration, OGPA and other requirements for successful completion of the degree programme.

26.7. Amending or Cancelling the Result: If it is established that the result of a candidate has been vitiated by malpractice, fraud or other improper conduct and that he/she has been a party to or connived at malpractice or improper conduct of another student, the Vice-Chancellor shall have the powers at any time to amend the results of such a candidate and to make such declaration as the Vice-Chancellor may deem necessary on that behalf including return of prize, scholarship money and debarring the candidate from the University for such periods as may be specified and to cancel the results of the candidate in such manner as the Vice-Chancellor may decide.

27. REMOVAL OF DIFFICULTIES:

27.1. If any difficulty arises in giving effect to the Provisions of these regulations, the Registrar/Dean may issue necessary orders which appear to him to be necessary or expedient for removing the difficulty.

27.2. Every order issued by the Registrar/Dean under this provision shall be laid before the Academic Council of the University immediately after the issuance.

27.3. Notwithstanding anything contained in the rules and regulations, the Board of Studies or Academic Council shall make changes whenever necessary.

**DETAILS ON FEE TO BE PAID BY THE STUDENT
(Other than admission fee and semester fee)**

Sl. No.	Particulars	Amount (Rs.)
1.	Late Registration fee	1000
2.	Re-registration fee with juniors	1000
3.	Duplicate hall ticket fee	200
4.	Fee for Transfer Certificate and Conduct Certificate	200
5.	Re-examination fee for comprehensive Qualifying Exam	5000
6.	Fee for availing grace period for submission of thesis a) Up to one month b) Up to three months	1000 2500
7.	Penalty for failure to appear for public defence	5000
8.	Penalty for late submission of thesis after public defence	5000
9.	Examination fee (per course) *	
10.	Improvement/ Re-examination fee (per course) *	
11.	Fee for Provisional Degree Certificate *	
12.	Fee for Transcript Card *	
13.	Fee for Degree Certificate *	
14.	Fee for Migration Certificate *	

* As fixed by the University from time to time

28. REGULATIONS GOVERNED BY PAJANCOA & RI

28.1. FEE STRUCTURE

- i) Fee structure is being revised every year with 10% fee hike. Lodging fees and charges for electricity, water and computer are revised based on the requirements and power tariff prevailing from time to time.
- ii) In the case of new admissions, the fees for the first semester should be paid at the time of admission.
- iii) For the remaining semesters, the fees should be paid on the date of registration of the semester.
- iv) Candidates who discontinue after admission are not eligible for refund of fees except caution money deposit.
- v) In case of a student who re-registers with junior batch, he/she has to pay the semester fees applicable to the junior batch in which he/she registers, besides the re-registration fee.

28.2. REGISTRATION

- i) All newly admitted candidates should register during the first semester of the programme. A candidate admitted to the Doctoral programme should report to the Head of the Department concerned on the date of registration. It is the responsibility of the candidate to register the courses in person on the due date prescribed for the purpose.

- ii) **In ABSENTIA** registration will not be permitted on any circumstances.
- iii) The Head of the Department and the PG coordinator shall help the student in selecting the courses for registration.
- iv) Admitted candidates shall register with the respective Department at the beginning of each semester and this should be completed within two working days.

28.2.1. Late registration:

- a) Late registration is permitted by the Dean of college within seven working days from the commencement of the semester provided the prescribed late registration fee is paid before registration.
- b) Registration beyond seven working days is not allowed except for new entrants who are admitted late due to administrative reasons in the first semester.

28.2.2. Registration cards:

- i. A student shall register the courses offered in a semester by writing all the courses in registration card in quadruplicate. The format of registration card is given in *Annexure-4*.
- ii. The Chairman, PG coordinator and Head of the Department are responsible to furnish the registration particulars of the students with their signature in the Registration card to the Dean.
- iii. The Dean shall approve the registration cards.
- iv. The approved registration cards shall be maintained by the Dean, PG coordinator, Chairman and the student concerned.
- v. The list of courses registered by the students in each semester shall be sent by the Dean to the Controller of Examinations/University for preparation of Report Cards

28.2.3. The mess dues clearance certificate has to be produced by the student at the time of registration and examination.

28.3. QUALIFYING EXAMINATION

The Heads of departments will monitor and coordinate in conduct of both the written and oral qualifying examinations.

28.4. MERIT SCHOLARSHIP/RESEARCH ASSISTANTSHIP

- i) PAJANCOA & RI fellowship shall be awarded to all the students who are admitted into the Ph.D programme based on allotment of Government fund. The students should be a resident of PAJANCOA & RI hostels. The award of fellowship is governed by the approved fellowship rules.
- ii) The Dean shall call for applications and sanction the scholarship every year.
- iii) The students availing any scholarship/fellowship are permitted to switch over to other fellowship/scholarship only one time during the course of study.

28.5. Student SRF:

- i. The selection of student SRF in external funded schemes will be made by the existing committee members for selection of regular SRF.
- ii. The PG coordinator of the concerned department will be an additional member of the committee.
- iii. The panel of names after the selection has to be sent to the Dean for approval in the prescribed Proforma.

- iv. If a student SRF/JRF discontinues before submitting the thesis or switch over to other fellowship/scholarship, the amount already paid has to be recovered in full in one lump sum with 6% penal interest.

28.6. GUIDELINES FOR HEADS OF THE DEPARTMENTS IN MONITORING PROGRESS OF DOCTORAL STUDENTS

28.6.1. Student records: The "Individual student" file (clip file) containing all the academic records of the student concerned with student's bio-data shall be maintained by the PG coordinator on behalf of the Institution. In each file a sheet containing the following information has to be attached.

- i) Date of registration:
- ii) Date of qualifying examination:
- iii) Due date for thesis submission:
- iv) Date of submission of thesis:
- v) Date of viva-voce:
- vi) Remarks:

28.6.2. The activities listed out in the following table must be meticulously taken care by the Professor and Head of the Department concerned

Sl. No.	Particulars	Time Schedule
1.	List of courses to be offered along with time table	A week before the commencement of each semester
2.	Course registration particulars	Within 10 working days from the date of commencement of each semester
3.	Mark lists after completing examinations	Within 10 days from the date of conduct of examinations

28.6.3. The time table for various examinations and evaluations of research credits should be prepared in advance as indicated in the academic calendar of semester concerned and such dates already fixed should not be postponed or changed subsequently.

28.6.4. The schedule for the important records to be sent to the Dean is furnished below and it should be followed strictly so as to get back the above academic reports in time for maintenance in the students file.

Sl. No.	Particulars	Time Schedule
1.	Formation of advisory committee (Form 1)	Within one month of the commencement of first semester
2.	Plan of course work (Form 2)	
3.	Programme of research work (Form 3)	Before the end of the semester in which the student registers the research credit for the first time or the commencement of the research work whichever is earlier.
4.	Proposal for qualifying examination (Form 4)	Two months before the completion of the course work.
5.	Qualifying examination result (Form 5)	The next day of the examination
6.	Panel of external examiners for	Three months before the probable date of

	thesis evaluation (Form 6)	submission of thesis
7.	Final viva-voce result (Form 7)	The next day of the examination
8.	Certificate for having carried out the suggestions of the external examiner and advisory committee (Form 8)	After receiving the evaluation report from the external examiner.

28.6.5. The Heads of the Departments should monitor the progress of the Doctoral students. Each department should maintain a list of thesis produced so far with the abstract of the same in both hard and soft copies.

Form – 1

PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAIKAL – 609 603

PROFORMA FOR FORMATION OF ADVISORY COMMITTEE

(To be sent in triplicate within one month from the commencement of First semester)

1. Name of the student :
2. Reg. No. :
3. Degree :
4. Subject :
5. Advisory committee :

S.No.	Advisory committee	Name, designation and department	Date of Retirement	Signature
1.	Chairperson :			
2.	Co-Guide (If any) :			
3.	Member	1.		
		2.		
		3.		
4.	Additional member :			
5.	Reasons for additional member			

Signature of the student

PG coordinator

Head of the Department

DEAN

* Additional members may be included only in the allied faculty related to thesis research with full justification at the time of sending proposals (Programme of research) to the Dean for approval.

Form – 1a

PONDICHERRY UNIVERSITY

**PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAİKAL – 609 603**

PROFORMA FOR CHANGE IN ADVISORY COMMITTEE

(To be sent in triplicate)

1. Name of the student :
2. Reg. No. :
3. Degree :
4. Subject :
5. Proposed change :

	Name and designation	Date of retirement	Signature
a. Existing Chairperson/ Co-Guide/ member			
b. Proposed Chairperson/ Co-Guide member			

6. Reasons for change :

Signature of the student

Chairperson of the Advisory Committee

PG Coordinator

Head of the Department

DEAN

Form – 2

PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAİKAL – 609 603

PROFORMA FOR PLAN OF COURSE WORK

(To be sent in triplicate before 55th working day during the first semester)

1. Name of the student :
2. Reg. No. :
3. Degree :
4. Subject :
5. Course Programme :

S. No.	Course No	Course Title	Credit Hour
		Major courses	
		Minor courses	
		Supporting courses	
		Seminar	
		Research	
		TOTAL	

6. Tentative area of research :
(indicate the major field of
specialization)

Signature of the student

APPROVAL OF THE ADVISORY COMMITTEE

Advisory committee	Name	Signature
Chairperson		
Co-Guide (If any)		
Members	1.	
	2.	
	3.	

DEAN

Form – 3

PONDICHERY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAIKAL – 609 603

PROFORMA FOR PROGRAMME OF RESEARCH WORK

(To be sent in triplicate before the end of the semester in which the student registers research credit for the first time or the commencement of research work whichever is earlier)

1. Name :
2. Reg. No. :
3. Degree :
4. Subject :
5. Date of joining :
6. Title of the research project :
7. Objective(s) :
8. Duration :
9. Location (campus/station) :
10. Review of work done :

11. Broad outline of work/methodology:

12. Semester wise break up of work :

Signature of the student

APPROVAL OF THE ADVISORY COMMITTEE

Advisory committee	Name	Signature
Chairperson		
Co-Guide(If any)		
Members	1.	
	2.	
	3.	

DEAN

Form – 3a

PONDICHERY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAIKAL – 609 603

PROFORMA FOR CHANGE IN PROGRAMME OF RESEARCH

(To be sent in triplicate)

1. Name :
2. Reg. No. :
3. Degree :
4. Subject :
5. Reason for change :
6. Proposed change in the approved programme of research :
7. Number of credits completed so far under the approved programme :
8. a) Whether already earned credits are to be retained or to be deleted :
- b) If retained, justification :

Signature of the student

APPROVAL OF THE ADVISORY COMMITTEE

Advisory committee	Name	Signature
Chairperson		
Co-Guide (If any)		
Members	1.	
	2.	
	3.	

DEAN

Form – 4

PONDICHERY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAIKAL – 609 603

PROFORMA FOR PROPOSAL OF QUALIFYING EXAMINATION

(To be sent in triplicate)

1. Name of the Department :
2. Degree :
3. Subject :
4. Whether all the courses have been completed :
5. Number of credits completed :
6. Whether the students have an OGPA of not less than 7.00/10.00 :
7. List of Ph.D. students appearing for qualifying examination :

Sl. No.	Name	I.D. No.	OGPA

8. Panel of External examiners :

Sl. No.	Name and Designation	Address	Area of specialization
1.			
2.			
3.			

9. Remarks :

PG coordinator

Head of the Department

DEAN

Form – 5

PONDICHERY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAIKAL – 609 603

PROFORMA FOR COMMUNICATION OF RESULTS OF
QUALIFYING EXAMINATION

(To be sent in triplicate)

1. Name of the student:
2. Reg. No.:
3. Degree:
4. Subject:
5. Date of examination:
6. Date of previous examination:
(only in case of re-examination)
7. Result (Successful/ Not successful*):
(*) to be written by the external examiner

EXAMINATION COMMITTEE

	Name in BLOCK letters	Signature
Chairperson		
Co-Guide (If any)		
Members	1.	
	2.	
	3.	
External Examiner		

Signature of Chairperson
with name and designation

PG Coordinator

Head of the Department

DEAN

Form – 6

PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAIKAL – 609 603

PROFORMA FOR PROPOSAL OF EXTERNAL EXAMINERS FOR THESIS EVALUATION

(To be sent in duplicate in Confidential cover)

1. Name of the student :
2. Reg. No. :
3. Degree :
4. Subject :
5. Thesis title :

6. Name of the Chairperson :
7. Panel of external examiners* :

Sl. No.	Name and Designation	Address with Contact No. and Email	Area of specialization
1.			
2.			
3.			
4.			
5.			

*Five external examiners should be given

8. Remarks :

**Signature of the Chairperson
of the advisory committee**

DEAN

PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAIKAL – 609 603

PROFORMA FOR SENDING THE RESULT OF FINAL THESIS VIVA-VOCE EXAMINATION

(To be sent in duplicate)

1. Name of the student :
2. Reg. No. :
3. Degree :
4. Subject :
5. Thesis title as in final copy of the thesis :

6. Date and time of *viva-voce* :

7. Particulars of the External examiner(s) :
 who has/have evaluated the thesis

Name and Designation of the External Examiner	Remarks of the External Examiner
1.	RECOMMENDED /RECOMMENDED FOR REVISION /NOT RECOMMENDED
2.	RECOMMENDED /RECOMMENDED FOR REVISION /NOT RECOMMENDED

8. **Recommendation of the Examining committee present at the time of final *viva voce* examination:**

a. Recommends/ does not recommend unanimously the award of degree

b. The performance of the candidate in final *viva voce* is assessed as _____
 (very good/ good/ satisfactory/ not satisfactory)

Sl. No.	Capacity of examiner	Name in BLOCK letters	Signature
1.	Chairperson/Co-opted Chairperson*		
2.	Co-Guide		
3.	Member 1.		
	2.		
	3.		
4.	Additional member		
5.	External examiner		

* If co-opted in the absence of Chairperson/Member

The original report(s) from the external examiner(s) is/ are enclosed

Head of the Department

**Chairperson of the Examining committee/
 Advisory committee with designation**

Form – 8

PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND
RESEARCH INSTITUTE, KARAIKAL – 609 603

**Certificate for having carried out the suggestions of the External Examiner and Advisory
committee**

(To be enclosed along with report of the public defense)

Certified that Thiru/Selvi/Tmt. _____

I.D. No. _____ has carried out all the corrections and suggestions as pointed
out by the external examiners (s) and the advisory committee and has submitted _____
copies of his/her Ph.D. thesis in hard bound cover and CD's.

**Signature of the Chairperson with
Designation**

Signature of the PG Coordinator

**Signature of the Head of the
Department**

Approved By

DEAN

SEAL OF THE
UNIVERSITY

Annexure – 1

Certificate Number:

PONDICHERRY UNIVERSITY
Puducherry – 605 014
Doctoral Degree Programme

REPORT CARD

Name	:		Year of admission	:	
Registration No.	:		Semester	:	
Father's Name	:		Date of Registration	:	
Date of birth	:		Date of Start	:	
College	:	Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal	Date of Closure	:	

Sl. No.	Course Code	Course Title	Credit Hours	Grade Point	Credit Points

E- Incomplete F- Fail S- Satisfactory NS-Not Satisfactory

Credit Status	Upto Last Semester		Current Semester		Cumulative Status	
	Credit Hours	Credit Points	Credit Hours	Credit Points	Credit Hours	Credit Points
Courses completed						
GPA/OGPA						

Prepared by	Checked By	Asst. Registrar (Exams)	Controller of Examinations

SEAL OF THE
UNIVERSITY

Annexure – 2

Certificate Number:

PONDICHERRY UNIVERSITY, PUDUCHERRY – 605 014
TRANSCRIPT CARD

Name :
Register No :
Father's Name :
Mother's Name :
Date of Birth :
Month & Year of Admission :
Month & Year of Passing :

PHOTO

Name & Address of College : Pandit Jawaharlal Nehru College of Agriculture & Research
Institute, Karaikal-609 603, U.T. of Pondicherry.

Name of University : Pondicherry University, R.V. Nagar, Kalapet, Puducherry 605014
Degree Programme : Ph.D. ()

Semester	Course No.	Title of the Paper	Credit Hours T+P	Grade point Obtained	Session

Reg. no:

Name:

* Non Credit Courses

S - Satisfactory

Title of the Thesis	:
Total Credit Hours	:
Total Credit Points Obtained	:
Overall Grade Point Average	:
Percentage	:
Class	:
Viva – Voce Completed on	:

Seal:

Date:

**Signature of
CONTROLLER OF EXAMINATIONS**

Classification of OGPA in 10.00 Point Scale.	
9.00 and above	First class with Distinction
8.00 to 8.99	First class
7.00 to 7.99	Second Class

PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603

STUDENT REGISTRATION CARD – Ph.D.

Name of the Student _____ Academic Year _____
 Registration No. _____ Semester _____
 Degree programme _____ Date of Registration _____
 Year of Admission _____ Date of Commencement _____

COURSES REGISTERED

Sl. No.	Course Code	Course Title	Credit Hours	Remarks
TOTAL CREDIT HOURS REGISTERED				

Signature of the Student	Signature of the Chairperson	Signature of the Head of the Department	Coordinator of Examinations

APPROVED BY

DEAN
PAJANCOA&RI
KARAIKAL

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

LIST OF ENCLOSURES TO BE SUBMITTED ALONG WITH THESIS

A. At the time of sending thesis for External Evaluation:

1. One copy of abstract of thesis
2. One copy of the summary of research finding in English (within one page)
3. One copy of the summary of research finding in Tamil (within one page)
4. One page abstract of thesis with key words
5. Clearance certificate from Hostel
6. Clearance certificate from Library
7. Clearance certificate from Department
8. Clearance certificate from Staff advisor
9. Clearance certificate from Physical Education
10. Approved registration cards (One set)
11. Report cards (one set)
12. Course completion certificate (signed by Chairperson and HOD)
13. Attendance Certificate
14. Result of comprehensive qualifying examination
15. Permission and fee receipt for availing grace period, if any.
16. Certificate for Anti – Plagiarism (**Proforma 15**).
17. Two copies of paper bound thesis

B. At the time of submission after final viva-voce:

1. Report of the final thesis viva voce examination (To be sent in duplicate)
2. External Examiners thesis evaluation report (Two copies – original + Xerox)
3. Certificate for having carried out the suggestions of the external examiner and advisory committee
4. Thesis in hard bound copy – Four Numbers.
5. Soft copy the thesis in CD (cover to cover in PDF format) - Two Number.

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

**PROPOSAL FOR RECOGNITION OF TEACHERS FOR TEACHING/ GUIDING Ph.D.
STUDENTS**

1. Particulars of the teacher seeking recognition

- a. Name of the teacher :
- b. Date of birth of the teacher :
- c. Designation & present official address of the teacher :
- d. Date of joining service in the entry cadre :
- e. Academic qualifications
- Date of acquiring Bachelor's Degree :
- Date of acquiring Master's Degree :
- Date of acquiring Ph. D degree :
- f. Total service as on the date of this proposal (excluding extraordinary leave) :
- g. Date of retirement :

2. Recognition proposal submitted for (tick any one)

- a. Recognition as teacher for Master's Programme
- b. Recognition as Guide for Doctoral Programme

3. Teaching experience as on the date of Application

- a. No. of UG courses offered :
- c. No. of M.Sc courses offered :

Signature of the teacher with date

4. Particulars to be furnished by Head of the Department

- No. of existing recognized teachers/guides pertaining to this proposal in your department :
- Justification for additional requirement of teachers/guide :

Signature of the Head of Department

Approval of the Dean

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAİKAL – 609 603**

PROFORMA FOR REGISTRATION OF RESEARCH CREDITS

PART- A: PROGRAMME

Semester:

Year:

Date of registration:

1. Name of the student :
2. Reg. No. :
3. Total research credits completed so far :
4. Research credits registered during the semester :
5. Programme of work for this semester :

(list out the items of research work to be undertaken during the semester)

- i)
- ii)
- iii)
- iv)

APPROVAL OF THE ADVISORY COMMITTEE

Advisory committee	Name	Signature
Chairperson		
Members	1.	
	2.	
	3.	

(Approval may be accorded within 10 days of registration)

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

PROFORMA FOR EVALUATION OF RESEARCH CREDITS

PART - B EVALUATION

(Evaluation to be done before the closure of semester)

Date of closure of semester :

Date of evaluation :

1. Whether the research work has been carried out as per the approved programme :

2. If there is deviation specify the reasons :

1. Performance * :

(*) Performance may be indicated as **SATISFACTORY /NOT SATISFACTORY**

APPROVAL OF THE ADVISORY COMMITTEE

Advisory committee	Name	Signature
Chairperson		
Members	1.	
	2.	
	3.	

Proforma-2

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

PERMISSION FOR LATE REGISTRATION

1. Name of the student :
2. Reg. No. :
3. Degree :
4. Department :
5. Semester and Academic year :
6. Date of commencement :
7. Date of registration without fine :
8. Last date for registration with fine :
9. Date on which registration is sought :
10. Reason :
11. Signature of the student :
12. Remarks and recommendation of the
Chairperson :

Signature of the Chairperson

PG Coordinator

Head of the Department

DEAN

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

**WILLINGNESS TO BE GIVEN BY THE STUDENTS TO AVAIL FELLOWSHIP FROM
EXTERNALLY FUNDED SCHEMES**

1. Name of the student :
2. Reg. No. :
3. Degree :
4. Subject :
5. OGPA of Master degree :
6. Name of the Chairperson :
7. Discipline/Department :
8. Thesis topic, if allotted :
9. Current semester and year in which studying :
10. Whether all the course works have been completed , if not indicate the pending courses with credit loads :

Undertaking by the student:

i. I am willing to avail the proposed fellowship under the scheme entitled_____.

ii. If I leave in the middle of the tenure of the fellowship, I am willing to repay the fellowship availed with 6% penal interest or any levy/fine imposed by the College/University.
I am willing to abide by all the rules and regulations laid down by the College/University in this regard.

Date:

Signature of Student

Chairperson of the Advisory Committee

Head of the Department

DEAN

Proforma-4

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

ALLOTMENT OF STUDENTS UNDER JRF/SRF STUDENT FELLOWSHIP

(To be submitted to the Dean)

1. Title of the scheme :
2. Location of the scheme (Department) :
3. Date of sanction of the scheme :
4. Period of the scheme :
5. Type of fellowship : JRF/SRF
6. Period of fellowship (only for the period of research credits registered) :
7. Amount of fellowship : Rs.....p.m
8. Amount of contingent grant : Rs.....p.a.
9. Amount of T.A. provided : Rs.....p.a.
- 10.a. Whether the technical programme submitted by the student to Dean is the same as envisaged in the scheme proposal : Yes / No
- b. If not, whether the revised programme of research is submitted (If yes, date of approval by the Dean) :
11. No. of research credit(s) completed so far by the proposed fellowship awardees (student) :
12. Whether the credits earned earlier are to be retained or to be cancelled? :
13. Whether funds received : Yes / No
14. Name of the student(s) & ID. No. :
15. Number of semesters for which fellowship may be sanctioned :
16. Can the fellowship be sanctioned for grace period also. : Yes / No

Principal Investigator

Head of the Department

Dean

List of Enclosures

1. Copy of concurrence of the sponsor of the sponsor to avail student fellowship
2. Copy of administrative sanction by Dean
3. Student's willingness and undertaking

Proforma-5

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

SPONSOR'S CONCURRENCE (PROFORMA)

1. Title of the scheme :
2. Location of the scheme (Department) :
3. a. Name & Designation of the PI :
- b. Name and designation of the Co-PI :
4. Type of fellowship : JRF/SRF
5. Period of fellowship :
- a. Indicate the period of fellowship to be awarded :
- b. Amount of fellowship : Rs.....p.m.
- c. Amount of contingent grant : Rs.....p.a.
- d. Amount of T.A. Provided : Rs.....p.a.
- e. Whether Institutional charges paid : Yes/No Rs.....

Signature of the Sponsor

To

The DEAN,
PAJANCOA & RI,
Karaikal – 609 603.

Proforma-6

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

Proforma for Monitoring Register

Date of meeting	Review of the previous work that was assigned	Remarks of Chairperson	Work assigned for next week	Date on which the student has to report	Signature of the Student	Signature of the Chairperson

Proforma-7

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

Proforma for Obtaining Permission for Re-registration of credits

1. Name :
2. I.D No :
3. Department :
4. Campus :
5. Mention the current semester : Eg. III/IV/V etc.,
6. Re-registration is requested for the semester : IV/V/VI
7. Permission requested for re-registration of :
- (a) Course credits : Second/Third time
- (b) Seminar credits : Second/Third time
- (c) Research credits : Second/Third/Fourth time

Grade Obtained E/NS/EE	Reason for re-registration	Credit hours to be re-registered
---------------------------	----------------------------	----------------------------------

Signature of Student

Chairperson

PG Coordinator

Head of the Department

DEAN

Encl: The following document to be enclosed if re-registration is requested for

Note:

* Example: For Fourth time request: Permission order that was obtained for re-registering third time

* If temporary discontinuance was a reason, then Dean orders to be enclosed.

* For re-registering research credits for second time, the HoD may approve.

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

PROFORMA FOR EVALUATION OF CREDIT SEMINAR

1. Name of the Student :
2. Register No :
3. Semester & Academic Year :
4. Seminar Title :

Sl. No.	Description	Max. Marks	Marks Awarded
1.	Synopsis of the Seminar	10.00	
2.	Presentation		
	a) Introduction	05.00	
	b) Style Clarity	10.00	
	c) Sequence and Organization	05.00	
	d) Topic Coverage	20.00	
	e) Effective use of Audio Visual Aids	05.00	
	f) Time Management	05.00	
	g) Response to Question during discussion	10.00	
3.	Report	30.00	
	TOTAL	100	

Grade: _____

Date:

Signature

Proforma-9

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

DEPARTMENT OF _____

COURSE COMPLETION CERTIFICATE

This is to certify that Thiru./Selvi/Tmt. _____
Reg. No. _____ has completed all the course and research credit requirements
on _____ for the award of Ph.D. (Agri./Horti.) degree
in _____.

Professor and Head

**Signature of the Chairperson
(with Name and designation)**

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

JUSTIFICATION FOR LATE SUBMISSION OF THESIS (if applicable)

1. Name of the student :
2. Reg. No. :
3. Degree :
4. Subject :
5. Date of first registration for the degree :
6. Number of semesters for which the candidate could not register :
7. Reason for not registering and continuing the study :
8. Period of delay in submission of thesis :
9. Period lost due to transfer/ill health :
10. Date of submission of thesis :

Signature of the student

11. Specific remarks and recommendation of:
the Chairperson

Signature of the Chairperson with designation

12. Specific remarks and recommendation of:
the Head of department

Signature of the Head of the Department

13. Approval of the Dean :

Signature of the Dean

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

PROFORMA FOR EVALUATION OF THESIS

Name of the degree programme: Ph.D. (Agri) in _____.

1. Name and Designation of the examiner :

2. Address of the Examiner:

Telephone/Mobile:

Fax:

E-mail:

3. Name of the candidate:

4. Reg. No.:

5. Title of the thesis:

6. Date of receipt of the thesis copy:

7. Date of despatch of the detailed report and:
thesis by the examiner to the Dean

8. Examiner's recommendations choosing one:
of the following based on quality of thesis

- a. Recommended for award
- b. Recommended for revision

9. Please state whether a list of questions if:
any to be asked at the viva-voce
examination (Questions to be attached)

Date:

Official Seal:

Signature of the Examiner

Note: Please enclose a detailed report in duplicate duly signed by you giving the merits and demerits of the thesis on the choice of problem, review of literature, methods followed, results and discussion etc.

Proforma-12

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

DEPARTMENT OF _____

**CERTIFICATE FOR HAVING CARRIED OUT THE SUGGESTIONS
OF THE EXTERNAL EXAMINER AND ADVISORY COMMITTEE**
(To be enclosed along with result of the final viva voce examination)

Certified that Thiru./Selvi./Tmt _____

Reg. No. _____ has carried out all the corrections and suggestions as pointed out by the external examiners(s) and the advisory committee and has submitted **FOUR** copies of his/her Ph.D. thesis in hard bound cover and **TWO** soft copies of thesis in PDF format in CDs.

Head of the Department

**Signature of the Chairperson
with Name and designation**

PONDICHERY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603

PROFORMA FOR OBTAINING PERMISSION TO PRESENT PAPERS IN
SEMINAR/ SYMPOSIA/ TRAINING

(To be sent in triplicate)

1. Name of the student :
2. Reg. No. :
3. Department & College :
4. Name of the Chairperson with designation :
5. Whether course work has been completed?
6. Title of paper/poster to be presented :
(enclose copy)
7. a. Name of the seminar/symposium :
b. Venue :
c. Dates (From-To) :
8. Period of absence (in days) inclusive of travel time :
9. Whether the paper was sent through proper channel (copy to be enclosed) :
10. Cost of travel & registration fee borne :
By the student himself (or) supported by the scheme in which he is drawing fellowship?

Date:

Signature of the Student

Specific Recommendations:

Chairperson Professor and Head

PERMISSION TO ATTEND THE SEMINAR/ SYMPOSIA

(to be issued by the Dean)

1. Permitted without any financial commitment to the College/ University / **Not permitted**
2. Period of absence from _____ to _____ (____ days) is to be treated as duty and can be counted for attendance.
3. Period of absence from _____ to _____ (____ days) **is not treated as duty and cannot be counted for attendance.**
4. The student should submit a report to the Dean, within 3 days after his return.

DEAN

Proforma-14

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAIKAL – 609 603**

APPLICATION FOR ISSUE OF CONDUCT AND TRANSFER CERTIFICATES

(To be submitted by the student with the recommendation of the Chairperson/ Head)

1. Name of the student :
2. Reg. No. :
3. Name of the Chairperson :
4. Designation of the Chairperson :
5. Name of the course undergone :
6. Year of joining course :
7. Year of leaving the course :
8. Whether copy of the PC enclosed :
9. Whether original clearance certificate from warden enclosed :

Date:

Signature of the Student

Recommendations:

Certified that the conduct and characters of Mr/Ms. _____
were _____ during the period of his/her studies. The certificates may be issued
accordingly.

Chairperson

PG Co-ordinator

Professor & Head

**PONDICHERRY UNIVERSITY
PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE
AND RESEARCH INSTITUTE, KARAİKAL – 609 603**

Proforma for Plagiarism Check

1	Name of the Student	
2	ID Number	
3	Degree	Doctoral
4	Title of the Thesis	
5	Department Name	
6	Campus	
7	Name of the Chairperson	
8	Total Word Count in the Document	
9	Initial Submission If No, If more than 5 times of submission,	Yes / No Provide the number of times plagiarism checked along with their plagiarism percent Provide the details of fine paid
10	Date of Submission	
11	Self-Plagiarism Exclusion Details (if published)	Kindly provide the links of your own publication (URL / DOI) to be excluded 1. 2.

Signature of the Student

Chairman / PG Coordinator / Head of the Department

Doctor of Philosophy (Ph.D.)

COURSE CURRICULA AND SYLLABI

DESCRIPTION OF TERMINOLOGIES

Major Course	The subject of Department or discipline in which the student takes admission. Among the listed courses, the core courses compulsorily to be registered shall be given ‘*’ mark
Minor Course	The course closely related to a student’s major subject
Supporting Course	The course not related to the major course. It could be any course considered relevant for student’s research work or necessary for building his/her overall competence

Credit Requirements

Particulars	Credits
(i) Course Work	
Major courses	12
Minor courses	06
Supporting courses	05
Seminar (2 number)	02
(ii) Thesis Research	75
TOTAL	100

SUPPORTING COURSES

Sl No.	Course Code	Course Title	Credits
01	MAT 601	Advanced Operations Research	2+1
02	STA 601	Applied Regression Analysis	2+1
03	STA 602	Multivariate Analysis for Applied Sciences	1+1
04	COM 601	Programming with R	1+1

MAT 601 Advanced Operations Research 2+1

Aim of the course

To provide an in depth knowledge in formulation of non -linear programming problems, integer programming, and Quadratic Programming. The application problems can be solved by using software packages.

Theory

Unit I

Formulating a nonlinear programming problem – unconstrained and constrained optimization problems – equality constraints - Lagrangian Multipliers-Hessian and bordered Hessian Matrices inequality constraints – Kuhn Tucker conditions.

Unit II

Linear programming -Definitions of primal and dual problems-Duality theorems, Complementary Slackness Theorem-Dual Simplex method – Economic interpolation of duality-Post-Optimal Analysis. Post-optimality Analysis-Changes in the objective function coefficients- Post-optimality Analysis Changes in the bi values- Post-optimality Analysis-Changes in the coefficients a_{ij} 's.

Unit III

Integer programming problems - Gomary's Cutting Plan method - Quadratic programming – Wolfe's modified simplex method- Beale's method. Goal programming problem – Formation and Algorithm- The weights method -The preemptive method

Unit IV

Markov Chains- Definition- Transition probability Matrices – Calculation of n step transition probabilities – Steady state conditions. Simulation – definition – Simulation models –generation of random numbers -Monte Carlo simulation – Application of simulation in queuing systems, maintenance problems, investment and budgeting.

Unit V

Dynamic programming problem- Formulation – Forward and backward, recursive methods- Discrete Dynamic Programming- Continuous Dynamic Programming. Software Packages for solving Operational Research problems

using MS Excel Solver, TORA, R, MATLAB, and other software packages.

Practical

Formulating a nonlinear programming problem - Problems in unconstrained and constrained optimization. Equality and inequality constraints - Kuhn Tucker conditions. Problems in Dual Simplex method – Economic interpolation of duality - Integer programming problems – Gomory's cutting plan method - Problems in quadratic programming, geometric programming– Dynamic programming – Forward and backward recursive methods. Markov decision problem. Transition probabilities – Transition matrices – n step transition probabilities – Steady state conditions – Simulation – definition – Simulation models - Monte Carlo simulation – generating random observations from uniform, exponential and normal probability distributions. Hands on sessions in MS Excel solver – GAMS – MATLAB and other software packages.

Learning Outcome

The students can acquire in depth knowledge in constrained and unconstrained optimization techniques. Also they obtain knowledge in linear and non-linear programming problems and they can solve the problems using software

Lecture Schedule

1. Formulating a non linear programming problem
2. Unconstrained optimization problems –functions of single variables
3. Unconstrained optimization problems –functions of several variables- Hessian Matrices
4. Constrained Optimization-Equality constraints –Lagrangian multipliers- Bordered Hessian matrices
5. Constrained Optimization –Inequality constraints with inequality constraints - Kuhn Tucker conditions
6. Linear programming – Definition of primal and dual
7. Duality theorems, Complementary Slackness Theorem
8. Dual simplex method
9. Economic interpolation of duality
10. Post-optimality Analysis-Changes in the objective function coefficients
11. Post-optimality Analysis-Changes in the b_i values
12. Post-optimality Analysis-Changes in the coefficients a_{ij} 's.
13. Integer programming problems -
14. Gomory's Cutting Plan method
15. Quadratic programming – Wolfe's modified simplex method
16. Quadratic programming – Beale's method.
17. Goal programming problem – Formation and Algorithm
18. The weights method
19. The preemptive method
20. Markov Chains – Definition - Transition probabilities
21. Calculation of n step transition probabilities and Steady State probabilities
22. Simulation definition – Simulation Models – Generation of Random numbers
23. Monte Carlo simulation

24. Application of simulation in queuing and inventory problems.
25. Application of simulation in maintenance and budgeting problems
26. Dynamic programming problem- Formulation – Forward and backward recursive methods
27. Discrete Dynamic Programming
28. Continuous Dynamic Programming
29. Stochastic Programming Problems.
30. Use of MS Excel solver in solving Optimization problems.
31. MATLAB ,GAMS and its features
32. MATLAB ,GAMS and its features
33. Features of other packages in solving OR problems

Practical Schedule

1. Unconstrained optimization problems –functions of single variables
2. Unconstrained optimization problems –functions several variables
3. Problems in Constrained Optimization-Equality constraints
4. Constrained Optimization –Inequality constraints with inequality constraints - Kuhn Tucker conditions
5. Problems in Dual simplex method
6. Integer programming problems - Gomary's cutting plan method
7. Quadratic programming Problems
8. Goal programming formation and solution
9. Discrete Dynamic programming problems
10. Continuous Dynamic programming problems
11. Markov chain-Construction of transition matrices - computation and steady state Probabilities
12. Simulation models- Monte Carlo simulation
13. Simulation in queuing and inventory problems
14. Simulation in maintenance and budgeting problems
15. Solving Use of MS Excel solver
16. Solution by GAMS and MATLAB
17. **Final practical examination**
 1. Fryer MJ and Greenman JV(1987)- Optimisation Theory Applications in OR and Economics, Edward Arnold, London
 2. Hamdy A. Taha (2002) -Operations Research (seventh edition) Prentice Hall of India Publisher, New Delhi.
 3. MJ. Fryer and JV Greenman (1987) Optimization Theory: Applications in OR and Economics, Edward Arnold
 4. Kanti Swarup, P.K Gupta, Man Mohan (1988) Operations Research (latest Edition) Sultan Chand & Sons educational publisher, New Delhi (latest edition).
 5. Michael D. Intriligator (1971), Mathematical Optimization and Economic Theory, Prentice- Hall of India Pvt Ltd., New Delhi

6. Don.T Phillips, Ravindran A. and James J.Solberg 1986 - Operations Research Principles and Practice

Suggested websites

1. http://en.wikipedia.org/wiki/Queueing_model
2. http://en.wikipedia.org/wiki/Dynamic_programming

Aim of the Course

To get depth knowledge and understanding of the linear and non-linear regression model and its limitations.

To learn how to develop regression model and check regression diagnostics and apply for the specific perspective data.

Theory**Unit I: Correlation Analysis**

Introduction to correlation analysis and its measures, Rank correlation, Testing of population correlation coefficients; Multiple and partial correlation coefficients and their testing.

Unit II: Regression Diagnostics

Problem of correlated errors; Auto correlation; Heteroscedastic models, Durbin Watson Statistics; Removal of auto correlation by transformation; Analysis of collinear data; Detection and correction of multi collinearity

Unit III: Regression analysis

Assumption and properties of regression coefficient - Method of least squares for curve fitting; Testing of regression coefficients and intercept. Coefficient of determination

Unit IV: Multiple Regression Analysis

Multiple and partial regressions - Diagnostic of multiple regression equation; Concept of weighted least squares; Various methods of selecting the best regression equation – Forward selection method, Backward elimination method, Stepwise regression

Unit V: Nonlinear Regression Analysis

Concept of nonlinear regression and fitting of quadratic, exponential and power curves; Economic and optimal dose, Orthogonal polynomial

Practical

Correlation coefficient and test of significance, Rank correlation. Regression analysis - Method of least squares for curve fitting - testing of hypothesis residuals and their applications in outlier detection; Handling of correlated errors, multi collinearity; - Multiple and partial regressions - Diagnostic of multiple regression equation Fitting of quadratic, exponential and power curves, fitting of orthogonal polynomials

Learning Outcome

After completion of this course the students will be able to

- Identify the relationship between the variables and solve problems involving simple and multiple linear regression.
- Select the best regression model and variables contributing to model.
- Carry out regression analysis for given data using different diagnostic measures, transformation.
- Fit linear and Non-linear regression curves and its implementation in real life situation

Lecture Schedule

1. Introduction to correlation analysis and its measures
2. Assumption and properties of correlation coefficient
3. Rank correlation
4. Testing of population correlation coefficients
5. Multiple correlation coefficients and their testing
6. Partial correlation coefficients and their testing
7. Correlation ratio
8. Auto correlation
9. Biserial correlation
10. Problem of correlated errors
11. Removal of auto correlation by transformation
12. Analysis of collinear data
13. Detection of multi collinearity and remedies
14. Correction of multi collinearity
15. Heteroscedastic models
16. Durbin Watson Statistics
17. Introduction to Regression analysis
18. Assumption and properties of regression coefficient
19. Method of least squares for curve fitting
20. Testing of regression coefficients
21. Interpretation of regression coefficient and intercept
22. Partial regressions
23. Multiple regression equation
24. Diagnostic of multiple regression equation
25. Concept of weighted least squares
26. Various methods of selecting the best regression equation - Forward selection method, Backward elimination method
27. Various methods of selecting the best regression equation - Stepwise regression
28. Concept of nonlinear regression
29. Fitting of quadratic curves
30. Fitting of exponential curves
31. Fitting of power curves
32. Economic and optimal dose
33. Orthogonal polynomial

Practical Schedule

1. Calculation of correlation coefficient

2. Calculation of partial correlation coefficient
3. Fitting of multiple linear regression equation
4. Testing of multiple linear regression coefficients
5. Calculation of Residuals and checking assumption of residuals
6. Outlier detection using residuals
7. Handling of correlated errors
8. Detection on multi-collinearity
9. Dealing with multi-collinearity
10. Detection on Autocorrelation
11. Detection on Heteroscedasticity
12. Estimation of linear model
13. Fitting of quadratic curves
14. Fitting of exponential curves
15. Fitting of power curves
16. Fitting of orthogonal polynomials
17. **Final practical examination**

Suggested Readings

1. David G. Kleinbaum, Lawrence L. Kupper, AzharNizam (2007). Applied Regression Analysis and Other Multivariable Methods (Duxbury Applied) 4th Ed.
2. Draper NR and Smith H. 1998. Applied Regression Analysis. 3 Ed. John Wiley.
3. Ezekiel M. 1963. Methods of Correlation and Regression Analysis. John Wiley
4. Kleinbaum DG, Kupper LL, Muller KE and Nizam A. 1998. Applied Regression Analysis and Multivariable Methods. Duxbury Press
5. Koutsoyiannis A. 1978. Theory of Econometrics. MacMillan
6. Kutner MH, Nachtsheim CJ and Neter J. 2004. Applied Linear Regression Models. 4th Ed. With Student CD. McGraw Hill
7. Chatterjee S, Hadi A and Price B.1999. Regression Analysis by Examples. John Wiley
8. Draper NR and Smith H. 1998. Applied Regression Analysis. 3rd Ed. John Wiley
9. David G. Kleinbaum, Lawrence L. Kupper, AzharNizam (2007). Applied Regression Analysis and Other Multivariable Methods (Duxbury Applied) 4th Ed
10. Draper NR and Smith H. 1998. Applied Regression Analysis. 3 Ed. John Wiley.

Suggested Websites

1. https://en.wikipedia.org/wiki/Regression_analysis
2. <http://home.iitk.ac.in/~shalab/course5.htm>

STA 602 Multivariate Analysis for Applied Sciences 1+1

Aim of the Course

- To learn and develop scientific view to deal with multidimensional datasets and its uses in the analysis of research data.

To understand the extensions of univariate techniques to multivariate frameworks and learn to apply dimension reduction techniques used in the data analysis.

Theory

Unit I: Multiple Regression Analysis

Multivariate statistical techniques – multiple linear regression – full model – stepwise regression – Step-up and step-down regression. Logit and Probit regression – two stage least squares – Canonical correlation.

Unit II: Principal Component and Factor Analysis

Principal component analysis – extraction of principal component – interpretation and uses – factor analysis – nature of factor analysis – basic concepts – assumptions of factor analysis – factor loadings – calculated rotated values – communalities – varimax rotation – quartimax rotation orthomax rotation

Unit III: Discriminant Function and Cluster Analysis

Discriminant function analysis – simple and multiple discriminant analysis – selection of variables – Cluster analysis – purpose of cluster analysis – hierarchical clustering – k means clustering dendrogram – interpretation of dendrogram.

Unit IV: Multi-Dimensional Scaling

Multi-dimensional scaling – method – metric and non-metric – interpretation.

Unit V: Reliability and Path Analysis

Reliability analysis – methods – split half method – Cronbach's Alpha – path analysis – path coefficients – direct and indirect effects – path diagram.

Practicals

Multivariate statistical techniques - Full model regression equation - fitting using software - analysis and interpretation. Stepwise regression analysis - Step up method, Step-down method – Stepwise regression analysis using software. Computation of Logit regression equation - two stage least square regression equation - Canonical correlation. Principal components analysis – deriving the components and its interpretation. Factor analysis - with varimax rotation - quartimax and other rotations. Discriminant analysis - simple discriminant analysis - Multiple discriminant analysis. Cluster analysis -k-means method - hierarchical clustering method and dendrogram. Multi- dimensional analysis - Split half method of reliability - Kornbach's Alpha. Path analysis.

Learning Outcome

After completion of this course the students will be able to

- Carry out an extensive exploratory multivariate analysis for a given multivariate

data.

- Interpret statistically the multivariate data through the various multivariate techniques.
- Carry out classification of given multivariate data.
- Solve problems involving multivariate normal distribution and to do good research in agricultural data.

Lecture Schedule

1. Multivariate techniques – introduction and basics – use of SYSTAT software
2. Full model regression equations – selection of variables – fitting – analysis and interpretation
3. Stepwise regression analysis – step up method
4. Stepwise regression analysis – step down method
5. Logit regression equation fitting and interpretation
6. Probit regression equation – fitting and interpretation
7. . Canonical correlations – computation and interpretation
8. Principal component analysis – deriving the components and its interpretation
9. Factor analysis – objective – designing and assumptions – various rotations
10. Deriving factors and assessment of overall fit – interpreting the factors
11. Discriminant analysis – classification of multivariate observations – principles – simple discriminant analysis – equation fitting
12. Multiple discriminant analysis – equation fitting
13. Cluster analysis – principles – steps in clustering – k – means method – hierarchical clustering method – dendrogram – interpreting the dendrogram
14. Multi dimensional analysis technique – method and interpretation
15. Reliability analysis – methods – split half method – Cronbach's Alpha
16. Path analysis – path coefficients – direct and indirect effects – construction of path diagram

Practical Schedule

1. Full model regression equations – fitting using software – analysis and interpretation
2. Stepwise regression analysis – step up method using software
3. Stepwise regression analysis – step down method using software
4. Computation of Logit regression equation
5. Computation of two stage least square regression equation
6. Computation of Canonical correlation
7. Principal components analysis – deriving the components and its interpretation
8. Factor analysis – with varimax rotation
9. Factor analysis – quartimax and other rotations
10. Discriminant analysis – simple discriminant analysis
11. Multiple discriminant analysis
12. Cluster analysis – k-means method
13. Cluster analysis – hierarchical clustering method and dendrogram
14. Multi dimensional analysis
15. Split half method of reliability – Kornbach's Alpha
16. Path analysis
17. **Final practical examination**

Suggested Readings

1. Anderson TW. 1984. An Introduction to Multivariate Statistical Analysis. 2nd Ed. John Wiley
2. Arnold SF. 1981. The Theory of Linear Models and Multivariate Analysis. John Wiley
3. Giri NC. 1977. Multivariate Statistical Inference. Academic Press
4. Johnson RA and Wichern DW. 1988. Applied Multivariate Statistical Analysis. Prentice Hall
5. Kshirsagar AM. 1972. Multivariate Analysis. Marcel Dekker.
6. Muirhead RJ. 1982. Aspects of Multivariate Statistical Theory. John Wiley.
7. Rao CR. 1973. Linear Statistical Inference and its Applications. 2nd Ed. John Wiley
8. Rencher AC. 2002. Methods of Multivariate Analysis. 2nd Ed. John Wiley
9. Srivastava MS and Khatri CG. 1979. An Introduction to Multivariate Statistics. North Holland

Suggested Websites

1. https://en.wikipedia.org/wiki/Multivariate_statistics
2. <https://online.stat.psu.edu/stat505/>
3. https://www.iiap.res.in/astrostat/School08/PennStateSchool08_LecNotes.pdf
4. <https://www.math.uci.edu/~htucker/LectureNotes/MultivariateAnalysis.PDF>
5. <http://i2pc.es/coss/Docencia/ADAM/Notes/MultivariateAnalysisSlides.pdf>
6. <http://www.statslab.cam.ac.uk/~pat/AppMultNotes.pdf>

Aim of the Course

To give an idea about programming in R software and learn how to use R for data visualization

Theory**Unit I**

R Console; R Data types; R Vector creation using `c()`; R Assignment operators `= <-` ; R Arithmetic Operators; R Logical Operators; R Relational Operators;

Unit II

R Matrix- Create, Print, Add Column using `cbind()`, Add Row using `rbind()`, Slice using `[,]`; R Data Frame - Create using `data.frame()`, Edit using `edit()`, Append using `cbind()`, `rbind()`, `select()`, `subset()`, sort using `order()`; List in R - Create using `list()`, Select; Data Importing and Exporting in R Using `read.table()` and `write.table()`;

Unit III

`install.packages()`, `library()`; Introduction to Machine Learning; Introduction to R package tensorflow Introduction to R package keras.

Unit IV

Rscript If, Else, Else If statements in R; For Loop and While Loop in R; R user defined Functions

Unit V

Scatter Plot, Bar Chart and Histogram in R; Data Visualization with R `ggplot2`; Publishing Data Visualizations with R Shiny;

Practical

R Console; R Vector creation using `c()`; R Assignment operators `= <-` ; R Matrix- Create, Print, Add Column using `cbind()`, Add Row using `rbind()`, Slice using `[,]`; R Data Frame - Create using `data.frame()`, Edit using `edit()`, Append using `cbind()`, `rbind()`, `select()`, `subset()`, sort using `order()`; List in R - Create using `list()`, Select; Data Importing and Exporting in R Using `read.table()` and `write.table()`; `install.packages()`, `library()`; `install.packages("tensorflow")`; `install.packages("keras")`; Rscript, If, Else, Else If statements in R; For Loop and While Loop in R; R user defined Functions; Scatter Plot, Bar Chart and Histogram in R; Data Visualization with R `ggplot2`; Publishing Data Visualizations with R Shiny;

Learning Outcome

The course will impart knowledge on how to analyze and visualize data using R programming

Lecture schedule

1. R Console; R Data types; R Vector creation using `c()`; R Assignment operators `= <-`
2. R Arithmetic Operators; R Logical Operators; R Relational Operators;

3. R Matrix- Create, Print, Add Column using `cbind()`, Add Row using `rbind()`, Slice using `[,]`;
4. R Data Frame - Create using `data.frame()`, Edit using `edit()`, Append using `cbind()`, `rbind()`, `select()`, `subset()`, sort using `order()`;
5. List in R - Create using `list()`, Select; Data Importing and Exporting in R Using `read.table()` and `write.table()`;
6. `install.packages()`, `library()`;
7. `install.packages("tensorflow")`;
8. `install.packages("keras")`;
9. Rscript
10. If, Else, Else If statements in R;
11. For Loop in R;
12. While Loop in R;
13. R user defined Functions
14. Scatter Plot, Bar Chart and Histogram in R;
15. Data Visualization with R `ggplot2`;
16. Publishing Data Visualizations with R Shiny;

Practical Schedule

1. R Console; R Vector creation using `c()`; R Assignment operators `= <-` ;
2. R Matrix- Create, Print, Add Column using `cbind()`,
3. Add Row using `rbind()`, Slice using `[,]`;
4. R Data Frame - Create using `data.frame()`, Edit using `edit()`, Append using `cbind()`, `rbind()`, `select()`, `subset()`, sort using `order()`;
5. List in R - Create using `list()`, Select; Data Importing and Exporting in R Using `read.table()` and `write.table()`;
6. `install.packages()`, `library()`;
7. `install.packages("tensorflow")`;
8. `install.packages("keras")`;
9. Rscript
10. If, Else, Else If statements in R;
11. For Loop in R;
12. While Loop in R;
13. R user defined Functions;
14. Scatter Plot, Bar Chart and Histogram in R;
15. Data Visualization with R `ggplot2`;
16. Publishing Data Visualizations with R Shiny;
17. **Final Practical Examination**

Suggested Readings

1. Michael J. Crawley (2013). The R Book. 2nd Edition. John Wiley
2. Robert Gentleman (2008). R Programming For Bioinformatics. Chapman and Hall/CRC.
3. Brian S. Everitt and Torsten Hothorn (2009). A Handbook of Statistical Analyses Using R. Second Edition. Chapman and Hall/CRC

Suggested Websites

1. RStudio.com Shiny Tutorial - <https://shiny.rstudio.com/tutorial/> - <https://shiny.rstudio.com/articles/>
2. R Interface to Tensorflow - <https://tensorflow.rstudio.com/>
3. R Interface to Keras - <https://keras.rstudio.com/>

Ph.D. Agronomy

Ph.D. Agronomy

Sl No.	Course code	Course Title	Cr. Hr.
I. Major courses (12 credits)			
01	Agron 601*	Current trends in Agronomy	3+0
02	Agron 602	Recent trends in crop growth and productivity	2+1
03	Agron 603	Irrigation management	2+1
04	Agron 604	Recent trends in weed management	2+1
05	Agron 605	Integrated farming systems for sustainable Agriculture	2+0
06	Agron 606	Soil Conservation and Watershed Management	2+1
07	Agron 607	Stress Crop Production	2+1
08	Agron 608*	Research and Publication ethics	2+0
II. Minor Courses (6 credits)			
01.	AGM 601	Climate Change and Sustainable Development	2+1
III. Supporting Courses (5 credits)			
IV. Seminar (2 credits)			
01	Agron 691	Doctoral Seminar	0+1
02	Agron 692	Doctoral Seminar	0+1
V. Thesis Research (75 credits)			
01	Agron 699	Doctoral Research	0+75

* Courses to be compulsorily registered

AIM OF THE COURSE

To acquaint the students about recent advances in agricultural production.

THEORY

Unit I

Globalization of agriculture and WTO, global warming, GM crops, Conservation agriculture: principles, prospects and importance, potential benefits of CA under climate change scenario, policy issues.

Unit II

Agro-physiological and environmental basis for variation in yield, recent advances in soil-plant-water relationship

Unit III

Precision farming: GIS, GPS and remote sensing for crop management, Mechanization in crop production: modern agricultural precision tools and technologies, Contract farming, Organic farming: marketing and export potential of organic products, certification, labelling and accreditation procedures in organic farming.

Unit IV

Crop residue management in multiple cropping systems; weed management, cropping systems, grassland management, agro-forestry, allelopathy, seed production technologies; seed certification, seed multiplication, hybrid seed production.

Unit V

Concepts of system agriculture; holistic approach of farming systems, dryland farming, sustainable agriculture and research methodology in Agronomy; bio-physical models for crop and cropping system simulation.

LECTURE SCHEDULE

1. Globalization of Agriculture
2. WTO – History, location and co-operation with other organizations
3. Role and importance of WTO in agriculture
4. Global warming – Meaning, Causes, green house gases,
5. Global warming – ill effects of global warming, effect on yield of crops, Remedies to reduce global warming.
6. GM crops – Meaning, Need for GM crops, Advantages and limitation, Methods of producing GM crops.
7. GM crops – Food safety and environmental issues
8. Conservation agriculture – meaning, principles, prospects and importance
9. Conservation agriculture – potential benefits of CA under climate change scenario, policy issues.
10. Agro-physiological basis for variation in yield
11. Environmental basis for variation in yield
12. Soil-plant-water relationship

13. Recent advances in soil-plant-water relationship
14. Precision farming – Concept, adaptability, advantages and limitations
15. GIS, GPS and remote sensing for crop management.
16. Mechanization in crop production
17. Modern agricultural precision tools and technologies
18. Contract farming – Meaning, Scope, Suitability, advantages and limitations
19. Organic farming – Meaning, Scope, Suitability, advantages and limitations
20. Marketing and export potential of organic products
21. Certification, labelling and accreditation procedures in organic farming.
22. Crop residue management – importance, availability, estimation of nutrient availability from crop residues
23. Crop residue management in multiple cropping systems
24. Weed management – Methods of weed management; weed prevention
25. Weed management – Physical, cultural, chemical and integrated weed management
26. Weed management in cropping systems
27. Cropping systems – Meaning/concepts, different cropping systems
28. Estimating yield advantage in cropping systems
29. Grassland management
30. Agro-forestry – meaning, methods, advantages and limitations
31. Allelopathy – meaning, history, applications in crop production
32. Seed production technologies
33. Seed certification and seed multiplication
34. Hybrid seed production
35. System agriculture – concepts
36. Holistic approach of farming systems
37. Farming systems for wetlands
38. Farming systems for garden lands
39. Farming systems for drylands
40. Dryland farming – meaning, area under dryland farming in India, Soil and water conservation techniques
41. Crop production techniques of for higher productivity in dryland conditions
42. Sustainable Agriculture – meaning, advantages and limitations
43. Sustainable Agriculture practices
44. Research methodology in Agronomy
45. Different statistical designs for agronomic research
46. Recording biometric observations
47. Bio-physical models for crop and cropping system simulation

LEARNING OUTCOME

Recent advances in agricultural production

SUGGESTED READING

- Agarwal RL. 1995. *Seed Technology*. Oxford & IBH.
- Dahiya BS and Rai KN. 1997. *Seed Technology*. Kalyani.
- Govardhan V. 2000. *Remote Sensing and Water Management in Command Areas: Agroecological Prospectives*. IBDC.
- Narasaiah ML. 2004. *World Trade Organization and Agriculture*. Sonali Publ.
- Palaniappan SP and Annadurai K. 2006. *Organic Farming - Theory and Practice*. Scientific Publ.
- Sen S and Ghosh N. 1999. *Seed Science and Technology*. Kalyani.
- Tarafdar JC, Tripathi KP and Kumar M. 2007. *Organic Agriculture* Scientific Publ.
- Kumar, R, Swarnkar KS, Singh KS and Narayan S. 2016. *A Text Book of Seed Technology*. Kalyani Publication.
- Reddy SR and Prabhakara G. 2015. *Dryland Agriculture*. Kalyani Publishers.
- Gururajan B, Balasubhranian R and Swaminath V. 2013. *Recent Strategies on Crop Production*. Kalyani Publishers.
- Venkateswarlu B and Shanker Arun K. 2009. *Climate change and agriculture: Adaptation and mitigation strategies*. *Indian Journal of Agronomy* **54**(2): 226-230.
- Muhammad Farooq and K.H. M. Siddique. 2019. *Conservation Agriculture*. DOI <https://doi.org/10.1007/978-3-319-11620-4>
- Somasundaram Jayaraman, Ram C. Dalal, Ashok K. Patra, Suresh K. Chaudhari. 2021. *Conservation Agriculture: A Sustainable Approach for Soil Health and Food Security* Conservation Agriculture for Sustainable Agriculture. Springer Publications.

AIM OF THE COURSE

To study the physiology of vegetative and reproductive growth in relation to productivity of different crops in various environments.

THEORY

Unit I

Plant density and crop productivity; plant and environmental factors, yield, plant distribution, strategies for maximizing solar energy utilization; leaf area – Different methods of estimation; interception of solar radiation and crop growth;

Unit II

Photosynthesis: the photosynthetic apparatus, factors essential for photosynthesis; difference in photosynthetic rates among and within species; physiological limitations to crop yield; solar radiation concept and agro-techniques for harvesting solar radiation.

Unit III

Growth analysis: concept, CGR, RGR, NAR, LAI, LAD, LAR; validity and Limitations, in interpreting crop growth and development; growth curves: sigmoid, polynomial, and asymptotic; root systems; root-shoot relationship; principles involved in inter and mixed cropping systems under rainfed and irrigated conditions; concept and differentiation of inter and mixed cropping; criteria in assessing the yield advantages.

Unit IV

Competitive relationship and competition functions; biological and agronomic basis of yield advantage under intercropping; physiological principles of dry land crop production, constraints and remedial measures; heat unit concept of crop maturity: concept and types of heat units.

Unit V

Concept of plant ideotypes: crop physiological and new ideotypes; characteristics of ideotype for wheat, rice, maize, etc.; concept and types of growth hormones; their role in field crop production; efficient use of resources.

PRACTICAL

- Field measurement of root-shoot relationship in crops at different growth stages
- Estimation of growth evaluating parameters like CGR, RGR, NAR, LAI etc., at different stages of crop growth
- Computation of harvest index of various crops
- Assessment of crop yield on the basis of yield attributing characters
- Construction of crop growth curves based on growth analysis data
- Computation of competition functions, viz. LER, IER aggressivity competition index, etc in intercropping
- Senescence and abscission indices
- Analysis of productivity trend in un-irrigated areas
- Analysis of productivity trend in irrigated areas

THEORY LECTURE SCHEDULE

1. Plant density and crop productivity
2. Plant and environmental factors
3. Yield
4. Plant distribution
5. Strategies for maximizing solar energy utilization
6. Leaf area- Different methods of estimation
7. Interception of solar radiation and crop growth
8. Photosynthesis - the photosynthetic apparatus
9. Factors essential for photosynthesis
10. Difference in photosynthetic rates among and within species
11. Physiological limitations to crop yield
12. Solar radiation concept and agro-techniques for harvesting solar radiation
13. Growth analysis: concept, validity and limitations in interpreting crop growth and development of CGR, RGR and NAR
14. Growth analysis: concept, validity and limitations in interpreting crop growth and development of LAI, LAD and LAR
15. Growth curves: sigmoid, polynomial, and asymptotic
16. Root systems; root-shoot relationship
17. Principles involved in inter and mixed cropping systems under rainfed and irrigated conditions
18. Concept and differentiation of inter and mixed cropping
19. Criteria in assessing the yield advantages.
20. Competitive relationship and competition functions
21. Biological and agronomic basis of yield advantage under intercropping
22. Physiological principles of dry land crop production
23. Constraints in dryland crop production
24. Remedial measures in dryland crop production
25. Heat unit concept of crop maturity - concept and types of heat units
26. Concept of plant ideotypes
27. Crop physiological and new ideotypes
28. Characteristics of ideotype for wheat, rice, maize, etc
29. Concept and types of growth hormones
30. Role of growth hormones in field crop production
31. Efficient use of resources

PRACTICAL SCHEDULE

1. Field measurement of root-shoot relationship in rice at different growth stages
2. Field measurement of root-shoot relationship in maize at different growth stages
3. Field measurement of root-shoot relationship in pulses (Black gram/green gram) at different growth stages
4. Estimation of growth evaluating parameters like CGR, RGR, NAR, LAI etc., at different stages of rice

5. Estimation of growth evaluating parameters like CGR, RGR, NAR, LAI etc., at different stages of maize
6. Estimation of growth evaluating parameters like CGR, RGR, NAR, LAI etc., at different stages of pulses (Black gram/green gram)
7. Assessment of crop yield on the basis of yield attributing characters in rice
8. Assessment of crop yield on the basis of yield attributing characters in pulses
9. Computation of harvest index of rice
10. Computation of harvest index of maize
11. Computation of harvest index of pulses
12. Construction of crop growth curves based on growth analysis data
13. Computation of competition functions, viz. LER, IER, aggressivity competition index, etc. in intercropping
14. Senescence and abscission indices
15. Analysis of productivity trend in un-irrigated areas
16. Analysis of productivity trend in irrigated areas
17. **PRACTICAL EXAMINATION**

LEARNING OUTCOME

Experience on the knowledge of crop growth for agricultural production

SUGGESTED READING

- Chopra VL and Paroda RS. 1984. Approaches for Incorporation of Drought and Salinity Resistance in Crop Plants. Oxford & IBH.
- Delvin RM and Vitham FH. 1986. Plant Physiology. CBS Publ.
- Evans LT. 1975. Crop Physiology. Cambridge Univ. Press.
- Evans LT. 1996. Crop Evolution, Adaptation and Yield. Cambridge Univ. Press.
- Gupta US. (Ed.). 1995. Production and Improvement of Crops for Drylands. Oxford & IBH.
- Gupta US. 1988. Progress in Crop Physiology. Oxford & IBH.
- Kramer PJ and Boyer JS. 1995. Water Relations of Plant and Soils. Academic Press.
- Mukherjee S and Ghosh AK. 1996. Plant Physiology. Tata McGraw Hill.
- Narwal SS, Politycka B and Goswami CL. 2007. Plant Physiology: Research Methods. Scientific Pub.
- Tiaz L. and Zeiger E. 2006. Plant Physiology. Sinauer Associates, Inc.

AIM OF THE COURSE

To teach students about optimization of irrigation in different crops under variable agro climatic conditions.

THEORY**Unit I**

Global water resources; Water resources of India, irrigation projects during pre- and post-independence period and their significance in crop production. Soil and plant water potential; Soil-plant-water atmospheric relationships, evaporation, transpiration and evapotranspiration, significance of transpiration, energy utilization in transpiration, physiological processes and crop productivity. Factors affecting ET, control of ET by mulching and use of anti-transpirants. Infiltration – water movement in soil under saturated and unsaturated conditions. Poiseuille's and Darcy's law, general equation of saturated and unsaturated flow of water in soil.

Unit II

Water requirement; water use efficiency and management practices to improve water use efficiency of crops. Crop water stress, water deficit and crop growth, adaptability of the crops. Fertilizer use in relation to irrigation. Water availability and its relation to nutrient availability.

Unit III

Conventional methods of irrigation, advanced irrigation methods, management of water in controlled environments and polyhouses. Automated irrigation system.

Unit IV

Strategies of using limited water supply; optimizing the use of given irrigation supplies; crop planning for optimum use of irrigation water. Ground water utilization and its impact on crop production. Drainage. Management of poor quality water. Water production function, Modelling in irrigation water management, economic analysis of irrigation.

Unit V

Land suitability for irrigation, land irrigability classification; conveyance and distribution system in irrigation projects, irrigation efficiency; agronomic considerations in the design and operation of irrigation projects; characteristics of irrigation and farming systems affecting irrigation management, integrated water management in command areas, water management institutions in commands, farmer's participation in command areas; irrigation legislation.

PRACTICAL

1. Determination of water infiltration characteristics of soil profiles
2. Determination of water holding capacity of soil profiles
3. Study of moisture extraction pattern in various crops.
4. Determination of ET / PET.
5. Determination of crop co-efficient of important crop (Sesame/black gram/green gram).
6. Estimation of soil moisture balance.
7. Designing, layout and evaluation of drip irrigation and working out the water requirement.

8. Designing, layout and evaluation of sprinkler irrigation and working out the water requirement.
9. Working out irrigation efficiencies.
10. Determination of irrigation timing under different methods of irrigation.
11. Working out economics of irrigations systems.
12. Determination of consumptive use and water requirement of a given cropping pattern.
13. Designing of drainage channel.
14. Water quality analysis and management of poor quality irrigation water.
15. Irrigation management modelling studies
16. Visit to irrigation command area / irrigation automation farms in farmers' field.

LECTURE SCHEDULE

1. Water resources of World and India. Availability of water resources for different sectors in India. Projections for next 25 years. Area and crop irrigated in India,
2. Irrigation - Definition, Irrigation projects during pre-post-independence period in India and their significance in crop production
3. Soil and plant water potential. Soil moisture constants and their importance in irrigation.
4. Soil-plant-water atmospheric relationships – evaporation, transpiration, ET and potential evapotranspiration. Significance of transpiration, transpiration efficiency - transpiration co-efficient, energy utilization in transpiration, physiological processes and crop productivity.
5. Factors affecting ET and crop yield. Control of ET by mulching and use of anti-transpirants.
6. Infiltration – Definition. Water movement in soil under saturated and unsaturated conditions. Water vapour movement. Poiseuille's and Darcy's law, general of saturated and unsaturated flow of water in soil.
7. Crop water requirement for various agricultural crops - Factors affecting crop water requirement. Critical stages of water requirement for different agricultural crops.
8. Crop water requirement for various horticultural crops. Critical stages of water requirement for different horticultural crops.
9. Water use efficiency and management practices to improve water use efficiency of crops.
10. Crop water stress, water deficit and crop growth, adaptability of the crops and measures to overcome moisture stress.
11. Fertilizer use in relation to irrigation. Water availability and its relation to nutrient availability.
12. Methods of irrigation – conventional methods of irrigation.
13. Methods of irrigation – Overhead and micro-irrigation - sprinkler irrigation - suitability - components - operations - advantages and disadvantages
14. Drip irrigation - suitability - components - layout - operation - advantages and disadvantages
15. Special and advanced methods of irrigation - suitability and advantages, deficit irrigation, automated irrigation system
16. Concept of fertigation- fertilizer type - suitability - method of applying fertilizer through irrigation water - fertigation under sub surface method
17. Irrigation under controlled environment - glass houses - green house - poly house – netted house - pot watering - sprinkling - pipe irrigations

18. Strategies of using limited water supply; optimizing the use of given irrigation supplies. Crop planning for optimum use of irrigation water.
19. Ground water utilization and its impact on crop production. Ground water recharge - definition, sea water intrusion, sea water utilization
20. Drainage and its importance. Causes and ill effects of excess water on soil and plants - tolerance of plants for water stagnated environment.
21. Methods of draining water - surface and subsurface methods; layout-drainage requirement for different crops.
22. Quality of Irrigation water. Management of poor quality water.
23. Water production function
24. Modelling in irrigation water management.
25. Economic analysis of irrigation
26. Land suitability for irrigation. Land irrigability classification.
27. Conveyance and distribution system in irrigation projects. Irrigation efficiency; agronomic considerations in the design and operation of irrigation projects
28. Characteristics of irrigation and farming systems affecting irrigation management.
29. Integrated water management in command areas. Institution of water management in command areas
30. Farmer's participation in command areas.
31. Irrigation legislation.

PRACTICAL SCHEDULE

1. Determination of water infiltration characteristics of soil profiles
2. Determination of water holding capacity of soil profiles
3. Study of moisture extraction pattern in various crops.
4. Determination of ET/PET
5. Determination of crop co-efficient of important crop (Sesame/black gram/green gram).
6. Estimation of soil moisture balance.
7. Designing, layout and evaluation of drip irrigation and working out the water requirement.
8. Designing, layout and evaluation of sprinkler irrigation and working out the water requirement.
9. Working out irrigation efficiencies.
10. Determination of irrigation timing under different methods of irrigation.
11. Working out economics of irrigations systems.
12. Determination of consumptive use and water requirement of a given cropping pattern.
13. Designing of drainage channel.
14. Water quality analysis and management of poor quality irrigation water.
15. Irrigation management modelling studies
16. Visit to irrigation command area / irrigation automation farms in farmers' field.
17. **FINAL PRACTICAL EXAMINATION**

LEARNING OUTCOME

Experience on the knowledge of crop growth for agricultural production

SUGGESTED READINGS

Panda S.C. 2003. *Principles and Practices of Water Management*. Agrobios Pub.

Singh MP, 2017. *Recent advances in Irrigation water management*. Kalyani Publishers

FAO, 1984. *Irrigation Practice and Water Management*. Oxford & IBH.

Mishra RR and Ahmad M. 1987. *Manual on Irrigation and Agronomy*. Oxford & IBH

Reddy S.R. 2000. *Principles of Crop Production*. Kalyani publishers.

Sankara Reddy GH and Yellamananda Reddy. 1995. *Efficient Use of Irrigation Water*. In: Gupta US. (Ed.). *Production and Improvement of Crops for Drylands*. Oxford & IBH

Lenka D. 1999. *Irrigation and Drainage*. Kalyani publishers.

Michael AM. 1978. *Irrigation: Theory and Practice*. Vikas Publ.

Majumdar DK. 2014. *Irrigation Water Management: Principles and Practice*. PHI publishers.

Mukund Joshi. 2013. *A Text book of Irrigation and Water Management*. Kalyani publishers.

AIM OF THE COURSE

To teach about the changing weed flora, new herbicides, their resistance, toxicity, antidotes and residue management under different cropping systems.

THEORY

Unit I

Crop-weed competition in different cropping situations; changes in weed flora, various causes and effects; different methods of weed management. Migration, introduction, adaptation of weeds. Invasive weeds - Different mechanisms of invasion — present status and factors influencing weed invasion. Biology and management.- Parthenium, Lantana, Chromolaena, Water hyacinth and Mikania.

Unit II

Physiological and biological aspects of herbicides, their absorption, translocation, metabolism and mode of action; selectivity of herbicides and factors affecting them.

Unit III

Climatic factors and phytotoxicity of herbicides: fate of herbicides in soil and factors affecting them, Degradation of herbicides in soil and plants- factors affecting it, primary and secondary metabolites, residue management of herbicides, adjuvants- Concepts and examples

Unit IV

Advances in herbicide products and application techniques and methods; herbicide resistance-Types- major HR weeds; antidotes and crop protection compatibility of herbicides of different groups; compatibility of herbicides with other pesticides: herbicide rotation and herbicide mixtures. Development of transgenic herbicide resistant crops: herbicide development, registration procedures.- Important herbicides registered for field crops in India

Unit V

Relationship of herbicides with tillage, fertilizer, and irrigation, cropping system; bioherbicides, allelochemical and alleloherbicides, herbicide bioassays. Nanotechnology in herbicidal weed management. Recent advances in nonchemical weed management. including deleterious rhizobacteria, biodegradable film, robotics and drones.

PRACTICAL

Crop-weed competition in lowland and upland ecosystem. Biology and management of lowland and upland weed. Weed seedbank estimation studies. Role of allelopathy in weed management. Herbicide spray calibration and methods of testing of herbicides (greenhouse and field condition). Drone technology in herbicide application. Study of adjuvants and antidotes on weed management. Bioassay of herbicides, Herbicide resistance studies. Nanotechnology in herbicidal weed management. Visit and estimate herbicide residue. Visit to agro-chemical industry.

LECTURE SCHEDULE

1. Crop-weed competition in different cropping situations
2. Changes in weed flora, various causes and effects
3. Different methods of weed management

4. Migration, introduction, adaptation of weeds
5. Invasive weeds- Different mechanisms of invasion — present status
6. Factors influencing weed invasion
7. Biology and management- Parthenium and Lantana,
8. Biology and management- Chromolaena, water hyacinth and Mikania
9. Herbicides- Physiological and biological aspects
10. Absorption and translocation of herbicides
11. Metabolism and mode of action of herbicides
12. Herbicides selectivity and factors affecting herbicide selectivity
13. Climatic factors affecting herbicide selectivity
14. Phytotoxicity of herbicides
15. Fate of herbicides in soil- influencing factors
16. Degradation of herbicides in soil and plants- factors influencing it
17. Primary and secondary metabolites
18. Residue management of herbicides
19. Adjuvants- Concepts and examples
20. Advances in herbicide products
21. Herbicide application techniques and methods
22. herbicide resistance -Types and major herbicide resistant weeds
23. Development of transgenic herbicide resistant crops
24. Antidotes and crop protection; compatibility of herbicides with other pesticides
25. Herbicide rotation and herbicide mixtures
26. Herbicide development, registration procedures- Important herbicides registered for field crops in India
27. Relationship of herbicides with tillage and fertilizer, irrigation and cropping system.
28. Bioherbicides, allelochemical and alleloherbicides.
29. Herbicide bioassays
30. Nanotechnology in herbicidal weed management.
31. Recent advances in nonchemical weed management- deleterious rhizobacteria and biodegradable film, robotics and drones

PRACTICAL SCHEDULE

1. Study on crop-weed competition in lowland ecosystem
2. Study on crop-weed competition in upland ecosystem
3. Study on biology and management of lowland weed
4. Study on biology and management of upland weed
5. Study on weed seedbank estimation
6. Study on allelopathy for weed management
7. Study on herbicide spray calibration
8. Study on methods of testing of herbicides
9. Study on herbicide application with drones
10. Study on adjuvants in weed management

11. Study on antidotes for crop protection
12. Study on herbicide bioassay
13. Study on herbicide resistance in weeds
14. Study on nano herbicide in weed management
15. Visit to residue laboratory and estimation of herbicide residue
16. Visit to agro-chemical unit/ industry
17. **FINAL PRACTICAL EXAMINATION**

LEARNING OUTCOME

Experience on the knowledge of new herbicides, their resistance, toxicity, antidotes, and residue management under different cropping systems.

SUGGESTED READING

Böger, Peter, Wakabayashi, Ko, Hirai, Kenji (Eds.). 2002. *Herbicide Classes in Development. Mode of Action, Targets, Genetic Engineering, Chemistry*. Springer.

Das TK. 2013. *Weed Science: Basics and Applications*, Jain Brothers (New Delhi)

Fennimore, Steven A and Bell, Carl. 2014. *Principles of Weed Control*, 4th Ed, California Weed Sci. Soc.

Gupta OP. 2007. *Weed Management: Principles and Practices*, 2nd Ed.

Jugulan M, (ed). 2017. *Biology, Physiology and Molecular Biology of Weeds*. CRC Press

Monaco TJ, Weller SC and Ashton FM. 2014. *Weed Science Principles and Practices*, Wiley

Powles SB and Shaner DL. 2001. *Herbicide Resistance and World Grains*, CRC Press.

Walia US. 2006. *Weed Management*, Kalyani.

Zimdahl RL. (ed). 2018. *Integrated Weed Management for Sustainable Agriculture*, B. D. Sci. Pub

SUGGESTED WEBSITES

<https://isws.org.in/IJWSn/Journal.aspx>

<https://onlinelibrary.wiley.com/journal/13653180>

<https://www.cambridge.org/core/journals/weed-science>

<https://dwr.icar.gov.in/>

<https://wssa.net/>

Agron 605 Integrated Farming Systems for Sustainable Agriculture 2+0

AIM OF THE COURSE

To appraise about different enterprises suitable for different agroclimatic conditions for sustainable agriculture.

THEORY

Unit I

Sustainable agriculture: Introduction, definition, concepts and goals; Elements of sustainability; Status of sustainable agriculture in India; Concept of sustainability in Integrated farming systems; Integrated Farming systems (IFS): definition, scope and importance.

Unit II

Classification of IFS based on enterprises as well as under rainfed/ irrigated condition in different land situation, farming systems according to type of rotation, intensity of rotation, degree of commercialization, water supply, enterprises. Efficient Integrated farming systems based on economic viability and natural resources - identification and management.

Unit III

Production potential of different components of Integrated farming systems; interaction and mechanism of different production factors; stability of Integrated Farming system based on research/ long term information in different systems through research; Integration of components and adaptability of different farming system based on land situations and climatic condition of a region; evaluation of IFS.

Unit IV

Eco-physiological approaches to intercropping; soil nutrient management in intercropping; Simulation models for intercropping; preparation of different farming system models; evaluation of different farming systems. Formation of different Integrated Farming system Models; evaluation of different Integrated Farming system models. Recycling of organic waste in IFS.

Unit V

New concepts and approaches of farming system and organic farming; value addition, waste recycling, quantification and mitigation of Green House gases; case studies/ success stories of different Integrated Farming systems, cropping systems and organic farming; case studies on different farming systems. Possible use of ITK in Integrated farming system.

LECTURE SCHEDULE

1. Sustainable agriculture: Introduction, definition, concepts and goals
2. Elements of sustainability and Status of sustainable agriculture in India
3. Concept of sustainability in Integrated farming systems
4. Integrated Farming systems (IFS): definition, scope and importance
5. Classification of IFS based on enterprises
6. Classification of IFS under rainfed/ irrigated condition in different land situation
7. Farming systems according to type of rotation and intensity of rotation
8. Farming systems according to degree of commercialization and water supply

9. Farming systems according to enterprises.
10. Efficient Integrated farming systems based on economic viability
11. Efficient Integrated farming systems based on natural resources
12. Identification and management of efficient Integrated farming systems
13. Production potential of different components of Integrated farming systems
14. Interaction and mechanism of different production factors
15. Stability of Integrated Farming system based on research/ long term information in different systems through research
16. Integration of components in IFS
17. Adaptability of different farming system based on land situations and climatic conditions of a region
18. Evaluation of IFS.
19. Eco-physiological approaches to intercropping.
20. Soil and nutrient management in intercropping
21. Simulation models for intercropping
22. Preparation of different farming system models
23. Evaluation of different farming systems models
24. Formation of different Integrated Farming system Models
25. Evaluation of different Integrated Farming system models
26. New concepts and approaches of farming system and organic farming
27. Value addition and waste recycling
28. Quantification and mitigation of Green House gases
29. Case studies/ success stories of different Integrated Farming systems, Cropping systems and organic farming
30. Case studies on different farming systems.
31. Possible use of ITK in Integrated farming system.

LEARNING OUTCOME

Experience on the knowledge of enterprises suitable for different agroclimatic conditions for sustainable agriculture and their proper utilization.

SUGGESTED READING

- Ananthkrishnan TN. (Ed.). 1992. Emerging Trends in Biological Control of *Phytophagus Insects*. Oxford & IBH
- Baishya A, Borah M, Das AK, Hazarika J, Gogoi B and Borah AS 2017. *Waste recycling through Integrated Farming systems. An Assam Agriculture Experience*. Omni Scriptum GmbH & Co. KG, Germany.
- Balasubramanian P and Palaniappan SP. 2006. *Principles and Practices of Agronomy*. Agrobios.
- Edens T. 1984. *Sustainable Agriculture and Integrated Farming System*. Michigan State Univ. press.
- Jayanthi C. 2006. *Integrated Farming systems- A way to sustainable Agriculture*. Tamil Nadu Agricultural University, Coimbatore.

- Joshi M and Parbhakarasetty TK. 2005. *Sustainability through Organic Farming*. Kalyani Publ.
- Kolhapure A and Madhukar D. *A Text Book of Farming System And Sustainable Agriculture*.
- Palaniappan SP and Anandurai K. 1999. *Organic Farming - Theory and Practice*. Scientific Publ.
- Panda SC. 2004. *Cropping systems and Farming Systems*. AgrobiosPubl..
- Lampin N. 1990. *Organic Farming*. Farming Press Books.
- Ravisankar D and Jayanthi C. 2015. *Farming systems: concepts and approaches*. Agrobios publ.

AIM OF THE COURSE

To teach about different soil moisture conservation technologies for enhancing the agricultural productivity through holistic

THEORY

Unit I

Soil erosion: definition, nature and extent of erosion; types of erosion, factors affecting erosion. Water erosion – Forms and mechanism; extent of soil loss. Wind erosion – Forms and mechanism; extent of soil loss

Unit II

Soil conservation: definition, methods of soil conservation; agronomic measures - contour cultivation, strip cropping, cover crops; mulching, tillage, cropping system vegetative barriers; improved dry farming practices; mechanical measures - bunding, gully control, bench terracing; role of grasses and pastures in soil conservation; wind breaks and shelter belts.

Unit III

Watershed management: definition, objectives, concepts, approaches, components, steps in implementation of watershed; development of cropping systems for watershed areas. Watershed development programmes in India.

Unit IV

Agro ecological classification; Land use capability classification, alternate land use systems; agro-forestry; ley farming; *jhum* management - basic concepts, socio-ethnic aspects, its layout.

Unit V

Drainage – methods of drainage, Drainage considerations and agronomic management; rehabilitation of abandoned *jhum* lands and measures to prevent soil erosion.

PRACTICAL

- Study of different types of erosion
- Determination of dispersion ratio
- Estimation of soil loss by Universal Soil Loss Equation
- Estimation of soil loss by wind erosion
- Measurement of runoff and soil loss
- Field studies of different soil conservation measures
- Laying out run-off plot and deciding treatments
- Identification of different grasses and trees for soil conservation
- Visit to watershed areas
- Visit to a soil conservation research centre, demonstration and training centre

LECTURE SCHEDULE

1. Soil erosion: definition, nature and extent of erosion
2. Types of erosion, factors affecting erosion and losses due to erosion
3. Water erosion – Forms and mechanism; extent of soil loss

4. Wind erosion – Forms and mechanism; extent of soil loss
5. Soil conservation: definition, methods of soil conservation
6. Agronomic measures - contour cultivation, strip cropping, cover crops
7. Agronomic measures - Mulching, tillage, cropping system, vegetative barriers
8. Improved dry farming practices
9. Mechanical measures - bunding, gully control, bench terracing
10. Role of grasses and pastures in soil conservation
11. Control measures for wind erosion
12. Wind breaks and shelter belts
13. Watershed management: definition, objectives, concepts
14. Approaches of watershed management
15. Components of watershed management
16. Steps in implementation of watershed
17. Development of cropping systems for watershed areas
18. Watershed development programmes in India
19. Agro ecological classification
20. Land use capability classification
21. Alternate land use systems
22. Agro-forestry – Types
23. Role of Agroforestry in watershed management
24. Ley farming
25. Jhum management - basic concepts, socio-ethnic aspects, its layout.
26. Rehabilitation of abandoned jhum lands
27. Measures to prevent soil erosion
28. Drainage – Definition, its necessity and effect on crops and soil
29. Methods of drainage – Surface methods
30. Methods of drainage – sub surface methods
31. Drainage considerations and agronomic management

PRACTICAL SCHEDULE

1. Study of different types of erosion
2. Determination of dispersion ratio
3. Computation of rainfall erosivity index
4. Computation of soil erodibility index
5. Estimation of land slope
6. Estimation of soil loss by Universal Soil Loss Equation
7. Laying out run-off plot and deciding treatments
8. Measurement of runoff and soil loss
9. Estimation of soil loss by wind erosion
10. Field studies of different soil conservation measures
11. Identification of different grasses and trees for soil conservation
12. Prioritization of watershed using remote sensing and GIS

13. Delineation and codification of watersheds in India
14. Studies on methods of farm drainage
15. Visit to watershed areas
16. Visit to a soil conservation research centre, demonstration and training centre

17. PRACTICAL EXAMINATION

LEARNING OUTCOME

Experience on the knowledge of soil moisture conservation technologies for enhancing the agricultural productivity through holistic approach watershed management.

SUGGESTED READING

- Arakeri HR and Roy D. 1984. *Principles of Soil Conservation and Water Management*. Oxford & IBH.
- Dhruvanarayana VV. 1993. *Soil and Water Conservation Research in India*. ICAR.
- FAO. 2004. *Soil and Water Conservation in Semi-Arid Areas*. *Soils Bull.*, Paper 57.
- Frederick RT, Hobbs J, Arthur D and Roy L. 1999. *Soil and Water Conservation: Productivity and Environment Protection*. 3rd Ed. Prentice Hall.
- Gurmel Singh, Venkataraman CG, Sastry B and Joshi P. 1990. *Manual of Soil and Water Conservation Practices*. Oxford & IBH.
- Murthy VVN. 1995. *Land and Water Management Engineering*. Kalyani.
- Tripathi RP and Singh HP. 1993. *Soil Erosion and Conservation*. Wiley Eastern.
- Yellamanda Reddy T and Sankara Reddy GH. 1992. *Principles of Agronomy*. Kalyani Publ.

Agron 607 Stress Crop Production 2+1

AIM OF THE COURSE

To study various types of stresses in crop production and strategies to overcome them.

THEORY

Unit I

Stress and strain terminology; nature and stress injury; susceptibility and resistance to stress; causes of stress.

Unit II

Low temperature stress: freezing injury and resistance in plants, measurement of freezing tolerance, chilling injury and resistance in plants, practical ways to overcome the effect of low temperature stress through, soil and crop manipulations. High temperature or heat stress: meaning of heat stress, heat injury and resistance in plants, practical ways to overcome the effect of heat stress through soil and crop manipulations.

Unit III

Water deficit stress: meaning of plant water deficient stress and its effect on growth and development, water deficit injury and resistance, practical ways to overcome effect of water deficit stress through soil and crop, manipulations. Excess water or flooding stress: meaning of excess water stress, its kinds and effects on crop plants, excess water stress injury and resistance, practical ways to overcome excess water stress through soil and crop manipulations.

Unit IV

Salt stress: meaning of salt stress and its effect on crop growth, salt stress injury and resistance in plants, practical ways to overcome the effect of salt stress through soil and crop manipulations.

Unit V

Mechanical impedance of soil and its impact on plant growth; measures to overcome soil mechanical impedance. Environmental pollution: air, soil and water pollution, and their effect on crop growth and quality of produce; ways and means to prevent environmental pollution.

PRACTICAL

- Determination of electrical conductivity of plant cell sap
- Determination of osmotic potential and tissue water potential
- Measurement of transpiration rate
- Measurement of stomatal frequency
- Measurement of Relative Water Content of leaf
- Measurement of electrolytic leakage
- Growing of plants in sand culture under salt stress for biochemical and physiological studies
- Studies on effect of osmotic and ionic stress on seed germination and seedling growth
- Measurement of low temperature injury under field conditions
- Studies on plant responses to excess water.

LECTURE SCHEDULE

1. Stress and strain – terminology; definition

2. Nature and stress injury concepts- theory
3. Causes of stress
4. Susceptibility to stress
5. Resistance to stress
6. Low temperature stress: freezing injury - related injuries
7. Resistance to low temperature in plants, measurement of freezing tolerance.
8. Chilling injury and resistance in plants,
9. Practical ways to overcome the effect of low temperature stress through, soil and crop
 - a. manipulations.
10. High temperature or heat stress: meaning & definition of heat stress,
11. Heat injury and resistance in plants,
12. Practical ways to overcome the effect of heat stress through soil and crop manipulations.
13. Water deficit stress: meaning of plant water deficient stress
14. Effect of water stress on growth and development,
15. Water deficit injury and resistance,
16. Practical ways to overcome effect of water deficit stress through soil and crop manipulations.
17. Excess water or flooding stress: meaning of excess water stress
18. Kinds of excess water stress and its effects on crop plants.
19. Excess water stress injury and resistance.
20. Practical ways to overcome excess water stress through soil and crop manipulations.
21. Salt stress – meaning of salt stress
22. Salt stress and its effect on crop growth,
23. Salt stress injury and resistance in plants,
24. Practical ways to overcome the effect of salt stress through soil and crop manipulations.
25. Mechanical impedance of soil and its impact on plant growth;
26. Measures to overcome soil mechanical impedance.
27. Environmental pollution – Definition and types of pollution
28. Air pollution and their effects on crop growth and quality of produce
29. Soil pollution and their effects on crop growth and quality of produce
30. Water pollution and their effects on crop growth and quality of produce
31. Ways and means to prevent environmental pollution.

PRACTICAL SCHEDULE

1. Determination of electrical conductivity of plant cell sap
2. Determination of osmotic potential and tissue water potential
3. Measurement of transpiration rate
4. Measurement of stomatal frequency
5. Measurement of Relative Water Content of leaf
6. Measurement of electrolytic leakage
7. Growing of plants in sand culture under salt stress for biochemical studies - I

8. Growing of plants in sand culture under salt stress for biochemical studies - II
9. Growing of plants in sand culture under salt stress for physiological studies - I
10. Growing of plants in sand culture under salt stress for physiological studies - II
11. Studies on effect of osmotic and ionic stress on seed germination and seedling growth
12. Measurement of low temperature injury under field conditions
13. Studies on plant responses to excess water.
14. Visit to industry/factory to assess the pollution
15. Visit to Coastal salinity/Dry farming Research station
16. Visit to Physiology /Tissue culture lab
- 17. PRACTICAL EXAMINATION**

LEARNING OUTCOME

Experience on the knowledge of various types of stresses in crop production and strategies to overcome these.

SUGGESTED READING

- Baker FWG.1989. *Drought Resistance in Cereals*. Oxon, UK.
- Gupta US. (Ed.). 1988. *Physiological Aspects of Dryland Farming*. Oxford & IBH.
- Kramer PJ.1983. *Water Relations of Plants*. Academic Press.
- Levitt J. 1980. *Response of Plants to Environmental Stresses*. Vols. I, II. Academic Press.
- Mavi HS.1978. *Introduction to Agro-meteorology*. Oxford & IBH.
- Michael AM and Ojha TP.1981. *Principles of Agricultural Engineering*. Vol II. Jain Bros.
- Nilsen ET and Orcut DM. 1996. *Physiology of Plants under Stress – Abiotic Factors*. John Wiley & Sons.
- Singh K. 2000. *Plant Productivity under Environmental Stress*. Agribios Publ.
- Singh KN and Singh RP. 1990. *Agronomic Research Towards Sustainable Agriculture*. Indian Society of Agronomy, New Delhi.
- Somani LL and Totawat KL. 1992. *Management of Salt-affected Soils and Waters*. Agrotech Publ.
- Virmani SM, Katyal JC, Eswaran H and Abrol IP. 1994. *Stressed Ecosystem and Sustainable Agriculture*. Oxford & IBH
- Narayanan.AL.2021.Introductory Agrometeorology. Brillion Publishing, New Delhi
- Narayanan.AL. 2015. *Principles of Applied Agricultural Meteorology*, Sri Velan Pathipagam, Chidambaram.

Journals

- Indian Journal of Agronomy
- Agronomy Journal
- Journal of Agrometeorology
- Mausam

AIM OF THE COURSE

To develop skill for research management and quality publication.

THEORY

Unit I

Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition, moral philosophy, nature of moral judgements and reactions. Scientific conduct: Ethics with respect to science and research, intellectual honesty and research integrity, Scientific misconducts- falsifications, fabrications and plagiarism (FFP): Redundant publications: duplicate and overlapping publications, salami slicing; selective reporting and misrepresentation of data

Unit II

Publication ethics: Definition, introduction and importance. Best practices/standard setting initiatives and guidelines: COPE, WAME, etc., conflicts of interest. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, type, violation of publication ethics, authorship and contributorship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals

Unit III

Open access publishing: open access publication and initiatives: SHERPA, RoMEO online resource to check publisher copy right and self archiving policies; software tool to identify predatory publications developed by SPPU, Journal finder/journal suggestions tools viz., JANE, Elsevier Journal Finder, Springer Journal Suggester etc.

Unit IV

Publication misconduct: Group discussions- subject specific ethical issues, FFP, authorship, conflicts of interest, complaints and appeals examples and fraud from India and abroad. Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools

Unit V

Database and Research metrics: Indexing data base, citation database, web of science, scopus, etc. Impact factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score; Metrics: h-index, g-index, i10-index altmetrics.

LECTURE SCHEDULE

1. Introduction to philosophy: definition, nature and scope,
2. Introduction to philosophy: concept, branches
3. Ethics: definition, moral philosophy, nature of moral judgements and reactions.
4. Scientific conduct: Ethics with respect to science and research, intellectual honesty and research integrity
5. Scientific misconducts- falsifications, fabrications and plagiarism (FFP):
6. Redundant publications: duplicate and overlapping publications,
7. Salami slicing; selective reporting and misrepresentation of data
8. Publication ethics: Definition, introduction and importance

9. Best practices/standard setting initiatives and guidelines: COPE, WAME, etc., conflicts of interest
10. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa
11. Publication misconduct: types, violation of publication ethics, authorship and contributorship
12. Identification of publication misconduct, complaints and appeals
13. Predatory publishers and journals
14. Open access publishing: open access publication and initiatives
15. SHERPA, RoMEO online resource to check publisher copy right
16. Self archiving policies
17. Software tool to identify predatory publications developed by SPPU
18. Journal finder/journal suggestions tools viz., JANE, Elsevier Journal Finder, Springer Journal Suggester etc.
19. Publication misconduct: Group discussions
20. subject specific ethical issues
21. FFP
22. authorship, conflicts of interest, complaints and appeals examples and fraud from India and abroad.
23. Software tools: Use of plagiarism software like Turnitin, Urkund
24. Software tools: other open source software tools
25. Database and Research metrics:
26. Indexing data base
27. Citation database
28. Web of science, scopus, etc
29. Impact factor of journal as per journal citation report
30. SNIP, SJR, IPP, Cite Score
31. Metrics: h-index, g-index, i10-index altmetrics

LEARNING OUTCOME

Developed skill for research management, quality publication.

SUGGESTED READING

- Kothari, C.R., 2004. *Research Methodology: Methods and Techniques*, New Age International Publ.
- Hugo FjelstedAlroe and Erik Steen Kristensen, 2002. Towards a systemic research methodology in agriculture: Rethinking the role of values in science. *Agriculture and Human values*, **19**:3-23
- Rana, S.S. and Suresh Kumar, 2014 *Research Techniques in Agronomy*, Department of Agronomy, College of Agriculture, CSK Himachal Pradesh KrishiVishvavidyalaya, Palampur, 64. P.

MINOR COURSE – TO BE OFFERED BY DEPT. OF AGRONOMY

AGM 601 Climate Change and Sustainable Development 2+1

AIM OF THE COURSE

To impart the theoretical and practical knowledge of climate change and the cause, effect, mitigation of climate change.

THEORY

Unit I

Climate change and global warming: definitions of terms; causes of climate change and global warming; greenhouse gases, ozone depletion; past records, present trends, extreme weather events and future projections; Case studies on various climatic projections and consequences thereof in relation to agriculture.

Unit II

Impacts of climate change on various systems: impacts resulting from projected changes on agriculture and food security; hydrology and water resources; terrestrial and freshwater ecosystems; coastal zones and marine ecosystems; human health; human settlements, energy, and industry; insurance and other financial services; climate change and crop diversification, loss of biodiversity, microbes and pest dynamics; climate change and storage, climate change and weed management. Advance methodology of assessing the impact of climate change on crops.

Unit III

Sensitivity, adaptation and vulnerability: system's sensitivity, adaptive capacity and vulnerability to climate change and extreme weather events; regional scenarios of climate change and variability.

Unit IV

Mitigation strategies for sustainable development: international policies, protocols, treaties for reduction in greenhouse gases and carbon emissions; carbon sequestration; carbon credit; Clean Development Mechanism (CDM) and land use, Crop management options for low emission, land use change and forestry mechanism, alternate energy sources, etc.

Unit V

Agricultural food security: reduction in carbon and GHG emission; fuel conservation and reduction in energy use, conservation tillage, biofuels for fossil fuels, reduction in machinery use etc; increasing carbon sinks; resource conservation technologies, mixed rotations of cover and green manure crops, minimization of summer fallow and no ground cover periods, etc.

PRACTICAL

- Case studies on various climatic projections and consequences thereof in relation to agriculture
- Advance methodology of assessing the impact of climate change on crops

LECTURE SCHEDULE

1. Climate change and global warming: definitions of terms
2. Causes of climate change and global warming
3. Greenhouse gases

4. Ozone depletion – past records and present trends,
5. Extreme weather events and future projections
6. Case studies on various climatic projections and consequences thereof in relation to agriculture.
7. Impacts resulting from projected changes on agriculture and food security
8. Impacts resulting from projected changes on hydrology and water resources
9. Impacts resulting from projected changes on terrestrial and freshwater ecosystems
10. Impacts resulting from projected changes on coastal zones and marine ecosystems
11. Impacts resulting from projected changes on human health and human settlements
12. Impacts resulting from projected changes on energy and industry
13. Impacts resulting from projected changes on insurance and other financial services;
14. Climate change and crop diversification, loss of biodiversity, microbes and pest dynamics;
15. Climate change and storage; climate change and weed management.
16. Advance methodology of assessing the impact of climate change on crops
17. Climate change and extreme weather events – system's sensitivity,
18. Climate change and extreme weather events – system's adaptive capacity
19. Climate change and extreme weather events – system's vulnerability;
20. Regional scenarios of climate change and variability.
21. Mitigation strategies for sustainable development:
22. International policies, protocols, treaties for reduction in greenhouse gases and carbon emissions
23. Carbon sequestration; carbon credit
24. Clean Development Mechanism (CDM) and land use
25. Crop management options for low emission – land use change and forestry mechanism, alternate energy sources, etc.
26. Agricultural food security – reduction in carbon and GHG emission
27. Agricultural food security – fuel conservation and reduction in energy use
28. Agricultural food security – conservation tillage, biofuels for fossil fuels, reduction in machinery use, etc.
29. Increasing carbon sinks – resource conservation technologies
30. Increasing carbon sinks – mixed rotations of cover and green manure crops
31. Increasing carbon sinks – minimization of summer fallow and no ground cover periods, etc.

PRACTICAL SCHEDULE

1. Institutions involved in climate change studies
2. Collection and analysis of observed trend and projection for different climate scenarios – World
3. Collection and analysis of observed trend and projection for different climate scenarios –India
4. Techniques for comparing station data with gridded historical runs
5. Identification of climatic hotspots – temperature (cold and heat waves)
6. Identification of climatic hotspots – rainfall (drought and flood)

7. Case studies on Climatic projections and consequences in relation to agriculture
8. Advanced methodology of assessing the impact of climate change on crops
9. Climate control experiments for identifying vulnerable crop stages.
10. Effect of elevated temperature on Crop production
11. Effect of elevated carbon di-oxide on Crop production
12. Incubation studies for GHGs assessment
13. Estimation of GHGs from field experiment
14. Estimation of GHGs from simulation model like DNDC
15. Remote sensing techniques for Climate change studies
16. Exposure visit to RMC, Chennai; IMD/DWRS, Karaikal; Climate Research centre, Anna University, Chennai.
- 17. PRACTICAL EXAMINATION**

LEARNING OUTCOME

Will be aware on causes, impacts, mitigation and adaptations to climate change in the field of agriculture

SUGGESTED READING

Anonymous. Clean Development Mechanism: Building International Public-Private Partnership under Kyoto Protocol. UNEP, UNDP Publ.

Anonymous. IPCC Assessment Reports on Climate Change (2001, 2007). WMO, UNEP Publ.

Bishnoi OP. 2007. Principles of Agricultural Meteorology. Oxford Book Co.

Jepma CJ and Munasinghe M. 1998. Climate Change Policy: Facts, Issues and Analysis. Cambridge Univ. Press.

Mintzer IM. 1992. Confronting Climate Change: Risks, Implications and Responses. Cambridge Univ. Press.

Pretty J and Ball A. 2001. Agricultural Influence on Carbon Emission and Sequestration: A Review of Evidence and the Emerging Trading Options. Univ. of Essex.

Pretty JN. 1995. Regenerating Agriculture: Policies and Practices for Sustainable and Self Reliance. Earthscan.

Salinger J, Sivkumar MVK and Motha RP. 2005. Increasing Climate Variability of Agriculture and Forestry. Springer.

Sinha SK. 1998. Dictionary of Global Climate Change. Commonwealth

Journals

- Mitigation and Adaptation strategies for Global Change
- Climate Change
- Climate Risk Management
- Journal of Agrometeorology

Websites

- <https://www.ipcc.ch/>
- www.environment.gov.au/climate-change/climate-science-data/climate-science/ipc

