PONDICHERRY UNIVERSITY
PUDUCHERRY – 605 014

6th PG BOARD OF STUDIES IN AGRICULTURAL SCIENCES

M.Sc. (Agri.) Agricultural Economics
REGULATIONS AND CURRICULUM
(Effective from 2022-23 batch onwards)

PANDITJAWAHARLAL NEHRU COLLEGE OF AGRICUL
AND RESEARCH INSTITUTE (PAJANCOA&RI)
(*A Government of Puducherry Institution*) KARAIKAL – 60

PONDICHERRY UNIVERSITY
PUDUCHERRY – 605 014

REGULATIONS AND
CURRICULAM
for
M.Sc. (Agriculture/Horticulture)

(Effective from 2022-23)

REGULATIONS

PONDICHERRY UNIVERSITY

POSTGRADUATE DEGREE PROGRAMME

(Agriculture/Horticulture)

SEMESTER SYSTEM – REGULATIONS

1. SYSTEM OF EDUCATION

1.1 The rules and regulations provided herein shall govern Masters degree programmes **[M.Sc. (Agri.) or M.Sc. (Hort.)]** offered by Pandit Jawaharlal Nehru College of Agriculture and Research Institute (PAJANCOA&RI), Karaikal under Pondicherry University.

1.2 The duration of Master's programme is two academic years (4 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.

2. COMMENCEMENT

These regulations shall come into force from the academic year **2022-23**

3. 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 the mid-semester and 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 fulfillment of the postgraduate degree programme.

3.5 **'Curricula and syllabi'** refer to list of approved courses for postgraduate degree programmes wherein each course is identified with a three-letter 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 '**Common course'** means a course which is compulsorily registered by the postgraduate student for the completion of postgraduate degree programme. The marks obtained by the student in a common course will also be taken into account for calculating OGPA.

Some of the common courses are in the form of e-courses/MOOCs. The students may be allowed to register these courses/similar courses on these aspects, if available online on SWAYAM or any other platform. If the student has already completed any of the common courses during UG, he/she may be permitted to register for other related courses with the prior approval of the Head of the Department/Board of Studies.

3.11 **'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 0+1 course (1 credit) means 2.5 hours practical per week
A 1+0 course (1 credit) means 1 hour theory per week

3.12 **'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.

3.13 **'Grade Point'** means the total marks in percentage obtained in a course divided by 10 and rounded to two decimals.

3.14 **'Credit Point' means** the grade point multiplied by the credit load of the course.

3.15 **'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.

3.16 **'Arrear examination'** is an examination written for the failed course by a student without undergoing regular classes in that course.

3.17 **'Transcript Card'** is the consolidated report of academic performance of a student issued by the University on completion of the curriculum fulfillment. The format of Transcript Card is furnished in *Annexure-1.*

4. POSTGRADUATE PROGRAMMES

The list of various postgraduate programmes offered in various dicipline of the College is as follows:

M.Sc. (Agri.) Agricultural Economics
M.Sc. (Agri.) Entomology
M.Sc. (Agri.) Agronomy
M.Sc. (Agri.) Genetics and Plant Breeding
M.Sc. (Agri.) Soil Science
M.Sc. (Hort.) Vegetable Science

5. ADMISSION

5.1 Eligibility for admission:

i. Candidates seeking admission to master degree programme should have a four year bachelor's degree from State Agricultural Universities (SAU) or from other universities recognized by UGC/ICAR.

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 various Master's degree programmes in this Institute. **Whereas, for SC/ST/PWD candidates the said requirement is an OGPA of 2.50 out of 4.00 or 6.00 out of 10.00 or 60 per cent aggregate.** However, this will not apply to State Department nominees. Just a pass in the concerned degree is sufficient for them.

iii. Prescribed minimum qualification from a recognized University for admission to Master's degree programme:

Sl.No.	Discipline	Requirement for Master's Degree
1.	Agricultural Economics	B.Sc.(Ag./Hort./Agrl. Marketing and Cooperation/Forestry) or B.Sc.(Hons) Agriculture/Horticulture/ Agrl. Marketing and Cooperation/Forestry
2.	Agronomy	B.Sc. (Ag.) or B.Sc.(Hons) Agriculture
3.	Entomology	B.Sc.(Ag./Hort./Forestry/Sericulture) or B.Sc. (Hons) Agriculture/Horticulture/ Forestry / Sericulture
4.	Genetics and Plant Breeding	B.Sc.(Ag./Hort./Forestry) or B.Sc. (Hons) Agriculture/Horticulture/ Forestry or B.Tech. (Biotechnology)
5.	Soil Science	B.Sc.(Ag./Hort) or B.Sc. (Hons) Agriculture/Horticulture
6.	Horticulture (Vegetable Science)	

5.2 Method of selection:

i. Candidates shall be required to be present on the specified date for a written test at their own expenses. If selected, they should come prepared to pay fees and get admitted immediately.

ii. The students will be ranked based on total marks scored by them in the categories mentioned below

Category	Weightage of marks (%)
OGPA in Bachelor's degree programme	50
Entrance	50
Total	**100**

iii. Written test with objective type (multiple choices) questions in the specific subject will be of one and half hour duration. A minimum of 50% (25 marks) is must for considering the candidate for admission. However, in case of SC/ST candidates, a minimum of 40% (20 marks) is must for considering the candidate for admission into that category.

Note: If a SC/ST candidate seeks admission under other categories a minimum of 50% **(25 marks)** in entrance test is must

iv. Candidates applied for two subjects should write the examination for both subjects continuously for two hours.

v. Seats are reserved for candidates belonging to scheduled Castes/Scheduled Tribes/Other Backward Classes as per the norms of Government of Puducherry.

vi. Two seats of the total sanctioned strength, irrespective of the discipline, are reserved for the in-service candidates of Department of Agriculture and Farmers Welfare, Government of Puducherry.

6. LANGUAGE REQUIREMENT

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

7. RESIDENTIAL REQUIREMENT

7.1 The minimum residential requirement for Masters' degree shall be two academic years (four semesters) and the course should be completed within the maximum period of **five academic years (ten semesters)** from the date of admission.

7.2 In case a student fails to complete the degree programme within the maximum duration of residential requirement (five years), his/her admission shall stand cancelled.

8. 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.

9. DISCONTINUANCE AND READMISSION

As per University Regulations.

10. ADVISORY COMMITTEE

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

10.2 **Chairman/Guide**:

i. The approved guides by the Dean of the college only can be the guide for the students.

ii. Every student shall have a Chairman of the Advisory Committee who will be from his/her major field of studies.

iii. The Head of the departments will allot the masters students among the recognized guides.

iv. A teacher should have a minimum of two years of service before retirement for

allotment of Master's students.

v. At any given time, a PG teacher shall not be a chairman of Advisory Committee (including Master's and Ph.D. programmes) for more than five students.

10.3 **Chairman/ Co-guide/ Member from other collaborating University/ Institute/ Organization:**

i. The University / Institute may enter into Memorandum of Understanding (MOU) with other Universities / Institutions / Organizations for conducting research.

ii. 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 a Chairman and two members. One member shall be from the concerned department and another member shall be from other department or discipline related to field of thesis research. **Staff having UG teaching experience of four years or more may be included as the members of the Student Advisory Committee.**

ii. In thesis topics involving more of inter-disciplinary approach, the number of advisory committee members from other disciplines may be increased by one with prior approval of the Dean.

10.5 **Formation of advisory committee:**

i. For Master's Programme the advisory Committee Chairman and members will be in the cadre of Professors, Associate Professors and Assistant Professors having three years of experience.

ii. Only recognized teachers are eligible for teaching PG Courses and guiding thesis research.

iii. A proposal for the formation of the advisory committee (Form 1) of the student shall be forwarded by the Heads 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.

iii. If a guide goes abroad or within India for more than 6 months, to attend any training or on leave for more than six months, the Chairman of the Advisory Committee has to be changed immediately. The same conditions will apply to members also.

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

i. Conducting qualifying and thesis 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 postgraduate 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 Chairman of advisory committee, respective Heads of Departments should act as Co-Chairman with prior permission of Controller of Examinations.

10.8 **Duties and responsibilities of the advisory committee**:

i. Drawing the student's academic plan for postgraduate 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 postgraduate course work (Form 2) drawn up by advisory committee shall be sent for the approval of the Dean before the commencement of the mid semester examination 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 postgraduate student should complete a minimum of 70 credits as detailed below for award of the Master's degree.

Details	Minimum Credits
Major courses	20
Minor courses	08
Supporting courses	06
Common courses*	05
Seminar	01
Research	30
TOTAL	**70**

* List of Common courses

Course code	Course Title	Credit hour
PGS 501	Library and information services	0+1
PGS 502	Technical writing and communication skills	0+1
PGS 503	Intellectual property and its management in agriculture	1+0
PGS 504	Basic Concepts in Laboratory techniques	0+1
PGS 505	Agricultural research, research ethics and rural development programmes	1+0

13.2 **Maximum credit load:** A postgraduate student can register a maximum of 22 credits per semester including common courses, seminar and research. However, research credits registered per semester should not exceed 15.

13.3 **Comprehensive qualifying examination and thesis:** A postgraduate 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 Master's programme.

ii. The extra credits registered will be accounted for calculation of OGPA.

14. ATTENDANCE REQUIREMENTS

14.1 i. A minimum of 80 per cent attendance separately in theory and practical of the concerned course is a must, failing which the student shall not be permitted to appear for both final theory and final practical examinations in the course concerned and grade 'E' (incomplete) will be awarded.

ii. If a student falls short of the required attendance to an extent of 10 per cent or less, the shortage may be condoned by the Dean on the recommendation of the Advisory Committee and the concerned Head of the Department, on the condition that such shortage in attendance was due to unavoidable circumstances (on medical grounds) and such absence was continuous.

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.
ii. The mid-semester examinations are normally conducted during class hours.
iii. The attendance for mid semester examination shall be counted as a theory class for calculating attendance.

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.

14.4 For calculating 80 per cent attendance the number of instructional days may be calculated only from the date of joining of the student for first year first semester only.

14.5 The students failing to attend the classes / examinations on non-official ground will be treated as absent.

14.6 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. The student should secure a minimum of 50 per cent marks in the final theory examination conducted by the University for securing a pass in a course.

iv. In each course, examinations will be conducted for 100 marks as detailed below.

Examination	Courses with theory and practical	Courses with only theory	Courses with only practical
Mid Semester (Internal)	20	30	30
Term paper (Internal)	10	10	10
Final Theory (External)	50	60	--
Final Practical	20	--	60
TOTAL	100	100	100

15.2 Mid Semester Examination (Internal Assessment):

i. Writing the mid-semester examination is a pre-requisite for writing the final theory and final practical examinations.

ii. Student failing to write mid-semester examination(s), shall not be permitted to attend the classes further in the course(s) concerned and the student will be awarded 'E' grade.

iii. The mid-semester examinations shall be conducted for a duration of one hour and for 20 or 30 marks.

iv. The Head of the Department with the help of the concerned PG coordinator shall prepare and announce the schedule of mid-semester examinations.

v. The mid-semester examinations shall be conducted from the 56th working day of the semester.

vi. The mid-semester examination shall be conducted and evaluated internally by the concerned course teacher(s).

vii. The mid-semester examination mark list should be sent by the course teacher to the academic section of the college 10 days prior to the commencement of final practical examinations along with term paper mark.

15.3 **Missing Examination:**

i. Missing examination shall be permitted only for mid-semester examination in deserving cases on the recommendation of the course teacher/Chairman and Head of the department and on prior approval by the Dean.

ii. The missing tests are not allowed for final theory and final practical examinations.

iii. The student shall write, in advance, to the Dean through the Chairman, PG coordinator and Head of the Department stating the reason for missing the mid-semester examination(s). Based on the recommendation of the Chairman, PG coordinator and the Head of the Department, the Dean shall permit the student for missing the mid-semester examination(s).

iv. A student missing mid-semester examination(s) with the prior approval of the Dean shall be permitted to take up missing examination of the particular course, subject to payment of the prescribed missing examination fee for each missing mid-semester examination.

v. Students deputed for official programmes of the College/University are exempted from paying the fee for missing test.

vi. Such missing examinations should be completed outside the regular class hours within 15 working days after the respective examinations.

vii. Attendance will not be given for taking up missing examinations.

15.4 **Final Theory Examination:**

i. An examination schedule prepared by the Controller of Examination 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 two and half hours for courses with theory and practical (50 marks) or three hours for courses with only theory (60 marks).

iii. The final theory examinations shall be conducted by the University. Evaluated by two examiner, one by internal and one by external. However, in case of Non-credit e-courses, the final theory examination shall be conducted internally by the course teacher.

iv. In the evaluation process, if deviation is more than 20 per cent between the first and second evaluator, the paper shall be referred to third examiner who shall also be an external examiner.

15.5 **Final Practical Examination:**

i. The Dean shall announce the commencement of final practical examinations. The Heads of the Departments shall prepare the schedule for practical examination.

ii. The final practical examinations shall be conducted after the completion of minimum of 96 working days.

iii. Submission of bonafide practical records certified by the Course Teacher is a pre-requisite for appearing in a practical examination failing which 'F' grade will be awarded.

iv. For conducting final practical examination in each course, an *external examiner* (faculty of the Department other than the course teacher) shall be nominated by the Dean and the course teacher will be the *internal examiner*.

v. In the event of external/internal examiner nominated for practical examination could not conduct the examination, then the Dean shall nominate an alternative examiner to conduct practical examination.

vi. The duration of final practical examination shall be two and half hours.

vii. The practical examinations shall be jointly conducted by the internal and external examiners with mutual co-operation.

viii. They shall evaluate the candidates appearing at the examination according to their performance and the Forms so prepared shall be signed by both the examiners.

ix. The practical examination marks should be communicated to the University/ uploaded in the university website within 10 days after conduct of examination duly signed by all the examiners and hard copy forwarded to the university thereon.

15.6 **Arrear examination:**

i. Arrear examination is permitted for the final theory and final practical examinations only.

ii. The students are permitted to write the arrear examinations as and when conducted by the University.

iii. A student is permitted to write the final theory and practical examinations only two times during 5 years duration excluding the regular final examination (Mid-semester marks and Term paper marks shall be retained as such).

iv. 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 the juniors as and when the course(s) are offered with the permission of the University and on payment of the prescribed fees.

15.7 **Evaluation of course**:

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. In case of courses with theory and practical, minimum of 50 per cent mark separately in theory and practical with an aggregate of 70 per cent is essential.

v. 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 per cent Attendance/other reasons)
F - FAILED

15.8 **Question paper pattern for theory examinations** :

15.8.1 The question paper pattern for mid semester (internal) examinations are indicated below:

Part	**Type of question**	**Number of questions**	**Number of questions to be answered**	**Mark per question**	**Total marks**
Courses with theory and practical (1+1 or 2+1 courses) (20 Marks & 1 hour duration)					
A	Objective*	20	20	0.5	10
B	Definitions/Concepts	12	10	1.0	10
	TOTAL				**20**
Courses with only theory (1+0 or 2+0 courses) (30 Marks & 1½ hour duration)					
A	Objective*	30	30	0.5	15
B	Definitions/Concepts	18	15	1.0	15
	TOTAL				**30**
Courses with only practical (0+1 courses) (30 Marks & 1½ hour duration)					
A	Objective*	30	30	0.5	15
B	Definitions/Concepts	18	15	1.0	15
	TOTAL				**30**

* Questions should be Fill-up the blanks, Choose the best among four options, True / False or Match the following type with equal number of question in each type and one or two more questions in any one type if examination is conducted for 30 marks

15.8.2 The question paper pattern final theory (external) examinations are indicated below:

Part	Type of question	Number of questions	Number of questions to be answered	Mark per question	Total marks
Courses with theory and practical (1+1 or 2+1 courses) (50 Marks & 2.5 hours duration)					
A	Objective (MCQ's only)	20	20	0.5	10
B	Definitions/Concepts	12	10	1.0	10
C	Paragraph answers	7	5	2.0	10
D	Essay type answers (**EITHER OR** type) - One main question from each unit shall have one choice	5	5	4.0	20
	TOTAL				**50**
Courses with only theory (1+0 or 2+0 courses) Final Theory Examination (60 Marks & 3.0 hours duration)					
A	Objective (MCQ's only)	20	20	0.5	10
B	Definitions/Concepts	18	15	1.0	15
C	Paragraph answers	7	5	2.0	10
D	Essay type answers (**EITHER OR** type) - One main question from each unit shall have one choice.	5	5	5.0	25
	TOTAL				**60**

15.9 **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	Courses with only Practical
Practical Field work / Lab Work / Written exam	20 (2.5 hrs)	60 (3 hrs)
Total	**20**	**60**

For conducting practical examinations, the type and number of questions can be decided by the concerned internal and external examiners. Choice may be given to the extent of 20 per cent under subjective type questions.

15.10 **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.

15.11 **Return of evaluated answer papers**:

i. The evaluated answer papers of mid-semester shall be shown to the students after the examination. Discrepancies if any, in awarding marks, the student can approach the teacher concerned immediately for rectification.

ii. The answer paper should be retained by the course teacher for 6 months or declaration of results by Pondicherry University, whichever is earlier and then disposed off.

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 PG Department shall send a panel of examiners for conducting the qualifying examination (Form 4). However, the University can draw its own panel of examiners.

ii. The panel of examiners for qualifying examinations shall be given 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 postgraduate 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 for 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 **Communication of results of qualifying examination**:

i. The Chairman of the advisory committee shall act as Chairman for the examination committee.

ii. The Chairman 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).

16.6 **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 Chairman 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 Master's 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.

17. CREDIT SEMINAR

17.1 Seminar is compulsory for all the postgraduate students and each postgraduate student should register and present one seminar with 0+1 credit.

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

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 title.

ii. The seminar topics are to be assigned to the students by the Chairman 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 per cent attendance in the semester in the presence of the Advisory committee, staff and postgraduate students of the concerned department.

ii. The circular on the presentation of the seminars by the postgraduate 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 Chairman 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	Marks
Coverage of literature	40
Presentation	30
Use of audio-visual aids	10
Capacity to participate in discussion and answer the questions	20
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. The minimum of 80 per cent attendance requirement for presenting the seminar after re-registration need not be insisted.

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 research area and for 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 Master's programme should be of such a nature as to indicate a student's potentialities 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 Chairman of the Advisory Committee shall accompany the thesis.

18.2 **Research proposal:**

i. The research proposal has to be presented by the student in a meeting organized by the Head of the department to get the opinion/suggestions of the teachers of the department for improving it.

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). 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 PG students to monitor whether the student has 80 per cent of attendance in research.

iii. After completion of 80 per cent 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 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 following 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.
- Non-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' should be awarded. The student has to

reregister the same block of research credits for which 'E' grade was awarded in the following 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 can not 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 can not 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

i. The research credits registered in the last semester of postgraduate 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-2*.

ii. If a postgraduate student has completed the thesis before the closure of the final semester, the Chairman 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. Copy of the thesis to be sent for evaluation should be submitted in paper pack.

iv. 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).

v. During submission of thesis for external evaluation, it is mandatory to enclose

certificates for plagiarism check and reference management (Proforma-12). Maximum of 20% plagiarism is permitted.

19.1 **Grace period:**

i. Students can avail a grace period upto three months for submission of thesis after the closure of final semester by paying prescribed fine to the University.

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 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 Departments 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.

19.2 **Re-registration and submission of thesis:** The minimum of 80 per cent 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*. 2 years (4 semesters) and completed the minimum credit requirements with 80 per cent attendance.

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

20 EVALUATION OF THESIS

20.1 The thesis submitted in partial fulfillment of a Master's degree shall be evaluated by an external examiner nominated by the Controller of Examinations. However, the Dean can send panel of three examiners (Form 6).

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

20.3 The Chairman of the advisory committee shall communicate the date of final thesis viva-voce examination to the student and advisory committee members. The thesis final viva-voce examination shall be completed within three months from the date of receipt of the report from the external examiner.

20.4 The Chairman shall send the recommendations of the advisory committee (Form 7) along with necessary certificate/documents in duplicate to the University.

20.5 i. In case, the External examiner does not recommend the thesis for the award of the degree, the advisory committee may send their recommendation for scrutiny of the thesis by another external examiner, through the Dean to Controller of Examinations within one month from the date of receipt of the thesis. The Controller of Examinations may, on the recommendation of the advisory committee and Dean, refer the thesis for scrutiny and independent judgment to a second external expert chosen by him.

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

iii. If the second examiner also does not recommend the thesis for acceptance, the degree shall not be awarded.

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 the Dean.

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

22 FAILURE TO APPEAR FOR FINAL VIVA/NON-SUBMISSION OF THESIS AFTER VIVA

If a candidate fails to appear before the examining committee for final thesis viva-voce, on the date fixed by the Chairman the following are the time-frame and penalty.

22.1 The thesis viva-voce must be completed within **five years from the date of first registration** for Master's programmes. The prescribed penalty/fine must be charged to the candidate.

22.2 After successful completion of thesis final viva voce, if a student fails to submit the corrected version of the thesis within 15 days he/she will be levied a fine at the time of sending the proposal for result declaration.

23 MALPRACTICES IN EXAMINATION AND MISCONDUCT OF STUDENTS

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

23.2 In case of final theory and final practical examination, the cases of malpractice will be dealt as per Chapter XV (A) of the Academic Ordinance of the University.

23.3 **Ragging rules:** Students found involved in ragging will be dealt as per the orders of the Supreme Court of India. The matter shall be reported to the University.

23.4 **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. The matter shall be reported to the University.

24 The schedule for the important records to be sent to the Dean is furnished below and 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)**	Before the commencement of mid semester examination in the first semester
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)**	Immediately
6	Panel of external examiners for thesis evaluation **(Form 6)**	Three months before the probable date of submission of thesis
7	Final viva-voce result **(Form 7)**	Fifteen days from the examination

25 AWARD OF DEGREE AND ISSUE OF TRANSCRIPT CARD

25.1 **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.

25.2 **Class Ranking**: In calculation of Class equivalent for OGPA the following classification will be adopted. First class with Distinction and first class shall be awarded to those students who have completed the course without arrear and all others shall be awarded second class

OGPA	Class
9.00 and above	First class with Distinction
8.00 to 8.99	First class
7.00 to 7.99	Second Class

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

25.4 **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 REMOVAL OF DIFFICULTIES:

26.1 If any difficulty arises in giving effect to the provisions of these regulations, the Vice-Chancellor may issue necessary orders which appear to him to be necessary or expedient for removing the difficulty.

26.2 Every order issued by the Vice-Chancellor under this provision shall be laid before the Academic Council of the University in the next meeting after the issuance.

26.3 Not-withstanding anything contained in the regulations, the Board of Studies or Academic Council reserve the right to make changes whenever necessary.

27. REGULATIONS GOVERNED BY PAJANCOA & RI

27.1 ADMISSION

27.1.1 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.

iii. Candidates seeking admission to the various Postgraduate degree courses are permitted to apply for only two subjects. Separate applications should be used for each course.

27.1.2 Admission procedure:

i. The admission is based on the merit category of the candidate and availability of vacancies at the time of counseling.

ii. All admissions made by this Institute are provisional and subject to the approval of the University.

iii. 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

27.2 FEE STRUCTURE

27.2.1 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.

27.2.2 In the case of new admissions, the fees for the first semester should be paid at the time of admission.

27.2.3 For the remaining semesters, the fees should be paid on the date of registration of the semester.

27.2.4 Candidates who discontinue after admission are not eligible for refund of fees except caution money deposit.

27.2.5 In case of a student who re-registers with junior batch, he/she has to pay the semester fess applicable to the junior batch in which he/she registers, besides the re-registration fee.

27.3 REGISTRATION

27.3.1 All newly admitted candidates should register during the first semester of the programme. A candidate admitted to the Postgraduate 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.

27.3.2 **In ABSENTIA** registration will not be permitted on any circumstances.

27.3.3 The Head of the Department and the PG coordinator shall help the student in selecting the courses for registration.

27.3.4 Admitted candidates shall register with the respective Department at the beginning of each semester and this should be completed within two working days.

27.3.5 **Late registration**:

i. 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.

ii. Registration beyond seven working days is not allowed except for new entrants who are admitted late due to administrative reasons in the first semester.

27.3.6 **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

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

27.4 ARREAR EXAMINATION:

i. The prescribed arrear examination fee should be paid on or before the specified date.

ii. 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.

27.5 QUALIFYING EXAMINATION

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

27.6 SUBMISSION OF THESIS

The research credits registered in the last semester of postgraduate 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-5*.

27.7 REVISION OF THESIS

The prescribed fine for late submission of revised thesis may be collected from the students submitting thesis beyond the due date with the recommendation of the Chairman. The Dean shall ensure that the delay is due to the fault of the student.

27.8. MERIT SCHOLARSHIP/RESEARCH ASSISTANTSHIP

27.8.1 PAJANCOA & RI PG fellowship shall be awarded to all the students who are admitted into the Masters programme based on allotment of Government fund. The PG students should be a resident of PAJANCOA & RI hostels. The award of PG fellowship is governed by the approved PG fellowship rules.

27.8.2 The Dean shall call for applications and sanction the scholarship every year.

27.8.3 The students availing any scholarship/fellowship are permitted to switch over to other fellowship/scholarship only one time during the course of study.

27.8.4 **Student SRF/JRF:**

i. The selection of student SRF/JRF in external funded schemes will be made by the existing committee members for selection of regular SRF/JRF.

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.

27.9 RECOGNITION OF POSTGRADUATE TEACHERS

27.9.1 The Dean normally recognizes teachers for offering courses and guiding the students of Master's programme based on the request of teachers and the recommendation of Head of the department.

27.9.2 The recognized PG teachers shall offer courses to masters 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.

27.9.3 All the recognized guides for Master's programme are competent to guide research work of Master's degree students in their own fields of specialization. The Heads of departments shall assign students to the recognized guides taking into account their specialization. The students should be uniformly distributed instead of all of them taking research topics in one or two specialized branches in the department.

27.9.4 **Teachers for Master's programme:** The following faculty shall be recognized as PG teachers for Master's programme

i. Professors
ii. Associate Professors
iii. Assistant Professors: Persons having Ph.D. degree with one year of active experience in the concerned field (or) Persons having a Master's degree with three years of active experience in the field. In case of contingencies, like start of new PG programme, persons having Ph.D. degree in the concerned field may be recognized as PG Teacher.

27.9.5 **Guides for Masters programme:** PG Teachers after handling PG courses in two semesters are eligible to guide M. Sc. students. In case of contingencies, like start of new PG programme, persons having Ph.D. degree in the concerned field may be recognized as PG Guide.

27.9.6 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*.

27.9.7 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.

27.10 GUIDELINES FOR HEADS OF THE DEPARTMENTS IN MONITORING PROGRESS OF POSTGRADUATE STUDENTS

27.10.1 **Student records:** The "Individual student" file (clip file) containing all the academic records of the student concerned with students 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 :

27.10.2 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	Time table for mid-semester examinations	A week before the scheduled date for the examinations notified in the academic calendar
~~4~~	Mark lists after completing examinations	Within 10 days from the date of conduct of examinations
5.	Class grade chart	Within 7 days from the date of closure of each semester

27.10.3 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.

27.10.4 The Heads of the Departments should monitor the progress of the postgraduate 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

FORMATION OF ADVISORY COMMITTEE

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

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

Sl. No.	Advisory Committee	Name, Designation and Department	Date of Retirement	Signature
1	Chairman			
2	Member 1			
	Member 2			
3	Additional Member			

6. Reason 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, KARAIKAL – 609 603

CHANGE IN ADVISORY COMMITTEE

(To be sent in triplicate)

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

		Name and designation	Date of retirement	Signature
a.	Existing Chairman/ member			
b.	Proposed Chairman/ member			

6. Reasons for change :

Signature of the student

Chairman of the Advisory Committee **PG coordinator**

Head of the Department **DEAN**

Form – 2

PONDICHERRY UNIVERSITY

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

PLAN OF COURSE WORK

(To be sent in triplicate before the commencement of mid semester examinations in the first semester)

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

S. No	Course No	Course Title	Credit Hour
		MAJOR COURSES	
		MINOR COURSES	
		SUPPORTING COURSES	
		NON-CREDIT 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
Chairman		
Members	1.	
	2.	
	3.	

PG coordinator **Head of the Department**

DEAN

Form – 3

PONDICHERRY UNIVERSITY

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

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. Registration 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
Chairman		
Members	1.	
	2.	
	3.	

PG coordinator **Head of the Department**

DEAN

Form – 3a

PONDICHERRY UNIVERSITY

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

CHANGE IN PROGRAMME OF RESEARCH

(To be sent in triplicate)

1. Name :
2. Registration 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
Chairman		
Members	1.	
	2.	
	3.	

PG coordinator **Head of the Department**

DEAN

Form – 4

PONDICHERRY UNIVERSITY

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

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 PG students appearing for qualifying examination :

Sl. No.	Name	Registration 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

PONDICHERRY UNIVERSITY

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

COMMUNICATION OF RESULT OF QUALIFYING EXAMINATION

(To be sent in triplicate)

1. Name of the student :
2. Registration 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**
Chairman		
Members	1.	
	2.	
	3.	
External Examiner		

Signature of Chairman 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

PROPOSAL OF EXTERNAL EXAMINERS FOR THESIS EVALUATION

(To be sent in duplicate in Confidential cover)

1. Name of the student :
2. Registration No. :
3. Degree :
4. Subject :
5. Thesis title :
6. Name of the Chairman :
7. Panel of external examiners* :

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

*Three external examiners should be given

8. Remarks :

Signature of the Chairman of the advisory committee

DEAN

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Form – 7

PONDICHERRY UNIVERSITY

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

RESULT OF FINAL THESIS VIVA-VOCE EXAMINATION

(To be sent in duplicate)

1. Name of the student :
2. Registration 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**
	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.	Chairman/Co-opted Chairman*		
2.	Member 1.		
3.	2.		
4.	Additional member		
5.	Co-opted member*		

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

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

Head of the Department

Chairman of the Examining committee / Advisory committee with designation

Annexure – 1

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.	Missing mid-semester examination fee (per course)	1000
3.	Re-registration fee with juniors	1000
4.	Duplicate Hall ticket	200
5.	Fee for Transfer Certificate and Conduct Certificate	200
6.	Re-examination fee for qualifying exam	5000
7.	Fee for availing grace period for submission of thesis	
	a) Upto one month	1000
	b) Up to three months	2500
8.	Penalty for re-viva voce examination for thesis	5000
9.	Fee for late submission of thesis after final viva-voce	5000
10.	Examination fee (per course)	*
11.	Arrear Examination fee (per course)	*
12.	Revaluation fee (per course)	*
13.	Re-totaling fee (per course)	*
14.	Fee for Provisional Degree Certificate	*
15.	Fee for Transcript Card	*
16.	Fee for Degree Certificate	*
17.	Fee for Migration Certificate	*

*** As fixed by Pondicherry University from time to time**

Annexure – 2

PONDICHERRY UNIVERSITY

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

STUDENT REGISTRATION CARD - PG

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 Chairman**	**Signature of the Head of the Department**	**Coordinator of Examinations**

APPROVED BY

DEAN
PAJANCOA&RI, KARAIKAL

Annexure-3

PONDICHERRY UNIVERSITY

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

LIST OF ENCLOSURES TO BE SUBMITTED ALONG WITH THESIS

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

To be submitted to the university

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. Result of comprehensive qualifying examination
6. Permission and fee receipt for availing grace period, if any.

To be submitted to the college along with above list

7. Clearance certificates from Hostel
8. Clearance certificates from Library
9. Clearance certificates from Department
10. Clearance certificates from Staff advisor
11. Clearance certificates from Physical Education
12. Approved registration cards (One set)
13. Report cards (one set)
14. Course completion certificate (signed by Chairman and HOD)
15. Attendance Certificate

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 – One Number.
5. Soft copy the thesis in CD (cover to cover in PDF format) - Two Number.

Annexure - 4

PONDICHERRY UNIVERSITY

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

PROPOSAL FOR RECOGNITION OF TEACHERS FOR TEACHING/GUIDING PG 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 Masters Programme

b. Recognition as Guide for Masters 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, KARIAKAL – 609 603

PROFORMA FOR REGISTRATION OF RESEARCH CREDITS

PART- A : PROGRAMME

Semester : I / II Year : Date of registration :

1. Name of the student :
2. Registration No.
3. Total research credits completed so for :
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
Chairman		
Members	1.	
	2.	
	3.	

(Approval may be accorded within 10 days of registration)

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 :
3. Performance * :

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

APPROVAL OF THE ADVISORY COMMITTEE

Advisory committee	**Name**	**Signature**
Chairman		
Members	1.	
	2.	
	3.	

Proforma-2

PONDICHERRY UNIVERSITY

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

PERMISSION FOR LATE REGISTRATION

1.	Name of the student	:
2.	Registration 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 Chairman	:

Signature of the Chairman

PG Coordinator **Head of the department**

DEAN

Proforma-3

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

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

1.	Name of the student	:
2.	Registration No.	:
3.	Degree	:
4.	Subject	:
5.	OGPA of Bachelor degree	:
6.	Name of the Chairman	:
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.

iii. I am fully aware that in case of campus transfer due the award of the fellowship that I have to loose the research credits already registered.

iv. I am fully aware that there is no guarantee for the continuation of the courses, which I currently undergo, in the other campus to which I am likely to be transferred.

v. I am willing to abide by all the rules and regulations laid down by the College/University in this regard.

Date: **Signature of Student**

Chairman of the Advisory Committee **Head of the Department**

DEAN

Proforma-4

PONDICHERRY UNIVERSITY

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

DEPARTMENT OF _____

COURSE COMPLETION CERTIFICATE

This is to certify that Thiru./Selvi/Tmt. _____ Registration No. _____ has completed all the course and research credit requirements on _____ for the award of _____ degree.

Professor and Head

Signature of the Chairman
(with Name and designation)

PONDICHERRY UNIVERSITY

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

JUSTIFICATION FOR LATE SUBMISSION OF THESIS (if applicable)

1. Name of the student :
2. I.D. 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 Chairman :

Signature of the Chairman with designation

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

Signature of the Head

13. Approval of the Dean :

Signature of the Dean

Proforma-8

PONDICHERRY UNIVERSITY

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

PROFORMA FOR EVALUATION OF THESIS

Name of the degree programme: _____.

1. Name and Designation of the examiner :

2. Address of the Examiner :

   Telephone/Mobile :
   Fax :
   e-mail :

3. Name of the candidate :

4. Registration 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-9

PONDICHERRY UNIVERSITY

PANDIT JAWAHARLAL NEHRU COLLEGE OF AGRICULTURE AND RESEARCH INSTITUTE, KARIAKAL – 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 _____

Registration 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 M.Sc. thesis in hard bound cover and **TWO** soft copies of thesis in PDF format in CDs.

Head of the department

Signature of the Chairman with Name and designation

Proforma-10

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

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

(To be sent in triplicate)

1.		Name of the student	:
2.		Registration No.	
3.		Department & College	:
4.		Name of the Chairman 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:

Chairman **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-11

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

APPLICATION FOR ISSUE OF CONDUCT AND TRANSFER CERTIFICATES

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

1. Name of the student :
2. Registration No. :
3. Name of the Chairman :
4. Designation of the Chairman :
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.

Chairman **PG Co-ordinator** **Professor & Head**

Proforma-12

PONDICHERRY UNIVERSITY

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

CERTIFICATE FOR HAVING CARRIED OUT PLAGIARISM CHECK

1	Name of the Student	
2	Registration Number	
3	Degree	
4	Title of the Thesis	
5	Name of the Chairman	
6	Total Word Count in the Document	
7	Initial Submission	Yes / No
	If No	Provide the number of times plagiarism checked along with their plagiarism percent
8	Date of Submission	

Signature of the Student

Signature of the Chairman/Chairperson

Signature of the Head of the Department

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

Common course Course which is compulsorily registered by the postgraduate student for the completion of postgraduate degree programme. The marks obtained by the student in a common course will also be taken into account for calculating OGPA

Credit Requirements

	Particulars	Credits
(i)	**Course Work**	
	Major courses	20
	Minor courses	08
	Supporting courses	06
	Common courses	05
	Seminar	01
(ii)	**Thesis Research**	30
	TOTAL	**70**

COMMON COURSES

Sl No.	Course Code	Course Title	Credits
1	PGS 501	Library and Information Services	0+1
2	PGS 502	Technical Writing and Communication Skill	0+1
3	PGS 503	Intellectual Property and its Management in Agriculture	1+0
4	PGS 504	Basic Concepts in Laboratory Techniques	0+1
5	PGS 505	Agricultural Research, Research Ethics and Rural Development Programmes	1+0

PGS 501 LIBRARY AND INFORMATION SERVICES 0+1

AIM OF THE COURSE

To equip the library users with skills, to trace information from libraries efficiently, to apprise them of information and knowledge resources, to carry out literature survey, to formulate information search strategies, and to use modern tools (Internet, OPAC, search engines etc.) of information search.

PRACTICAL

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary -Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services - (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing - information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized - library services; Use of Internet including search engines and its resources; e-resources access methods.

PRACTICAL SCHEDULE

1. Introduction to library and its services
2. Role of libraries in education, research and technology transfer;
3. Classification systems and organization of library
4. Sources of information- Primary Sources, Secondary Sources and Tertiary Sources
5. Intricacies of abstracting and indexing services
6. Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.);

7. Tracing - information from reference sources;
8. Literature survey
9. **Mid- Semester**
10. Citation techniques/Preparation of bibliography;
11. Use of CD-ROM Databases,
12. Online Public Access Catalogue and other computerized - library services
13. Online Public Access Catalogue and other computerized - library services
14. Use of Internet including search engines and its resources
15. Use of Internetincluding search engines and its resources
16. E-resources access methods.
17. Final practical examination

PGS 502 TECHNICAL WRITING AND COMMUNICATION SKILLS 0+1

AIM OF THE COURSE

To equip the students with skills *Viz.,* writing of dissertations, research papers, etc. andto communicate and articulate in English (verbal as well as writing)

PRACTICAL

Grammar - Tenses, parts of speech, clauses, punctuation marks; Error analysis Common errors; Concord; Collocation; Phonetic symbols and transcription; Accentual pattern: Weak forms in connected speech: Participation in group discussion: Facing an interview; presentation of scientific papers. Proof reading. Technical Writing - Various forms of scientific writings- theses, technical papers, reviews, manuals, etc; Structure of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion); Writing of abstracts, summaries, précis, citations etc.; commonly used abbreviations in the theses and research communications; illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations; Writing of numbers and dates in scientific write-ups; Editing and proof-reading; Writing of a review article.

PRACTICAL SCHEDULE

1. Grammar (Tenses, parts of speech)
2. Grammar (clauses, punctuation marks)
3. Error analysis (Common errors); Concord; Collocation;
4. Phonetic symbols and transcription;
5. Accentual pattern: Weak forms in connected speech
6. Participation in group discussion
7. Facing an interview; presentation of scientific papers.
8. Technical Writing- Various forms of scientific writings- theses, technical papers

9. **Mid -semester examination**
10. Technical Writing- reviews, manuals
11. Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion)
12. Writing of abstracts, summaries, précis, citations etc
13. Commonly used abbreviations in the theses and research communications
14. Illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustration
15. Writing numbers and dates in scientific write-ups
16. Editing and proof-reading, writing of a review article.
17. **Final practical examination**

SUGGESTED READING

1. Barnes and Noble. Robert C. (Ed.). 2005. *Spoken English: Flourish Your Language*.
2. *Chicago Manual of Style*. 14th Ed. 1996. Prentice Hall of India.
3. *Collins' Cobuild English Dictionary*. 1995.
4. Harper Collins. Gordon HM and Walter JA. 1970. *Technical Writing*. 3rd Ed.
5. Holt, Rinehart and Winston. Hornby AS. 2000. *Comp. Oxford Advanced Learner'sDictionary of Current English*. 6th Ed. Oxford University Press.
6. James HS. 1994. *Handbook for Technical Writing*. NTC Business Books.
7. Joseph G. 2000. *MLA Handbook for Writers of Research Papers*. 5th Ed. AffiliatedEast-West Press.
8. Mohan K. 2005. *Speaking English Effectively*. MacMillan India.
9. Richard WS. 1969. *Technical Writing*.
10. Sethi J and Dhamija PV. 2004. *Course in Phonetics and Spoken English*. 2nd Ed.Prentice Hall of India.
11. Wren PC and Martin H. 2006. *High School English Grammar and Composition*.S. Chand & Co.

PGS 503 INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN AGRICULTURE 1+0

AIM OF THE COURSE

The main objective of this course is to equip students and stakeholders with knowledge of Intellectual Property Rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge-based economy.

THEORY

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and bio-diversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

SUGGESTED READING

1. Erbisch FH and Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.
2. Ganguli P. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill. Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC and Aesthetic Technologies.
3. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol. V. Technology Generation and IPR Issues. Academic Foundation.
4. Rothschild M and Scott N. (Ed.). 2003. Intellectual Property Rights in Animal Breeding and Genetics. CABI.
5. Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya Publ. House.
6. The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout Design Act, 2000; PPV and FR Act 2001, and Rules 2003; National Biological Diversity Act, 2003

PGS 504 BASIC CONCEPTS IN LABORATORY TECHNIQUES 0+1
(For Social Science)

PRACTICAL

Use of R / SPSS / equivalent for Frequency distribution, Summarization and tabulation of data, F test, Correlation, Pearson Correlation, Spearman Correlation, ANOVA, ANCOVA

Use of R / SPSS / equivalent for Regression: Simple, Multiple Linear regression, Estimation of regression by OLS & MLE method, Logit, Probit, Stepwise regression, Coefficient of determination

Use of R / SPSS / equivalent for Kolmogorov-Smirnov test, Wilcoxon signed rank test, Mann-Whitney U, Kruskal-Wallis, McNemar's test

Use of R / SPSS / equivalent for Discriminant analysis - fitting of discriminant functions, identification of important variables, Factor analysis. Principal component analysis - obtaining principal component.

Use of R / SPSS / equivalent for Analysis of time series data - AR, MA, ARIMA models

SUGGESTED READING

1. Anderson CW & Loynes RM. 1987. The Teaching of Practical Statistics. John Wiley.
2. Atkinson AC. 1985. Plots Transformations and Regression. Oxford University Press.
3. Chambers JM, Cleveland WS, Kleiner B & Tukey PA. 1983. Graphical Methods for Data Analysis. Wadsworth, Belmount, California.
4. Chatfield C & Collins AJ. 1980. Introduction to Multivariate Analysis. Chapman & Hall.
5. Chatfield C. 1983. Statistics for Technology. 3 rd Ed. Chapman & Hall.
6. Chatfield C. 1995. Problem Solving: A Statistician's Guide. Chapman & Hall.
7. Cleveland WS. 1985. The Elements of Graphing Data. Wadsworth, Belmont, California.
8. Ehrenberg ASC. 1982. A Primer in Data Reduction. John Wiley.
9. Erickson BH & Nosanchuk TA. 1992. Understanding Data. 2 nd Ed. Open University Press, Milton Keynes.
10. Snell EJ & Simpson HR. 1991. Applied Statistics: A Handbook of GENSTAT Analyses. Chapman & Hall
11. Sprent P. 1993. Applied Non-parametric Statistical Methods. 2 nd Ed. Chapman & Hall.
12. Tufte ER. 1983. The Visual Display of Quantitative Information. Graphics Press, Cheshire, Conn.
13. Velleman PF & Hoaglin DC. 1981. Application, Basics and Computing of Exploratory Data Analysis. Duxbury Press.
14. Weisberg S. 1985. Applied Linear Regression. John Wiley.
15. Wetherill GB. 1982. Elementary Statistical Methods. Chapman & Hall.
16. Wetherill GB.1986. Regression Analysis with Applications. Chapman & Hall.
17. Learning Statistics: http://freestatistics.altervista.org/en/learning.php.
18. Free Statistical Soft wares: http://freestatistics.altervista.org/en/stat.php.
19. Statistics Glossary http://www.cas.lancs.ac.uk/glossary_v1.1/main.html

PGS 504 BASIC CONCEPTS IN LABORATORY TECHNIQUES 0+1
(For Plant Sciences)

AIM OF THE COURSE

To acquaint the students about the basics of commonly used techniques in laboratory.

PRACTICAL

Unit I

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separator funnel, condensers, micropipettes and vaccupets. Ashing, drying and sterilization of glassware; Drying of solvents/chemicals.

Unit II

Weighing and preparation of solutions of different strengths and their dilution; Handling techniques of solutions. Preparation of solutions of acids; Neutralisation of acid and bases; Preparation of buffers of different strengths and pH values.

Unit III

Preparation of different agro-chemical doses in field and pot applications. Principles and handling techniques of Chromatography.

Unit IV

Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sand bath, water bath, oil bath. Preparation of media and methods of sterilization.

Unit V

Seed viability testing, testing of pollen viability; Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy. Specific methodologies concerning each discipline

PRACTICAL SCHEDULE

1. Safety measures while in Lab; Handling of chemical substances
2. Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micro pipettes and vaccupets
3. Washing, drying and sterilization of glassware
4. Drying of solvents/chemicals
5. Weighingandpreparationofsolutionsofdifferentstrengthsandtheirdilution
6. Handling techniques of solution; Preparation and neutralisation of acid and bases
7. Preparation of buffers of different strengths and pH values
8. **Mid semester examination**
9. Preparationofdifferentagro-chemicaldosesinfieldandpotapplications (Herbicides and Fertilizers)

10. Preparationofdifferentagro-chemicaldosesinfieldandpotapplications (Pesticides)
11. Principles and Handling techniques of Chromatography.
12. Use and handling of microscope, laminar flow, vacuum pumps viscometer, thermometer, magnetic stirrer, micro-ovens, incubator, sand bath, water bath, oil bath etc.
13. Preparation of media and methods of sterilization
14. Seed viability testing, testing of pollen viability
15. Tissue culture of crop plants. Description of flowering plants in botanical term sin relation to taxonomy
16. Specific methodologies of each discipline concerned.
17. **Final Practical Examination**

SUGGESTED READING

1. FurrAK.2000.*CRC Hand Book of Laboratory Safety*. CRC Press.
2. Gabb MH and Latchem WE.1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co.

PGS 505 AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES 1+0

AIM OF THE COURSE

To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programmes and policies of Government.

THEORY

Unit I

History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions.

Unit II

Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centers (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility.

Unit III

Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

Unit IV

Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme.

Unit V

Integrated Rural Development Programme (IRDP) Panchayat Raj Institutions, Co-operatives, Voluntary Agencies/Non-Governmental Organizations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

LECTURE SCHEDULE

1. History of agriculture in brief; Global agricultural research system: need, scope, opportunities
2. Role in promoting food security, reducing poverty and protecting the environment
3. National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions
4. Consultative Group on International Agricultural Research (CGIAR); International Agricultural Research Centres (IARC)
5. Partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels
6. International fellowships for scientific mobility.
7. Research ethics: research integrity, research safety in laboratories
8. Welfare of animals used in research, computer ethics, standards and problems in research ethics.
9. **Mid semester examination**
10. Social trends on research ethics, adequate codes of conduct to regulate researchactivity
11. Concept and connotations of rural development, rural development policies and strategies.
12. Rural development programmes: Community Development Programme, Intensive Agricultural District Programme
13. Special group – Area Specific Programme
14. Integrated Rural Development Programme (IRDP) Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/ Non-Governmental Organisations.
15. Critical evaluation of rural development policies and programmes
16. Constraints in implementation of rural policies and programmes
17. Final Examination.

SUGGESTED READING

1. Bhalla GS and Singh G. 2001. Indian Agriculture - Four Decades of Development. Sage Publication. Punia MS. Manual on International Research and Research Ethics. CCS, Haryana Agricultural University, Hisar.

2. Rao BSV. 2007. Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives. Mittal Publication.
3. Singh K. 1998. Rural Development - Principles, Policies and Management. Sage Publication.

SUPPORTING COURSES

Sl No.	Course Code	Course Title	Credits
1	COM 501	R and Python Programming	2+1
2	MAT 501	Mathematics For Agricultural Economics	2+1
3	STA 501	Statistical Methods for Applied Sciences	2+1
4	STA 502	Design of Experiments	2+1

COM 501 R AND PYTHON PROGRAMMING 2+1

WHY THIS COURSE?

This course is all about R which is mainly used for statistical analysis while Python provides a more general approach to data science. R and Python are state of the art in terms of programming language oriented towards data science. Learning both of them gives an idea for handling agricultural data.

AIM OF THE COURSE

The objective of the course is partly to give an introduction to python and software R and how to handle data analysis using R.

THEORY

Unit I

Introduction to Python – Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Reading Input, Print Output, Type Conversions - Control Flow Statements, Looping Statements, Functions - Built-In Functions, Commonly Used Modules, Packages - Strings and Lists – Iterators.

Unit II

Regular Expression - pattern matching and searching using regex - validations using regular expressions - Exception handling - Python Database Interaction - SQL Database connection using python - Creating, Reading, storing and searching information on tables.

Unit III

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

Unit IV

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

Unit V

R script If, Else, Else If statements in R; For Loop and While Loop in R; Scatter Plot, Bar Chart and Histogram in R; Data Visualization with R ggplot2; Publishing Data Visualizations with R Shiny;

PRACTICALS

Implementation of Control Flow Statements, Looping Statements, Functions, Regular Expression, pattern matching and searching using regex. Validations using regular expressions. Python Database Interaction - SQL Database connection using python. Creating, Reading, storing and searching information on tables. 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(); Rscript, If, Else, Else If statements in R; For Loop and While Loop in R; Scatter Plot, Bar Chart and Histogram in R; Data Visualization with R ggplot2; Publishing Data Visualizations with R Shiny;

LECTURE SCHEDULE

Unit I

1 Introduction to Python – Identifiers, Keywords, Statements and Expressions
2 Operators, Precedence and Associativity, Data Types
3 Reading Input, Print Output, Type Conversions
4 Control Flow Statements, Looping Statements
5 Functions - Built-In Functions, Commonly Used Modules, Packages
6 Strings and Lists
7 Iterators

Unit II

8 Regular Expression
9 Pattern matching and searching using regex
10 Validations using regular expressions
11 Exception handling
12 Python Database Interaction - SQL Database connection using python
13 Creating, Reading, storing and searching information on tables.

Unit III

14 R Console; R Data types; R Vector creation using c();
15 R Assignment operators = <- ;
16 R Arithmetic Operators;
17 **Mid semester examination**

18 R Logical Operators;

19 R Relational Operators;

Unit IV

20 R Matrix- Create, Print,

21 Add Column using cbind(), Add Row using rbind(), Slice using [,];

22 R Data Frame - Create using data.frame (), Edit using edit(), Append using cbind (), rbind(),

23 Select (), subset(), sort using order();

24 List in R - Create using list(), Select;

25 Data Importing and Exporting in R Using read.table() and write.table();

26 install. packages(), library();

Unit V

27 Rscript

28 If, Else in R

29 Else If statements in R;

30 For Loop in R;

31 While Loop in R;

32 Scatter Plot, Bar Chart and Histogram in R;

33 Data Visualization with R ggplot2

34 Publishing Data Visualizations with R Shiny;

PRACTICAL SCHEDULE

1 Implementation of Control Flow Statements, Looping Statements, Functions

2 Regular Expression

3 Pattern matching and searching using regex

4 Validations using regular expressions

5 Python Database Interaction - SQL Database connection using python

6 Creating, Reading, storing and searching information on tables

7 R Console; R Vector creation using c(); R Assignment operators = <- ;

8 R Matrix- Create, Print, Add Column using cbind (), Add Row using rbind (), Slice using [,];

9 R Data Frame - Create using data. frame (), Edit using edit(), Append using cbind (), rbind (), select (), subset (), sort using order();

10 List in R - Create using list(), Select; Data Importing and Exporting in R Using read.table () and write. Table ();

11 Install. packages(), library(); Rscript,

12 If, Else, Else If statements in R;

13 For Loop in R; While Loop in R;

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**

LEARNING OUTCOME

This course will impart knowledge on how to interpret and analyze data using R and Python programming.

SUGGESTED READING

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
4 Bassi, S. (2017). Python for bioinformatics. Chapman and Hall/CRC.

SUGGESTED WEBSITES

1 https://www.python.org/doc/
2 https://www.r-project.org/other-docs.html
3 https://www.r-exercises.com/
4 RStudio.com Shiny Tutorial - https://shiny.rstudio.com/tutorial/ - https:// shiny. rstudio.com /articles/

MAT 501 MATHEMATICS FOR AGRICULTURAL ECONOMICS 2+1

WHY THIS COURSE?

This course provides a strong quantitative basis for the students to understand various Micro and Macroeconomic concepts

AIM OF THE COURSE

This course exposure student of Agricultural Economics to calculus and its applications in Agricultural Economics. It covers applications of Differential calculus, Integral calculus and Differential equations. This course provides a strong quantitative basis for the students to understand various Micro and Macro economic concepts.

THEORY

Unit I

Matrices – types - algebra of matrices. Determinants – properties - solution of simultaneous equations. Inverse of a matrix. Caylay Hamilton theorem- Eigen values and Eigen vectors.

Unit II

Definition and examples of variables and functions- basic theorems on limits and continuity (without proof). Revision of methods of differentiation. Maxima and minima of single. Application of differentiation - Elasticity of demand in terms of differentiation.

Average and marginal functions. Cost and Revenue curves- relationship. Conditions for profit maximization, Effects of taxation and subsidy.

Unit III

Revision of Partial differentiation - Maxima and minima of several variables with and without constraints -Marginal demands, partial elasticitics and utility analysis. Theory of consumer behavior- Rate of commodity substitution, Maximization of utility – slut sky equation (Income and substitution effects). Production functions and their mathematical properties- Isoquants and Ridge lines- Least cost combination – Constrained profit Maximization- Properties of linear homogenous functions- Euler's theorem.

Unit IV

Definite integrals, methods of integration definite integral; - Capital formation. Present value of continuous equal income stream. Consumer's and producer's surplus.

Unit V

Differential equations-meaning-types of differential equations-order and degree of the differential equations-formation and solution of first order and first degree linear differential equations . Solution of linear homogeneous equations. Applications in Micro economics – Utility and Demand analysis- Cost functions, Market equilibrium Harood Domor model, basic neo classic models, Solow models Domar debit models and some further applications**.**

PRACTICALS

Problems in algebra of matrices and determinants, simultaneous equation, eigen values and eigen vectors, simple differentiation, maxima and minima for single variables. Application of differentiation in Agricultural Economics. Simple problems in partial differentiation & Maxima and minima for several variables, Maxima and minima for several variables with constraints-Lagrange's method, Application of partial differentiation in agricultural economics, simple integral, calculation of consumer's and producer's surplus, formation of differential equation, solution of first order and first degree linear differential, solution of linear homogeneous equations.

LECTURE SCHEDULE

Unit I

1 Matrices – types of matrices, Algebra of matrices and determinant
2 Inverse of a matrix, Solution of simultaneous linear equations
3 Caylay Hamilton theorem
4 Eigen Values and Eigen Vector

Unit II

5 Definition and examples of variables and functions
6 Basic theorems on limits and continuity (without proof).
7 Revision and Simple Problems in differentiation

8 Maxima and minima of function of single with out constraints
9 Definitions of Elasticity, Total average and Marginal cost curve – relations
10 Total average and Marginal Revenue curves – Conditions for profit maximization

Unit III

11 Revision and Simple Problems in partial differentiation.
12 Maxima and minima of function of several variables – without constraints
13 Maxima and minima of function of several variables – with constraints - Lagrange's Multiplier's method
14 Partial elasticties and utility Analysis - Theory of consumer behavior
15 Rate of commodity substitution
16 **Mid semester examination**
17 Maximization of utility
18 Slutsky equation (Income and substitution effects).
19 Production functions and their mathematical properties
20 Isoquants and Ridge lines
21 Least cost combination Constrained profit Maximization
22 Properties of linear homogeneous functions - Euler's theorem

Unit IV

23 Definite integrals and their geometrical applications
24 Capital formation - Capital growth equation
25 Present value of continuous equal income stream
26 Calculations of consumer's and producer's surplus

Unit V

27 Solution of first order differential equations and Homogeneous
28 Linear differential equation with constant coefficients
29 Applications in Micro economics – Utility and Demand analysis
30 Applications in Micro economics - Cost functions, , Market equilibrium
31 Applications in Macro growth economics - Dynamic multiplier models
32 Applications in Macro growth economics - Harood Domor model
33 Applications in Macro growth economics - Basic neo classic models
34 Applications in Macro growth economics - Solow models Domar debit models

PRACTICAL SCHEDULE

1 Simple Problems in Matrices, Inverse Matrix
2 Problems in Solution of simultaneous linear equations
3 Problems in cayley Hamilton
4 Problems in Eigen value and Eigen verctor
5 Simple Problems in Differentiation
6 Maximum and minimum of function of single variables without constraints
7 Problems in Elasticity, Total average and Marginal cost/Revenue curves

8 Problems in Marginal demands, Partial elasticties and utility Analysis.
9 Simple Problems in partial differentiation
10 Maximum and minimum of function of several variables without constraints
11 Maximum and minimum of function of several variables with constraints
12 Problems in Maximization of utility and slut sky equation (Income and substitution effects) and Constrained profit Maximization
13 Homogeneous functions and Euler's theorem on homogenous functions
14 Problems in Definite integrals – geometrical applications
15 Calculations of consumer's and producer's surplus
16 Problems in Homogeneous, Linear differential equations
17 **Final practical examination**

LEARNING OUTCOME

Students can get exposure in basic knowledge in set theory, cost curve, supply curves and asticity with the applications in Agricultural Economics. Students can know to solve macro and micro economic models. Also this course provides a strong quantitative basis for the students to understand various Micro and Macro economic concepts

SUGGESTED READING

1 Metha, B.C. and Madani, G.M.K. (Reprint2008) Mathematics for Economists, Sultan Chand & Sons Educational Publishers, New Delhi.

2 ArumugamS. And Thangapandi Isaac (2002), Advanced Calculus, New Gamma Publishing house, Chennai.

SUGGESTED WEBSITES

1 http://en.wikipedia.org/wiki/Set_theory mathworld.wolfram.com /Newtons Divided Difference Interpolation Formula.html
2 http://en.wikipedia.org/wiki/Taylor_series

STA 501 STATISTICAL METHODS FOR APPLIED SCIENCES 2+1

WHY THIS COURSE?

- This course will help the students
- To study the exploratory data analysis
- To understand the various probability distributions and their application in their respective fields
- To perform the parametric and non-parametric tests based on the data
- To learn the relationship of the variables using correlation and regression techniques

AIM OF THE COURSE

The students would be exposed to concepts of statistical methods and statistical inference that would help them in understanding the importance of statistics. It would also help them in understanding the concepts involved in data presentation, analysis and interpretation. The students would get an exposure to presentation of data, probability distributions, parameter estimation, parametric and non-parametric tests, selection of sampling techniques and correlation, regression and ANOVA techniques.

THEORY

Unit I

Descriptive Statistics: Measure of Central Tendency, Measure of Dispersion, Skewness and Kurtosis for raw data only. Graphical and Diagrammatical representation: Bar Chart, Pie Chart, Frequency curve, Box Plot. Theory of Probability: axioms and properties, Addition and Multiplication Theorems on probability, Random Variable and Mathematical Expectation.

Unit II

Discrete and continuous probability distribution: Binomial, Poisson, Normal Distribution. Sampling theory: Population, parameter, sample and statistics; Sampling, need for sampling; Probability sampling: Simple random sampling (SRS), stratified random sampling, systematic sampling, cluster sampling; Non Probability sampling: Purposive and judgment sampling.

Unit III

Sampling distribution: Standard error and its uses, chi-square, t and F distributions. Theory of Estimation: Point Estimation, properties of good estimators; Properties of good estimators – unbiasedness, consistency, efficiency and sufficiency. Interval estimation: confidence limit, confidence interval. Test of significance based on Normal, t, F and Chi-square distributions.

Unit IV

Correlation and Regression: Correlation, types of correlation, pearson's correlation, testing the significance of correlation coefficient, rank correlation. Simple linear regression: assumption and fitting of simple linear regression, testing and interpretation of regression coefficient, coefficient of determination. Multiple linear regression and testing of coefficients.

Unit V

Introduction to ANOVA: One Way and Two way ANOVA. Non-parametric test: Sign test, Wilcoxon Test, Mann-Whitney U-test, Run test for the randomness of the sequence, Median test, Kruskalwallis test, Friedman's test.

PRACTICAL

Descriptive Statistics: Measure of central tendency, Measure of dispersion, Skewness and Kurtosis for raw data. Graphical and diagrammatical representation, Problems on Binomial, Poisson, Normal Distribution. Confidence interval estimation, Large sample test – testing mean and proportion, t-Test for single mean and two means, F-test for two variance, Test based on chi-square distributions. Correlation and Regression analysis. One Way ANOVA and Two way ANOVA. Non Parametric test: Wilcoxon Test, Mann-Whitney U-test, Run test for the randomness of the sequence, Median test, Kruskalwallis test, Friedman's test

LECTURE SCHEDULE

Unit I

1 Descriptive Statistics: Measure of central tendency for raw data
2 Descriptive Statistics: Measure of dispersion for raw data
3 Skewness and Kurtosis for raw data
4 Graphical and diagrammatical representation – Bar Chart, Pie Chart, frequency curve, Box Plot
5 Theory of Probability: axioms and properties, Addition and Multiplication Theorems on probability
6 Random Variable and Mathematical Expectation

Unit II

7 Discrete distribution: Binomial distribution
8 Discrete distribution: Poisson distribution
9 Continuous probability distribution: Normal Distribution
10 Sampling theory: Population, parameter, sample and statistics; Sampling, need for sampling
11 Probability sampling: Simple random sampling (SRS) – with and without replacement
12 Probability sampling: stratified random sampling and its method of allocation, Systematic sampling, cluster sampling
13 Non Probability sampling: Purposive and judgment sampling

Unit III

14 Sampling distribution: Standard error and its uses, chi-square, t and F distributions
15 Theory of Estimation: Point Estimation, Properties of good estimators: unbiasedness, consistency, efficiency and sufficiency
16 Interval estimation: confidence limit, confidence interval for single and two sample mean (t and Z)
17 **Mid Semester Examination**
18 Test of significance based on Normal distribution
19 Test of significance based on t distribution
20 Test of significance based on F distribution

21 Test of significance based on chi-square distributions

Unit IV

22 Correlation, Types of correlation, Pearson's correlation and its properties

23 Rank correlation

24 Simple linear regression: assumption and fitting of simple linear regression

25 Testing and interpretation of regression coefficient, coefficient of determination

26 Multiple linear regression model – Matrix approach and

27 Testingthe significance of correlation coefficient and regression coefficients, coefficient of determination

Unit V

28 Introduction to ANOVA: One Way ANOVA

29 Two way ANOVA

30 Introduction to Non-parametric test: Sign test

31 Wilcoxon Test, Mann-Whitney U-test

32 Run test for the randomness of the sequence, Median test

33 Kruskalwallis test

34 Friedman's test

PRACTICAL SCHEDULE

1 Descriptive Statistics: Measure of central tendency, Measure of dispersion, Skewness and Kurtosis for raw data.

2 Graphical and diagrammatical representation – Bar Chart, Pie Chart, frequency curve, Box Plot

3 Problems on Binomial distribution, Poisson distribution

4 Problems on Normal Distribution

5 Confidence interval estimation for single and two sample mean (t and Z)

6 Large sample test – testing mean and proportion of single and two sample

7 t-Test for single mean, two means (paired t-test)

8 t-Test for two means (independent t-test), F-test for two variance

9 Test of significance based on chi-square distributions

10 Correlation and testing of correlation coefficient

11 Regression analysis and testing the significance of regression coefficient

12 One Way ANOVA and Two way ANOVA

13 Wilcoxon Test, Mann-Whitney U-test

14 Run test for the randomness of the sequence, Median test

15 Kruskalwallis test

16 Friedman's test

17 **Practical Examination**

LEARNING OUTCOME

After successful completion of the course the students will be able to understand the exploratory data analysis, sampling and probability distribution, perform parametric and non parametric tests, well versed with regression and correlation analysis.

SUGGESTED READING

1 Goon A M, Gupta MK and Das Gupta B. 1983. Fundamentals of Statistics. Vol. I. The World Press.

2 Hoel PG. 1971. Introduction to Mathematical Statistics. John Wiley

3 Hogg RV and Craig TT. 1978. Introduction to Mathematical Statistics. Macmillan

4 Robert V. Hogg, Joseph W. McKean, Allen T. Craig (2012). Introduction to Mathematical Statistics (7th Edition)

5 Siegel S, Johan N and Casellan Jr. 1956. Non-parametric Tests for Behavior Sciences. John Wiley

6 Gupta. S.P, 2005, Statistical Methods, Sultan Chand & Sons, New Delhi

7 Rangaswamy, R, 2009, A text book of Agricultural Statistics, New Age International (P) Ltd., New Delhi.

8 K.P. Dhamu and K. Ramamoorthy, 2007, Statistical Methods, Agrobios (India), Jodhpur.

9 R. GangaiSelvi and C. Kailasam, 2017, Applied Statistics, Kalyani Publishers, New Delhi.

SUGGESTED WEBSITES

1 https://online.stat.psu.edu/statprogram/statistical%20methods

2 https://home.iitk.ac.in/~kundu/Statistical-Methods.pdf

3 https://www.nature.com/subjects/statistical-methods

4 https://sccn.ucsd.edu/~arno/mypapers/statistics.pdf

5 https://www.sciencedirect.com/book/9780123749703/statistical-methods

STA 502 DESIGN OF EXPEREIEMNTS 2+1

AIM OF THE COURSE

Designing an experiment is an integrated component of research in almost all sciences. The students would be exposed to various Design of Experiments so as to enable them to understand the concepts involved in planning, designing their experiments and analysis of experimental data.

THEORY

Unit I

Need for designing of experiments, Characteristics of good design. Basic principles of designs- randomization, replication and local control. Uniformity trails, size and shape of plots and blocks – determination of optimum plot size.

Unit II

Analysis of Variance, Data Transformation – Logrithmic, angular and square root transformation. Multiple comparison procedures – Least significant difference and Duncan's multiple range test. Completely randomized design, randomized block design and Latin square design.

Unit III

Factorial Experiments: 2^n and 3^n factorial experiments, analysis using regular method, Yates algorithm (2^n, upto three factors), Asymmetric factorial experiments (upto three factors). orthogonality and partitioning of degrees of freedom. Concept of confounding in symmetric factorial experiments, complete and partial confounding. Split plot and strip plot designs.

Unit IV

Missing plot techniques in randomized block design and Latin square designs. Analysis of covariance.

Unit V

Balanced Incomplete Block Design (BIBD), Partially Balanced Incomplete Block Design (PBIBD), Lattice design, alpha design: concept, randomization procedure, analysis and interpretation. Introduction to resolvable designs and their applications. Combined analysis. Response surface design.

PRACTICAL

Uniformity trial data analysis, formation of plots and blocks, Fairfield Smith Law, Analysis of data obtained from CRD, RBD, LSD; Analysis of factorial experiments; Analysis of covariance; Analysis with missing data; Data transformation - Split plot and strip plot designs - Analysis of data obtained from BIBD, PBIBD.

LECTURE SCHEDULE

Unit I

1. Introduction to principles of Experimental designs; need for designing of experiments
2. Characteristics of good design
3. Basic principles of designs- randomization, replication and local control.
4. Uniformity trails, size and shape of plots and blocks – determination of optimum plot size

Unit II

5. Analysis of Variance
6. Data Transformation – Logrithmic and angular transformation
7. Square root transformation
8. Multiple comparison procedures – Least significant difference and Duncan's multiple range test

9. Completely randomized design: Layout, randomization, analysis, advantage and disadvantage
10. Randomized block design: Layout, randomization, analysis, advantage and disadvantage
11. Latin square design: Layout, randomization, analysis, advantage and disadvantage
12. Introduction to Factorial Experiments and its type

Unit III

13. 2^n factorial experiments using regular method (up to three factors)
14. 3^n factorial experiments using regular method (up to three factors)
15. Yates algorithm: 2^n factorial experiments (up to three factors)
16. Asymmetric factorial experiments (up to three factors)
17. **Mid Semester Examination**
18. Orthogonality : orthogonal Latin squares, Mutually orthogonal Latin squares (MOLS)
19. Partitioning of degrees of freedom
20. Concept of confounding in symmetric factorial experiments (in 2^3 factorial), advantage and disadvantage
21. Complete and Partial confounding (in 2^3 factorial)
22. Split plot designs: Layout, Randomization, Analysis, Advantage, Disadvantage.
23. Strip plot designs: Layout, Randomization, Analysis, Advantage, Disadvantage

Unit IV

24. Missing plot techniques in randomized block design – one and two missing observation
25. Missing plot techniques in Latin square designs. – one missing observation
26. Analysis of covariance (with one covariate)

Unit V

27. Balanced Incomplete Block Design (BIBD) – concept, randomization procedure
28. Balanced Incomplete Block Design (BIBD) – analysis and interpretation
29. Partially Balanced Incomplete Block Design (PBIBD): concept, randomization procedure, analysis and interpretation.
30. Introduction to Lattice design: Square lattice design, randomization, analysis and their application
31. Introduction to Alpha design: concept, randomization procedure, analysis and interpretation.
32. Introduction to resolvable designs and their applications.
33. Concepts of Combined analysis.
34. Response surface design and application: second order response surface design

PRACTICAL SCHEDULE

1. Uniformity trial data analysis
2. Formation of plots and blocks
3. Fairfield Smith Law

4. Analysis of data obtained from CRD
5. Analysis of data obtained from RBD
6. Analysis of data obtained from LSD
7. Data transformation: logarithmic, angular transformation
8. Square root transformations
9. Analysis with missing data (RBD one missing value only)
10. Analysis of factorial experiments - symmetrical
11. Analysis of factorial experiments - symmetrical
12. Split plot design
13. Strip plot design
14. Analysis of covariance in case of RBD
15. Analysis of data generated from a BIB design
16. Analysis of data generated from a PBIB design
17. **Final practical examination**

SUGGESTED READING

1. Cochran WG and Cox GM. 1957. Experimental Designs. 2nd Ed. John Wiley.
2. Dean AM and Voss D. 1999. Design and Analysis of Experiments. Springer.
3. Douglas C. Montgomery (2012). Design and Analysis of Experiments, 8th Ed. John Wiley.
4. Federer WT. 1985. Experimental Designs. MacMillan.
5. Fisher RA. 1953. Design and Analysis of Experiments. Oliver & Boyd.
6. Nigam AK and Gupta VK. 1979. Handbook on Analysis of Agricultural Experiments. IASRI Publ.
7. Pearce SC. 1983. The Agricultural Field Experiment: A Statistical Examination of Theory and Practice. John Wiley
8. Gomez, K.A. and Gomez, A.A., 1993, Statistical Procedures for Agricultural Research, John Wiley & Sons, New Delhi.
9. Rangaswamy, R, 2009, A text book of Agricultural Statistics, New Age International (P) Ltd., New Delhi.
10. K.P. Dhamu and K. Ramamoorthy, 2007, Statistical Methods, Agrobios (India), Jodhpur.

SUGGESTED WEBSITES

1. www.drs.icar.gov.in
2. https://www.moresteam.com/toolbox/design-of-experiments.cfm
3. https://www.coursera.org/specializations/design-experiments
4. https://online.stat.psu.edu/statprogram/stat503
5. https://www.labmanager.com/laboratory-technology/online-resources-for-experimental-design-21103

M.Sc. (Agri.)
Agricultural Economics

M.Sc. (Agri.) Agricultural Economics

Sl No.	Course Code	Course Title	Credits
Major Courses			
1.	AEC 501	Micro Economic Theory and Applications	2+1
2.	AEC 502	Agricultural Production Economics	1+1
3.	AEC 503	Agricultural Marketing and Price Analysis	2+1
4.	AEC 504	Macro Economics and Policy	2+0
5.	AEC 505	Applied Econometrics	2+1
6.	AEC 507	Agricultural Finance and Project Impact Analysis	2+1
7.	AEC 508	Linear Programming	1+1
8.	AEC 509	Research Methodology for Social Sciences	1+1
Minor Courses			
1	AEC 506	Agricultural Development and Policy Analysis	2+0
2	AEC 511	International Economics	1+1
3	AEC 513	Natural Resource and Environmental Economics	1+1
4	AEC 514	Commodity Futures Trading	2+0
5	AEC 515	Development Economics	2+0
6	AEC 516	Rural Marketing	2+0
Seminar and Research			
1	AEC 591	Seminar	0+1
2	AEC 599	Research	0+30

SEMESTER WISE DISTRIBUTION OF COURSES

SEMESTSER I

Sl.No.	Course No.	Course Title	Credits
I.	Major Courses to be registered		11
II.	Minor Courses to be registered		04
III.	Supporting Course		
1	STA 501	Statistical Methods for Applied Sciences	2+1
IV.	Common Courses		
1	PGS 501	Library and Information Services	0+1
2	PGS 503	Intellectual Property and its Management in Agriculture	1+0
3	PGS 504	Basic Concepts in Laboratory Techniques	0+1

SEMESTSER II

Sl.No.	Course No.	Course Title	Credits
I.	Major Courses to be registered		09
II.	Minor Courses to be registered		04
III.	Supporting Course		
1	COM 501/ MAT 501	R and Python Programming/ Matematics for Agricultural Economics	2+1
IV.	Common Courses		
1	PGS 502	Technical Writing and Communication Skill	0+1
2	PGS 505	Agricultural Research, Research Ethics and Rural Development Programmes	1+0

SEMESTER III

Sl.No.	Course No.	Course Title	Credits
1	AEC 591	Master's Seminar	0+1
2	AEC 599	Master's Research	0+15

SEMESTER IV

Sl.No.	Course No.	Course Title	Credits
1	AEC 599	Master's Research	0+15

MAJOR COURSES

AEC 501 MICRO ECONOMIC THEORY AND APPLICATIONS 2+1

WHY THIS COURSE?

Markets form an integral part of the economy. They are governed by demand and supply mechanism with profit making its goal. Thus, it is imperative to expose the students towards how the markets function, their types and how the buyers and sellers behave. That will help them to make correct decision when it comes to price setting and choice of product.

AIM OF THE COURSE

The course envisages the concepts and principles embodying micro-economics. The economic problems, functioning of price mechanism, theory of household behavior and consumer's demand function. Theory of firm, supply determinants, determination of price under different market structures factor pricing (microeconomic components). This course will also expose the students to the theory of general equilibrium and welfare economics.

THEORY

Unit I - Basic Concepts and Consumer Choice

Scarcity and Choice – Theory of Consumer Behaviour – Cardinal and ordinal utility approaches – Utility maximization under indifference curve approach – Graphical and mathematical approaches – Income effect and substitution effect -normal and inferior goods- Engel Curve - Applications of Indifference curve analysis – Indirect utility function – Hicks and Slutsky theorem - Consumer'ssurplus,Labour-leisuremodelandcomparisonofincomesupportvs. Food subsidy policies. Revealed Preference Hypothesis. Derivation of demand curve from utility maximization problem– Demand functions – Elasticity of demand.

Unit II – Theory of Production and Costs

Production functions: single variable - average and marginal product, variable proportions, stages of production. Two variables - isoquants, returns to scale and to a factor; factor prices; Technical progress; cost minimization and output maximization; Elasticity of substitution. Expansion path and the cost function Concept of economic cost; Short run and long run cost curves; increasing and decreasing cost industries; envelope curve; L-shaped cost curves; economies of scale; revenue and expenditure, elasticity and marginal revenue; Firm equilibrium and profit – Economics of Uncertainty.

Unit III – Market Forms

Behaviour of profit maximizing firms and the production process- Perfect competition: Equilibrium of the market. Long run industry supply, applications: effects of taxes and subsidies; Monopoly: Equilibrium; supply; multi-plant firm ;monopoly power; dead weight loss; price discrimination; Monopolistic Competition: Product differentiation; equilibrium of the firm in the industry-with entry of new firms and with price competition. Comparison with pure competition. Duoploy: Cournot model and reaction curves; Stackelberg's model, Bertrand model; Oligopoly.

Unit IV – Factor Markets

Theory of distribution – Marginal productivity theory of distribution in perfectly competitive markets - Labour and land markets - basic concepts (derived demand, productivity of an input,marginalproductivityoflabour,marginalrevenueproduct);demand for labour; input demand curves; shifts in input demand curves; competitive labour markets; Economic rent and quasi rent

Unit V - General Equilibrium and Welfare Economics

General Equilibrium Theory – 2X2X2 general equilibrium model. Derivation of general equilibrium conditions using Edgeworth box approach and mathematical approach. Welfare Economics – Pareto Optimality – Social welfare criteria – Uncompensated and compensated Consumer Welfare - Arrow's General Possibility Theorem – Amartya Sen's Capability Approach towell being.

PRACTICAL

Utility Maximization – Graphical method - Utility maximization through constrained optimization technique – Estimation of Elasticity of demand using various demand functions - Measurement of Consumer's Surplus Producers' equilibrium – Profit maximization and cost minimization – Cost functions – Estimation of different cost curves - Price determination under perfect competition – Problem solving by mathematical approach-Measurement of Effect of Taxes and Subsidies on Consumer's and Producer's Surpluses under perfect competition – Price determination under monopoly and multi-plant monopoly – Problem solving - Measurement of monopoly power using Lerner Index-Measurement of welfare effects of monopoly using dead weight loss –Price determination under monopolistic competition - Problem solving Oligopoly – Cournot model–Derivation of Reaction curves and equilibrium price-Collusive oligopoly– Price determination – Problem solving – Equilibrium in factor markets – Problem solving-General equilibrium – Problem solving.

LECTURE SCHEDULE

Unit I

1 Basic concepts review: Scarcity and Choice; Theory of demand and supply and its determinants Elasticity of demand and supply

2 Theory of consumer behaviour – Consumer equilibrium – Cardinal utility approach

3 Consumer Equilibrium under ordinal utility approach – Constrained maximization of utility - Graphical and Mathematical (Lagrangian) methods

4 Consumer's surplus – definition and its measurement

5 Applications of indifference curve approach – Labour - leisure model

6 Engel curve- Applications of indifference curve approach Comparative analysis of income Support vs Food subsidy policies

7 Application of indifference curve approach Decomposition of total price effect into substitution and income effects – Indirect utility function – Hicks and Slutsky income and substitution effects

8 Revealed preference hypothesis- Derivation of demand curve from utility maximization problem

Unit II

9 Demand functions – Elasticity of demand

10 Theory of Production – Production functions – Homogenous production function – Returns to scale

11 Derivation of isoquants –Technical progress –Definition and types

12 Profit maximization and cost minimization.

13 Concept of economic cost; Short run and long run cost curves; increasing and decreasing Cost industries; envelope curve; L-shaped cost curves; economies of scale

14 Revenue and expenditure, elasticity and marginal revenue; Firm equilibrium and profit.

Unit III

15 Theory of firm- Types of market structure – Characteristic features

16 Perfect competition–Price determination–Producer's surplus and consumer's surplus

17 **Mid semester examination**

18 Impact of changes in cost structure on short-run and long run equilibrium under perfect Competition – Analysis of effect of taxes and subsidies on equilibrium under perfect competition

19 Price determination under monopoly – Estimation of monopoly power - Comparison of producer's surplus and consumers' surplus under monopoly and perfect competition

20 Price determination under monopolistic competition – comparison with pure competition

21 Collusive oligopoly – Simple model of collusion-

22 Duoploy: Cournot model and reaction curves;

23 Stackelberg's model, Bertrand model

Unit IV

24 Theory of distribution – Marginal productivity theory of distribution – Factor markets - Labour and land markets-basic concepts
25 Demand for labour; input demand curves; shifts in input demand curves
26 Competitive labour markets; Economic rent and quasi rent
27 Factor markets – Equilibrium under perfectly competitive market
28 Factor price determination under monopoly output markets
29 Determination of factor shares–Euler's Product Exhaustion Theorem

Unit V

30 General Equilibrium Theory – An overview of Walrasian General Equilibrium
31 Partial vs. general equilibrium
32 General equilibrium in 2x2x2 model – Edge worth box approach (two lectures)
33 An overview of Welfare Economics-Welfare criteria
34 Arrow's General Possibility Theorem – Amartya Sen's Capability Approach to well being

PRACTICAL SCHEDULE

1 Utility Maximization – Graphical method
2 Utility maximization through constrained optimization technique
3 Estimation of Elasticity of demand using various demand functions
4 Measurement of Consumer's Surplus
5 Producers' equilibrium – Profit maximization and cost minimization
6 Cost functions – Estimation of different cost curves
7 Price determination under perfect competition – Problem solving by mathematical approach
8 Measurement of Effect of Taxes and Subsidies on Consumer's and Producer's Surpluses Under perfect competition
9 Price determination under monopoly and multi-plant monopoly – Problem solving
10 Measurement of monopoly power using Lerner Index
11 Measurement of welfare effects of monopoly using dead weight loss
12 Price determination under monopolistic competition -Problem solving
13 Oligopoly – Cournot model – Derivation of Reaction curves and equilibrium price
14 Collusive oligopoly – Price determination – Problems solving
15 Equilibrium in factor markets – Problem solving
16 General equilibrium–Problem solving
17 **Final practical examination**

LEARNING OUT COME

- After completion of the course the student will be able to-

- Get acquainted with the basic concepts of microeconomics.
- Buildup vision towards how consumers make choices and market reaches the equilibrium.
- Develop decision making skill for firms about product selections and scale of production to ensure maximum profit.
- Understand about different types of markets existing in the real world, their principles and whereabouts.
- Comprehend how firms and households determine factor prices.
- Appreciate welfare optimality and the nature of policies aimed at improving welfare.

SUGGESTED READING

1 Modern Micro Economics by A. Koutsoyiannis, Published by MAC MILLAN PRESS LTD.
2 Micro Economic Theory by Ferguson and Gould by RichardD Erwin INC USA.
3 Richard A. Bilas, Micro Economic Theory.

SUGGESTED WEBSITES

1 https://ocw.mit.edu/courses/economics/
2 https://www.adb.org/adbi/main
3 https://openknowledge.worldbank.org/

AEC 502 AGRICULTURAL PRODUCTION ECONOMICS 1+1

WHY THIS COURSE?

Production in agriculture is the outcome of the input factors involved. In this competitive and uncertain market, it is important that the farmers take the right decision about the combination of inputs that will result in higher income. Thus, as an economist it is a pre-requisite that the students understand the interaction between output and input. And workout the most effective production plan.

AIM OF THE COURSE

To expose the students to develop the concept, significance and uses of production economics. To understand the relationships between factors and output. To learn how to decide the combination of inputs to be used as per the resources available. Ensure that the production process works efficiently.

THEORY

Unit I: Concepts of Production Economics

Nature, scope and significance of agricultural production economics – Agricultural Production processes, character and dimensions - spatial, temporal – Centrality of production functions, assumptions of production functions.

Unit II: Production Functions

Commonly used forms - Properties, limitations, specification, estimation and interpretation of commonly used production functions.

Unit III: Factors and Theory of Production

Factors of production, classification, interdependence, and factor substitution. Determination of optimal levels of production and factor application – Optimal factor combination and Least Cost Combination of production – Theory of product choice; selection of optimal product combination.

Unit IV: Concepts of Cost

Cost functions and cost curves, components, and cost minimization – Duality theory–cost and production functions and its applications – Profit function and its estimation – Derivation of firm's Input demand and output supply functions – Economies and diseconomies of scale.

Unit V: Dynamics of Economic Assessment

Technology in agricultural production, nature and effects and measurement – Measuring efficiency in agricultural production; technical, allocative and economic efficiencies-Yield gap analysis -concepts- types and measurement - Nature and sources of risk, modelling and coping strategies.

PRACTICALS

Different forms of production functions - specification, estimation and interpretation of production functions – returns to scale, factor shares, elasticity of production – physical optima -economic optima – least cost combination – optimal product choice –cost function estimation, interpretation estimation of yield gap – incorporation of technology in production functions – total factor productivity – measuring returns to scale – risk analysis – MOTAD analysis.

LECTURE SCHEDULE

Unit I

1 Nature, scope and significance of agricultural production economics

2 Agricultural Production processes, character and dimensions - spatial, temporal

3 Centrality of production functions, assumptions of production functions, commonly used forms

Unit II

4 Properties, limitations, specification, estimation and interpretation of commonly used production functions

Unit III

5 Factors of production, classification, inter dependence and factor substitution

6 Factor-Product-Determination of optimal levels of production and factor application (LDR)

7 Factor-Factor-Optimal factor combination and least cost combination

8 **Mid-semester examination**

9 Product-Product-Theory of product choice; selection of optimal product combination

Unit IV

10 Cost functions and cost curves, components, and cost minimization

11 Duality theory – cost and production functions and its applications

12 Profit function, Derivation of firm's input demand and output supply functions

13 Economies and diseconomies of scale.

Unit V

14 Technology in agricultural production, nature and effects and measurement

15 Measuring efficiency in agricultural production; technical, allocative and economic efficiencies

16 Measurement of efficiencies using stochastic production function and DEA approach

17 Risk – types and simple method of measurement

PRACTICAL SCHEDULE

1 Collection of realistic datasets for estimation of production functions

2 Estimation and interpretation of linear, Cobb-Douglas and Quadratic production functions

3 Estimation and interpretation of Translog and transcendental production functions

4 Comparison of results of different production and selecting best functional form for data

5 Optimization of input applications underestimated functional forms

6 Estimation of physical optimum and economics optimum using quadratic production function

7 Estimation of various Elasticities, returns to scale and interpretation

8 Comparison of product maximization and cost minimization

9 Derivation of empirical derived demand from production function

10 Derivation of empirical supply from profit function

11 Estimation of linear and Translog cost functions

12 Estimation of factor productivities, factor shares and total factor productivity

13 Estimating production functions incorporating technology changes: Decomposition analysis and incorporation of technology

14 Measurement of yield gap for important crops

15 Estimation of Stochastic Frontier Production function and measurement of Technical efficiency

16 Estimation of risk using MOTAD analysis

17 **Final practical examination**

LEARNING OUTCOME

After the successful completion of the course the student will be able to

- Understand how the factors and output interact with each other.
- Workout whether the production system is working efficiently and point out the loopholes.
- Apply the knowledge of costs and profits to work out the demand and supply functions.
- This will result into more efficient decision making.

SUGGESTED READING

1 E.O. Heady, Economics of Agricultural Production and resources use.

2 John P. Dolland Frank Orazem, Production Economics: Theory with application.

3 Heady E.O. &Dillon, J L. 1961. Agricultural Production functions. Kalyani Publishers, Ludhiana, India.667p.

4 Baumol, W.G. 1973. Economic theory and operations analysis. Practice Hall of India Private Limited, NewDehli. 626p.

5 Gardner BL & Rausser GC. 2001. Handbook of Agricultural Economics Vol.I Agricultural Production. Elsevier.

6 Heady, Earl O., and John L. Dillon, Agricultural Production Functions" (Ames: Iowa State University Press), 2012.

7 Dillon John L., The Analysis of Response in Crop and Livestock Production, (Oxford: Pergamon Press), 1990.

8 Doll, JohnP. And Frank Orazem, ProductionEconomics – Theory and Applications, (New York: John Wiley and Sons),1984.

SUGGESTED WEBSITES

1 http://ocw.mit.edu/courses/economics

2 https://www.msu.edu/course/ECO/855

3 http://www.uky.edu/~deberti/prod/agprod5.pdf

4 http://www.csuchico.edu/ag/_assets/documents/syllabi/ABUS/ABUS%20301%20AG%20 Production%20Econ%20Analysis.pdf

AEC 503 AGRICULTURAL MARKETING AND PRICE ANALYSIS 2+1

WHY THIS COURSE?

The aim of production process is to sell the produce in the market and generate income. Markets serves as platform where this exchange takes place. Agriculture markets are different from other markets due to the nature of the commodity. Thus, it is important to develop a strong foundation of agricultural marketing, its components and issues. The student needs to know about the multi-pronged ways of marketing the produce, agencies involved. In this modern era, it is important to understand how technology is transforming this sector.

AIM OF THE COURSE

This course is designed to acquaint the students about the basics of dynamics of agricultural marketing and impart adequate knowledge and analytical skills in addressing the issues of agricultural marketing and enhance expertise in improving the performance of the marketing institutions and the players in marketing of agricultural commodities. The content includes supply, demand and marketing of farm production, marketing functions and channels, marketing costs, margins and efficiency, agricultural prices, New marketing formats like e-marketing, e-NAM future trading, supply chain management, market intelligence etc.

THEORY

Unit I: Agricultural Marketing: Concepts & Problems

Review of Concepts in Agricultural Marketing – Characteristics of Agricultural product and Production – Problems in Agricultural Marketing – Demand based, Supply based and Institutional based. Market intermediaries and their role – Need for regulation in the present context – Marketable & Marketed surplus estimation. Marketing Efficiency – Structure Conduct and Performance analysis – Vertical and Horizontal integration – Integration over space, time and form – Vertical co-ordination - Box-Jenkins Model.

Unit II: Aspects of Agricultural Marketing

Different Forms of marketing: Co-operatives Marketing – APMC Regulated Marketing – Direct marketing, Farmer Producer Companies, e-NAM and marketing under e-NAM, e-marketing / m-marketing - Contract farming and Retailing, Organized retailing - Supply Chain Management –State trading, Warehousing and other Government agencies – Performance and Strategies –Market infrastructure needs, performance and Government role – Organised retailing – Value Chain Finance – Logistic functions – Marketing mix, segmentation, Consumerism and consumer rights.

Unit III: Use of Information Technology

Role of Information Technology and telecommunication in marketing of agricultural commodities - Market research – Market information service – electronic auctions (e-bay), e-Chaupals, AGMARK net and Domestic and Export market Intelligence Cell(DEMIC)–Latest developments in Online marketing – Market led extension.

Unit IV: Dynamics of Price

Theory of storage – storage decision making – Spatial and temporal price relationship – price forecasting – time series analysis – time series models 'spectral analysis – Price discovery – Price policy and economic development–non-price instruments.

Unit V: Future marketing and Government

Introduction to Commodities markets and future trading - Basics of commodity futures – Operation Mechanism of Commodity markets – Price discovery - Hedging and Basis - Fundamental analysis – Technical Analysis –Role of Government/ SEBI in promoting commodity trading and regulatory measures - Recent marketing reforms - EXIM Policy- Role of WTO – Agreement on Agriculture – Recent trends in agricultural export and imports.

PRACTICALS

Supply and demand elasticity's in relation to problems in agricultural marketing. Price spread and marketing efficiency analysis. Marketing structure analysis through concentration ratios. Performance analysis of Regulated market and marketing societies. Analysis on contract farming and supply chain management of different agricultural commodities, milk and poultry products. Supply Chain Analysis - quantitative estimation of supply chain efficiency - Market Intelligence – Characters, Accessibility, and Availability Price forecasting. Online searches for market information sources and interpretation of market intelligence reports – commodity outlook – Technical Analysis for important agricultural commodities – Fundamental Analysis for important agricultural commodities – Presentation of the survey results and wrap – up discussion.

LECTURE SCHEDULE

Unit I

1 Agricultural marketing definitions and concepts. Characteristics of agricultural Commodities and production – implications for marketing
2 Agricultural marketing problems – supply side problems – demand side problems –Institutional side problems.
3 Market intermediaries and their role in agricultural marketing.
4 Government regulation of agricultural markets and its need in the present context

5 Marketable surplus and marketed surplus – need and estimation.
6 Marketing channels and marketing efficiency
7 Market structure – meaning – analysis and policy.
8 Market conduct – meaning – analysis and policy –Marketing mix and segmentation
9 Market performance – meaning – analysis and policy
10 Marketing integration – vertical integration – horizontal integration.
11 Integration over space, time and form – vertical coordination – supply chain/ Value chain

Unit II

12 Marketing cooperatives – regulated markets - farmers market – marketing boards and Commodity boards
13 Direct marketing, e-NAM and marketing under e-NAM, e-marketing/M – Marketing (Mobile marketing) – Latest developments in Online marketing – Case studies –Consumerism and consumer rights.
14 Role of FPC in marketing of agricultural produce
15 Contract farming –– state trading – warehousing – Retailing - Organized retailing – Supply Chain Management
16 Market infrastructure needs, performance and Government role – Value Chain Finance
17 **Mid semester examination**
18 Commodity markets – origin – functioning – conduct and performance analysis.
19 Forward contracts – forward trading – fundamentals – similarities and differences.
20 Commodity futures concepts – role in Agricultural markets – market linkages – Commodity Exchanges – stock exchanges – operations and functions.
21 Price discovery – theoretical base – mechanism – price stability and price volatility
22 Market risk – price risk – measurement and analysis – temporal analysis of prices – revisited – concept of basis importance.
23 Hedging – speculation – Arbitrage – Swap – Fundamental analysis.
24 Technical analysis – implications and applications
25 Role of Government/ SEBI in promoting commodity trading and regulatory measures –EXIM Policy – Recent marketing reforms Role of WTO – Agreement on Agriculture – recent trends in agricultural export and imports

Unit III

26 Information technology – role in agricultural marketing – market research – market information–market intelligence.
27 Electronic auctions – e-bay – e chaupals – agmarknet– Domestic and export market Intelligence cell – market-led Extension

Unit IV

28 Agricultural Prices – importance – Economic functions of price – price signals. Theory of storage – storage decision making – commodity stocking.

29 Spatial relationship in prices – market integration models – Ravallion model – exposition.

30 Temporal relationship in prices – market integration – Cobweb model – Exposition – co Integration VECM

31 Time series analysis – basic characteristics – stationarity and unit root - decomposition of time series

Unit V

32 Price forecasting – Time series Models – Theoretical framework and building. AR model –Fundamentals, Construction and Application – Box – Jenkins Model

33 MA and Spectral model – Fundamentals, Construction and Application

34 Agricultural price policy evolution – role in economic development – non price instruments and incentives. Consumerism and consumer rights

PRACTICAL SCHEDULE

1 Demand and supply Elasticity – estimation – interpretation and determinant

2 Marketable surplus and marketed surplus – need and estimation

3 Market equilibrium – equilibrium price – estimation – market disequilibrium.

4 Marketing efficiency analysis – price spread – indicator method

5 Market structure analysis – computing concentration ratios, Lorenz curve

6 Visit to Regulated markets/ farmers market – Performance analysis of regulated markets – Farmers market – cooperatives marketing societies

7 Case analysis of contract farming – supply chain management in milk marketing and Poultry marketing – estimating chain efficiency.

8 Supply response analysis of various Agricultural Commodities.

9 Visit to commodity exchange, brokerages firm

10 TCSI Analysis of Time Series data

11 Market integration analysis – Ravallion model – estimation and interpretation

12 Market integration analysis – VECM model – estimation and interpretation

13 Single and Double Exponential Smoothing of Time series data.

14 Price forecasting using AR, MA models.

15 Application of Difference equations in Agricultural Commodity market estimation.

16 Market intelligence – agricultural marketing portals – information gathering – extraction and usage

17 **Final practical examination**

LEARNING OUTCOME

After the completion of this course the student will be able to -

- Understand the whereabouts of agricultural marketing.
- Acquisition analytical skills in addressing the issues of agricultural marketing
- Be familiar with the different forms of marketing in this sector.

- Reap expertise in improving the performance of the marketing institutions
- Gain expertise in market intelligence and price forecasting.

SUGGESTED READING

1 Acharya, S. S. & Agarawal, N.L.2004.Agricultural Marketing in India. Oxford and IBH Publishing company Pvt. Ltd. New Delhi.

2 Acharya, S.S. & Agarawal, N.L. 1994. Agricultural Prices – Analysis and Policy, Oxford and IBH Publishing company Pvt. Ltd. New Delhi.

3 Richard H Kohls and Joseph N. Uhl: Marketing of Agricultural products by Collier Mac Millan International.

SUGGESTED WEBSITES

1 http://courses.cals.uidaho.edu/aers/agecon289/Index.htm
2 http://www.uky.edu/Classes/AEC/305-001/classppts/01.pdf
3 http://www.youtube.com/watch?v=1vixHc37DII
4 http://www.stanford.edu/group/FRI/indonesia/.../chapt4.fm.
5 htmlhttp://www.Franciscovergara.Com/Pricecontrols.doc
6 http://www.docstoc.com
7 http://en.wikipedia.org/wiki/Market_structure
8 http://pdf.usaid.gov/pdf_docs/PNADL965.pdf
9 http://ageconsearch.umn.edu/handle/47883
10 http://faculty.quinnipiac.edu/charm/CHARM%20proceedings/.../160%20faria.pdf

AEC 504 MACRO ECONOMICS AND POLICY 2+0

WHY THIS COURSE?

The economy of the nation is governed by certain rules, regulation and principles. The students have to gain knowledge of the mechanism through which the large economies are controlled and ensure that welfare prevails. They are entitled to know the transactions between different markets and policies framed to keep value of money under control.

AIM OF THE COURSE

The course envisages the concepts and principles of macroeconomics from classical to Keynesian theories. The other component deals with the monetary system-money, credit and banking system, value of money and economic activities, national income accounting and approaches to estimate national income theory of income and employment determination and inflation.

THEORY

Unit I: Introduction: Measurement and Concepts and Classical Macro Economics

Basic concepts and scope of Macro-economics, National Income Accounting: Methods of measurement of key macro-economic aggregates, relationship of national income and other aggregates (with numerical exercises), real and nominal income. Say's Law, Quantity Theory of Money, aggregate labour supply and demand of labour, Classical theory of determining output, wages and prices.

Unit II: Income and Spending: Keynesian Framework

Simple Keynesian model of income determination; Keynesian Multiplier- aggregate spending, taxation, transfer payments, foreign spending, balanced budget; budget surplus (with numerical exercises).

Unit III: Theories of Aggregate Consumption and Investment

Absolute Income Hypothesis, Relative Income Hypothesis, Fisher's Inter-temporal Choice Model, Life-Cycle and Permanent Income Hypotheses; Profits and Accelerator Theory.

Unit IV: Money, Interest, Income and Inflation

Money and classical theories of Money and Price – Keynesian theory of money and Friedman Restatement theory of money - Supply of Money - Supply of Money – Crypto Currency and Block chain technology, - Public Finance, Tax policies, Excise duty, GST, Goods market equilibrium - IS curve; Demand for Money, the Liquidity Preference Theory – Liquidity Trap; asset market equilibrium- LM curve; simultaneous equilibrium in goods and asset market - effect of fiscal and monetary policy Central banking. Inflation: Nature, Effects and control; Types of inflation – demand pull, cost push - stagflation, core inflation, hyperinflation; Phillips curve.

Unit V: Inflation, Unemployment and Balance of Payment

International Trade - Balance of Payment – Foreign Exchange Rate determination - Business cycles

LECTURE SCHEDULE

Unit I

1. Introduction to Macro Economics, its importance and scope
2. National Income Accounting: Methods of measurement of key macro-economic aggregates, relationship of national income and other aggregates(with numerical exercises), real and nominal income
3. Circular Flow of Income in 2, 3 and 4 sector model
4. Classical Theories – Theory of Employment: Say's Law, aggregate labour supply and demand of labour
5. Classical theory of determining output, wages and prices

Unit II

6 Keynesian model of income determination

7 Keynesian Multiplier - aggregate spending, taxation, transfer payments, foreign spending, balanced budget; budget surplus (with numerical exercises)

8 Modern theory of money, Employment and Effective Demand

9 Classical theory Vs. Keynesian theory

10 Consumption Function – Propensity to Consume – Factors Determining Propensity to Consume

Unit III

11 Absolute Income Hypothesis, Relative Income Hypothesis, Fisher's Inter-temporal Choice Model, Life – Cycle and Permanent Income Hypotheses

12 Investment – Meaning and Types of Investment – Factors affecting Investment Decisions

13 Concept of Profits and Accelerator Theory

14 Concept of Multiplier – Types and Limitations of Multipliers, Static and Dynamic Multiplier

Unit IV

15 Money – Functions of Money – Measures of Money – classical theories of Money

16 Demand for Money – Factors affecting Demand for Money – Motives for Holding Money

17 **Mid semester examination**

18 The Liquidity Preference Theory – Liquidity Trap; asset market equilibrium

19 Keynesian theory of money and Friedman Restatement theory of money

20 Supply of Money, Crypto Currency and Block chain technology

21 Public Finance, Tax policies, Excise duty, GST

22 Goods market equilibrium – IS curve – The Two Market Equilibrium – The Product Market Equilibrium

23 Money Market Equilibrium – LM – curve – Derivation of LM – curve – Properties of LM - curve

24 General Equilibrium of an Economy: IS-LM Analysis

25 Monetary Policy - Objectives, Instruments and types

26 Fiscal policy: Objectives, Instruments and types

27 Effectiveness of Monetary Policy and Fiscal policy

28 Central banking: Functions and Credit control

29 Inflation, Meaning and its Types - stagflation, core inflation, hyperinflation

30 The Keynesian Theory of Inflation – Demand Pull Inflation – Cost Push Inflation – Demand Pull vs Cost Push Inflation

31 Control of Inflation – Philips Curve

Unit V

32 Unemployment and Full employment
33 Business cycles: Meaning and Nature & Themes
34 Balance of Payments – Foreign Exchange Rate determination

LEARNING OUTCOME

After the completion of the course the student will be able to understand the concepts of national income, theories buildup to understand macroeconomics. Understand better about the policies and government steps taken to control the economic transaction of the nation. Workout how the investment acts as a catalyst in national development.

SUGGESTED READING

1 Stonier & Hegue, A Text Book of Economic Theory.
2 Samuelson, P.A. 1948. Foundation of Economic Analysis. Harvard University Press.
3 M.C.Vaish, Allid, New Delhi, 1983 Macro – Economics Theory.
4 Gardner Ackley, Macmillan, NewYork, 1961Macro–EconomicsTheory.
5 T.F. Dernburg & D.M. Mcdougali - MacroEconomics.
6 G.Sirkin – Introduction to Macro–Economics Theory.
7 R.L. Heibroker – Understanding Macro–Economics.
8 J.K. Mehta – Macro Economics.
9 Michael R. Edgemand – Macro-Economics: Theory & Policy.
10 David'W. Pearce – The dictionary of modern Economics.

SUGGESTED WEBSITES

1 https://www.youtube.com/watch?v=VVy9s5p-zTM&t=37s
2 https://d3bxy9euw4e147.cloudfront.net/oscmsprodcms/media/documents/Macroeconomics2e-OP_08uAIKN.pdf
3 https://www.khanacademy.org/economics-finance-domain/macroeconomics-topic

AEC 505 APPLIED ECONOMETRICS 2+1

WHY THIS COURSE?

Development of analytical skills is imperative to make students proficient in conducting quality Research work. The knowledge of variables, their models, and problems encountered when dealing with variables will build up a compatibility with the analytical aspects.

AIM OF THE COURSE

The course provides knowledge of the econometric methods like time series analysis, linear regression models and their application in economic analysis. The course provides an insight into the econometric problems in analyzing time series and cross section data.

THEORY

Unit I: Introduction to CNLRM & OLS

Introduction – relationship between economic theory, mathematical economics, models and Econometrics – centrality of hypothesis testing – methodology of econometrics –correlation & regression analysis.

Unit II: Estimation of Regression and Test of Significance

Basic two variable regression model – assumptions, estimation and interpretation – approaches to estimation – OLS methods and its properties – extensions to multivariable models – multiple regression estimation and interpretation.

Unit III: Violation of CNLRM Assumptions

Violation of regression assumptions – Testing for the presence of multicollinearity - Zero-order correlation matrix - Auxiliary regressions - Eigen values, condition index and Variance inflation factor. Consequences and remedial measures for multicollinearity. Heteroscedasticity problem –Diagnostic techniques to identify Heteroscedasticity – Graphical method – Park test - Goldfeld – Quandt test and White's test. Consequences and remedial measures for heteroscedasticity - Weighted least Squares and transformation of original model - The problem of autocorrelation – Diagnostic techniques for autocorrelation – Graphical method, Durbin – Watson 'd' test – Breusch – Godfrey Test – Consequences and remedial measures for autocorrelation.

Unit IV: Dummy Variables and Panel Data

Dummy variable regression models – intercept and slope dummy – interaction dummy estimation and interpretation – Dummy dependent variable models – Linear probability models, logit and probit models-estimation and interpretation.

Unit V: Simultaneous Equations & Multivariate Analysis

Simultaneous equation models – structural equations – reduced form equations – identification and approaches to estimation.

PRACTICALS

Single equation two variable model specification and estimation – hypothesis testing – restrictions on parameters - transformations of functional forms and OLS application-estimation of multiple regression model - hypothesis testing - testing and correcting specification errors - testing and managing Multicollinearity – testing and managing Heteroscedasticity – testing and managing autocorrelation –estimation of regressions with dummy explanatory variables – Intercept and slope dummy variable models. Estimation of regression with limited dependent variable – Logit and probit models. Identification of quations in simultaneous equation systems

LECTURESCHEDULE

Unit I

1 Methods of analysis in social sciences
2 Positive and normative analysis
3 Econometrics and its relation with related fields
4 Hypothesis testing
5 Methodology of Econometrics
6 Introduction to correlation & regressions

Unit II

7 Specification of models
8 Data, variables and models
9 Correlation analysis
10 Regression – normality assumptions
11 Regression – violation of assumptions
12 Multiple linear regressions
13 Estimation and interpretation of multiple regressions

Unit -III

14 Methods of estimation–OLS
15 Methods of estimation–MLE
16 Problems in estimation
17 **Mid semester examination**
18 Testing for the presence of Multicollinearity
19 Multicollinearity (contd.)
20 Heteroscedasticity
21 Heteroscedasticity(contd.)
22 Autocorrelation
23 Autocorrelation(contd.)

Unit IV

24 Data issues – Model misspecification
25 Model misspecification (contd)
26 Distributed lag models

27 Dummy variable models intercept and slope dummy – interaction
28 Dummy estimation and interpretation Limited dependent variable
29 Limited dependent variable (contd.)
30 Limited dependent variable (contd.)

Unit V

31 Simultaneous equation models
32 Structural and reduced forms
33 Identification problem
34 Approaches to estimation of simultaneous equation models

PRACTICAL SCHEDULE

1 Hypothesis testing
2 Correlation analysis
3 Descriptive statistical analysis +
4 Estimation of simple regression models
5 Estimation of multiple regression models
6 Estimation of multiple regression models – matrix approach
7 Hypothesis testing with/ without parameter restrictions
8 Functional forms and regression estimation
9 Tests of multicollinearity
10 Tests of heteroscedasticity
11 Tests of autocorrelation
12 Tests of model misspecification
13 Estimation of dummy variable regressions and tests of structural change
14 Estimation of LPM, logitmodels
15 Specification of simultaneous equation model and deriving reduced form equations
16 Identification of simultaneous equation system
17 **Final practical examination**

LEARNING OUTCOME

After the completion of the course, the student will be able to understand the variables and the properties of regression models. Identify the problems in variables and remove them before conducting the analysis and avoid biased results.

SUGGESTED READING

1 Pindyck, R.S. and D.L. Rubinfeld, Econometrics Models and Econometric Forecasts, (New York: Mc Graw Hill), 1990.
2 Maddala G.S., Introduction to Econometrics, (New York: MacMillan), 1992.
3 Harry. H.Kelejian, and Walace E.Oates, Introduction to Econometrics

Principles and Applications, (NewYork: Harper and RowPub.)1994.

SUGGESTED WEBSITES

1 http://www.oswego.edu/~kane/economterics/chap_resources.html
2 http://econ.la.psu.edu/~hbierens/lecnotes.html
3 http://www.stata.com/features
4 http://varsitynotes.com/economics/econometrics.html

AEC 507 AGRICULTURAL FINANCE AND PROJECT IMPACT ANALYSIS 2+1

WHY THIS COURSE?

Money is the fuel of driving all the economic activities. India is a land of small and marginal farmers. The financial conditions of the farmers are not so strong that they can finance themselves. They require credit to meet the requirements of inputs. Thus, the student should know the sources, principles involved and types of credit available. The institutions involved and on what grounds the finance is given to the farmer. What are the risks involved and how to overcome them.

AIM OF THE COURSE

This course is designed with an objective to deliver knowledge of the principles, procedures, problems and policies relating to financing agricultural firms. In addition to this the students are also given knowledge about the research developments in the subject. The approach is analytic.

THEORY

Unit I: Basic concepts: A Review

Role and Importance of Agricultural Finance. Financial Institutions and Credit Flow to Rural/ Priority Sector. Agricultural Lending – Direct and Indirect Financing – Financing through Co-operatives, NABARD, Commercial Banks and RRBs. District Credit Plan and Lending to Agriculture /Priority Sector. Capital Formation in Agriculture. Non-banking financial institutions, Small finance banks. Recent Banking Reforms and its Impact on Agriculture. Digitization of banking sector. Micro-Financing and Role of MFI's - NGO's and SHGs/ JLGs. Financial Inclusion – Credit Linked Rural Development Programmes.

Unit II: Appraisal of Farm Credit Proposals

Lending to farmers – The concept of 3C's, 7P's and 3R's of credit. Estimation of Technical Feasibility, Economic Viability and Repaying Capacity of Borrowers and Appraisal of Credit Proposals. Understanding lenders and developing better working relationship and Supervisory Credit System. Overdue Problem – Causes, Consequences and Mitigating Measures. Credit Rationing. Credit Inclusion – Credit Widening and Credit Deepening. Macro finance assessment.

Unit III: Farm Financial Analysis

Financial Decisions – Investment, Financing, Liquidity and Solvency. Preparation of financial statements - Balance Sheet, Cash Flow Statement and Profit and Loss Account. Ratio Analysis and Assessing the performance of farm/firm.

Unit IV: Project Overview and Impact Analysis

Project Approach in Financing Agriculture. Project cycle - Identification, Preparation, Appraisal, Financing and Implementation of Projects. Project Appraisal – Financial, Economic and Environmental Appraisal of Investment Projects. Project Appraisal Techniques –Undiscounted Measures. Time Value of Money – Use of Discounted Measures – NPV, B-C Ratio, IRR, Modified IRR and Sensitivity analysis. Agreements, Supervision, Monitoring and Evaluation phases in Appraising Agricultural Investment Projects. Net Work Techniques – PERT and CPM. Project Impact Evaluation - meaning, Prospective versus Retrospective Impact Evaluation, Ethical Considerations - Impact evaluation for policy decision; Preparing for an evaluation - Initial Steps, Constructing a Theory of Change, Specifying Evaluation Questions, Selecting Outcome and Performance Indicators; Methods of Impact Evaluation – Causal Inference and Counter factuals, Randomized Assignment, Instrumental Variables, Regression Discontinuity Design, Difference-in-Differences, Propensity Score Matching.

Unit V: Risks and its Management

Risks in Financing Agriculture. Risk Management Strategies and Coping Mechanism. Crop Insurance Programmes – Review of Different Crop Insurance Schemes - Yield and Weather Based Insurance Schemes and their Applications – PMFBY and its features – Information asymmetry in Farm financing – Adverse selection and Moral hazard issues.

PRACTICALS

Development of Rural Institutional Lending-Branch Expansion, Demand and Supply of Institutional Agricultural Credit and Overdues and Loan Waiving: An Overview. Rural Lending Programmes of Commercial Banks and RRBs. Lead Bank Scheme - Preparation of District Credit Plan. Rural Lending Programmes of Co-operative Lending Institutions. NABARD–Functions. Visit to PCAS, RRBs and Lead

Bank. Financial Instruments and Methods – E - banking, Kisan Credit Cards and Core Banking. Performance of Micro Financing Institutions - NGO's and Self-Help Groups. Preparation of Financial Statements using Farm/ Firm Level Data. Farm Credit Appraisal Techniques and farm financial analysis through financial statements. Identification and Formulation of Investment Projects. Project Appraisal Techniques – Undiscounted and Discounted Measures and their Limitations - Sensitivity Analysis. Methods of Impact Evaluation- Randomized Assignment, Instrumental Variables, Difference-in-Differences, Propensity Score Matching. Network Techniques–PERT and CPM for Project Management. Case Study Analysis of an Agricultural Project. Financial Risk and Risk Management Strategies – Crop Insurance Schemes.

LECTURE SCHEDULE

Unit I

1 Role and Importance of Agricultural Finance in agriculture and rural development
2 Financial institution and Credit Flow to Rural/ Priority Sector – Direct and Indirect Financing to Rural Sector
3 Financing through Co-operatives, NABARD, Commercial Banks and RRBs
4 Lead Bank – District Credit Plan and Lending to Agriculture/ Priority Sector
5 Capital Formation in Agriculture, Non-banking financial institutions, Small finance banks
6 Recent banking reforms and its impact on agriculture. Digitization of banking sector
7 Micro-Financing and Role of MFI's - NGO's and SHGs/JLGs
8 Financial Inclusion - Overview
9 Credit Linked Rural Development Programmes

Unit II

10 Lending to farmers – The concept of 3C's,7P'sand3R'sofcredit
11 Technical Feasibility, Economic Viability and Repaying Capacity of Borrowers and Appraisal of credit proposals
12 Understanding lenders and developing better working relationship and Supervisory Credit System
13 Overdue Problem–Causes, Consequences and Mitigating Measures
14 Credit Rationing. Credit Inclusion – Credit Widening and Credit Deepening, Macro finance assessment

Unit III

15 Financial Decisions on Farm Investment. Preparation of Financial Statements – Balance Sheet, Profit and Loss Statement, Cash Flow Statement
16 Ratio Analysis - Leverage, Liquidity and Solvency Ratios
17 **Mid semester examination**
18 Assessing the Performance of Farm/ Firm – Farm Efficiency and Break-Even

Analysis

Unit IV

19 Project: meaning and approaches in Financing Agriculture, Project cycle

20 Financial, Economic and Environmental Appraisal of Investment Projects

21 Project Appraisal Techniques – Undiscounted Measures. Time Value of Money – Use of Discounted Measures – NPV, B-C Ratio, IRR, Modified IRR and Sensitivity Analysis

22 Agreements, Supervision, Monitoring and Evaluation phases in Appraising Agricultural Investment Projects

23 Project Impact Evaluation - meaning, Types, Ethical Considerations, Impact evaluation for policy decision

24 Preparing for an evaluation- Initial Steps, Constructing a Theory of Change, Specifying
Evaluation Questions, Selecting Outcome and Performance Indicators, Checklist: Getting Data for Your Indicators

25 Methods of impact evaluation – Causal Inference and Counter factuals

26 Methods of impact evaluation – Randomized Assignment, Instrumental Variables, Regression Discontinuity Design

27 Methods of impact evaluation - Difference-in-Differences, Propensity Score Matching

28 Net Work Techniques – PERT and CPM

Unit V

29 Risks in Financing Agricultural Projects

30 Risk Management Strategies and Coping Mechanism Adopted by Bankers and Firms/ Farms

31 Crop Insurance Programmes – Review of Different Crop Insurance Schemes

32 Yield loss and Weather Based Insurance Schemes and their Applications

33 PMFBY and its features

34 Information asymmetry in farm financing – Adverse selection and Moral hazard

PRACTICAL SCHEDULE

1 Development of Rural Institutional Lending – Branch Expansion

2 Demand and Supply of Institutional Agricultural Credit. Overdues and Loan Waiving: An overview

3 Rural Lending Programmes and Credit Policies Commercial Banks RRBs, FSS and LAMPS

4 Visit to PACS and RRB

5 Visit to a Lead Bank. Lead Bank Scheme, Preparation of District Credit Plan

6 Visit to NABARD to study the Organization and Functions

7 Financial Instruments and Methods – e-banking, Kisan Credit Cards and Core Banking
8 Performance of Micro Financing Institutions - NGO's and Self-Help Groups
9 Preparation of Financial Statements using Farm/ Firm Level Data and Ratio Analysis
10 Estimation of Technical Feasibility, Economic Viability and Repaying Capacity of Borrowers and Appraisal of Credit Proposals
11 Project Appraisal Techniques – Undiscounted Measures and their Limitations. Discounted Measures –NPV, BCR and IRR, Sensitivity Analysis for investment projects
12 Methods of Impact Evaluation – Randomized Assignment, Instrumental Variables
13 Methods of Impact Evaluation - Difference-in-Differences, Propensity Score Matching
14 Network Techniques–PERT and CPM for Project Management
15 Case Study Analysis of an Agricultural Project
16 Review of Different Crop Insurance Schemes – Yield and Weather Based Insurance Schemes and their Applications
17 **Final practical examination**

LEARNING OUTCOME

After the completion of the course the student will be able to - Understand the key issues of Finance in Agriculture. Learn the techniques of assessing the worth of a project.

SUGGESTED READING

1 E. DieSollem, H. and Heady, E.O.(Ed.). Capital and Credit Needs in Changing Agriculture, Bauman
2 Hopkins, A. Barry, PeterJo, and Baker,C.B., Financial Management in Agriculture
3 William G. Murray and Aaron G.Nelson, IowaStateUniversity,1960 Agricultural Finance
4 Agricultural Finance in India: Role of commercial banks, Charnjitchanona, Marketing and Economics Research Bureau, New Delhi,1969
5 Gittinger, J.P. 1972, Economic analysis of agricultural projects, JohnHopkins, Univ.Press, Baltimore
6 Little, I.M.D and J.A. Mirrless 1974, Project appraisal and Planning for developing countries, oxford and IBH publishing Co., New Delhi
7 Harberger, ArnoldC 1972, Project Evaluation, collected papers, Macmillan
8 Muniraj,R.1987. Farm Finance for Development. Oxford & IBH Publications
9 Paul J. Gertler, Sebastian Martinez, Patrick Premand, Laura B.Rawlings, and Christel M.J. Vermeersch, Impact Evaluation in Practice, The World

Bank, Washington, DC.

SUGGESTED WEBSITES

1 http://pages.stern.nyu.edu/~adamodar
2 www.microfinancegateway.org
3 http://www.ruralfinance.org
4 www.nabard.org
5 www.rbi.org

AEC 508 LINEAR PROGRAMMING 1+1

WHY THIS COURSE?

In sphere of management, it is important, to take correct decision of assigning tasks and roles to individuals. The business is full of uncertainty and in this situation the manager has to take decision under various risk situations. It becomes imperative to gain knowledge of models used for finding this solution of performing well.

AIM OF THE COURSE

The Objective of the course is to impart knowledge of Linear programming techniques and its applications in agricultural production decisions.

THEORY

Unit I: Introduction of LP

Decision Making – Concepts of decision making. Introduction to linear programming, uses of LP in Different fields, graphic solution to problems, Different form of LP.

Unit II: Methods of Solving LP

Simplex Method: Concept of simplex Method, solving profit maximization and cost minimizations problems. Formulation of farms and non-farm problems as linear programming models and solutions.

Unit III: Duality in LP and Sensitivity Analysis

Extension of Linear Programming models: Duality theory – definition of dual Problems – Duality Theorems – Dual simplex method – Primal dual method. Sensitivity analysis. Transportation problems.

Unit IV: Game Theory

Game Theory – Concepts of game theory, two-person constant sum, zero sum game, saddle point, solution to mixed strategies, the rectangular game as Linear Programming.

Unit V: Risk Programming

Risk and Uncertainty – Planning under Risk – Risk programming – MOTAD – Data Envelopment Analysis (DEA).

PRACTICALS

Graphical and algebraic formulation of linear programming models. Solving of maximization and minimization problems by simplex method. Sensitivity analysis in LP - Problems in Duality – Dual simplex method-formulation of problem and finding solution – Problems on Parametric linear programming-Problem on Integer Programming – Formulation of MOTAD and Targeted MOTAD problems and finding solution under risk environment - Formulation of Transportation problem and solution-Data Envelopment Analysis and estimating efficiency in agricultural production – Formulation of Compromise Programming problem and finding solution.

LECTURE SCHEDULE

Unit I

1 Decision Making – Concepts of decision making, introduction to quantitative tools
2 Introduction to linear programming(LP) – Assumptions of LP – significance of Assumptions –Advantages and limitations of LP-Applications of LP
3 General Formulation of LP problem- Standard form of LP problem - Matrix form of LP problem. Graphical solution of LP problem

Unit II

4 Simplex Method: Concept of simplex Method, solving LP problem by Simplex method
5 Method, solving profit maximization and cost minimizations problems by simplex method
6 Formulation of farm problem as linear programming model and solutions

Unit III

7 Integer linear programming – introduction – formulation of problem
8 **Mid semester examination**
9 Duality theory–definition of dual Problems -Duality theorems
10 Dual simplex method and Primal-dual method
11 Sensitivity analysis – introduction – forms of sensitivity analysis
12 Transportation problem – formulation and methods of solving Transportation problem

Unit IV

13 Concepts of game theory, two-person constant sum, zero sum game

14 Solution to mixed strategies, the rectangular game as Linear Programming

Unit V

15 Risk and Uncertainty – Planning under Risk

16 Risk programming models formulation – MOTAD – introduction – problem formulation

17 Data Envelopment Analysis (DEA)-introduction-application of LP to estimate technical efficiency

PRACTICAL SCHEDULE

1 Formulation of general Linear Programming Problem - Farm visit
2 Graphical solution of LP problem-formulation and finding solution
3 Formulation of the simplex matrices for typical farm situations
4 Solving of maximization problems by simplex method
5 Solving of minimization problems by simplex method
6 Sensitivity analysis in LP
7 Problems in Duality
8 Dual simplex method – formulation of problem and finding solution
9 Problems on Integer Programming
10 Formulation of MOTAD problem and finding solution under risk environment
11 Problems in Targeted MOTAD
12 Transportation problem – formulation and finding solution
13 Data Envelopment Analysis and estimating efficiency in agricultural production
14 Formulation of Compromise Programming problem and finding solution
15 Game theory applications in decision making
16 Problems in two-person constant sum, zero sum game
17 **Final practical examination**

LEARNING OUTCOME

After successful completion of this course, the student will be able to gain expertise in formulating Problems in agricultural production and marketing problem into mathematical form and workout the optimum solutions. They are able to apply the knowledge of different models in better decision making and controlling of the firm.

SUGGESTED READING

1 Murtagh,B.,AdvancedLinearProgramming,McGraw-Hill,1981.

2 Sharma.S.D. 1985. Linear Programming and Theory of Games, Kedar Nath Ram Nath And Co, Meerut, India.

3 Thie, P.R., An Introduction to Linear Programming and Game Theory, Wiley,1988.

4 ShenoyG.1989. Linear Programming – Principles & Applications. WileyEasternPubl.

5 Nering,E.D.&Tucker,A.W.,Linear Programs and Related Problems, AcademicPress,1993.
6 Ignizio,J.P.&Cavalier,T.M.,Linear Programming,PrenticeHall,1994.
7 Saigal, R., Linear Programming: A Modern Integrated Analysis, Kluwer Academic Publishers,1995.
8 Dorfman R. 1996. Linear Programming & Economic Analysis. McGraw Hill. Loomba NP.2006. Linear Programming. Tata McGraw Hill.
9 Vaserstein.2006. Introduction to Linear Programming. Pearson Education Publication.
10 Jiri Matousek, Bernd Gärtner 2007. Understanding and Using Linear Programming, Springer Berlin Heidelberg, New York.
11 Robert Vanderbei 2008.Linear Programming: Foundations and Extension, Springer publications.

SUGGESTED WEBSITES

1 Thomas S. Ferguson, Linear Programming – A Concise introduction ttps://www.math.ucla.edu/~tom/LP.pdf
2 JEBeasley,OR-Notes http://people.brunel.ac.uk/~mastjjb/jeb/or/morelp.html
3 https://www.analyticsvidhya.com/blog/2017/02/lintroductory-guide-on-linear-programming-
4 https://wps.pearsoned.co.uk/ema_ge_render_qam_11/202/51952/13299752.cw/index.html

AEC 509 RESEARCH METHODOLOGY FOR SOCIAL SCIENCES 1+1

WHY THIS COURSE?

Developing research issues and planning research is very essential for conducting good research. This will help the students in understanding the underlying principles of development research methodology that will complement and extend the more specialized knowledge and to give an insight to the student about how to conduct a research, right from data collection to analysis and finally writing the references.

AIM OF THE COURSE

The main objective of this course is to expose the students to research methodology used in social sciences. The focus will be on providing knowledge related to research process – identification of research problems, formulation of objectives, construction of hypotheses, sampling techniques, data collection and data analysis, hypothesis testing, interpretation of results, report writing, etc.

THEORY

Unit I: Concepts of Research Methodology

Importance and Scope of Research in Agricultural Economics. Types of Research – fundamental vs Applied Research. Qualitative vs Quantitative Research. Concept of Researchable Problem – Research Prioritization–Selection of Research Problem.

Unit II: Research Process and Hypothesis

Approaches to Research – Research Process. Project Proposals – Contents and Scope – Different Types of Projects to Meet Different Needs – Trade-Off Between Scope and Cost of the Study. Review of Literature-online sources. Purpose Statement. Research Design and Techniques – Types of Research Design. Framing and Testing Hypothesis – Meaning – Characteristics – Types of Hypothesis - Setting of Objectives and Hypotheses –testing of hypothesis.

Unit III: Sampling

Sampling Theory and Sampling Design – Sampling Error – Methods of Sampling – Probability and Non-Probability Sampling Techniques – Criteria to Choose. Sampling Distribution –z, t, χ^2 and F.-Methods of Conducting Survey – Reconnaissance Survey and Pre-Testing.

Unit IV: Data Collection

Data Collection – Assessment of Data Needs – Sources of Data Collection – Discussion on Sampling under Different Situations. Participatory Rural Appraisal (PRA) Technique. Experimental methods-Randomized Control Trails–Natural Experimental methods and Quasi Natural Experimental Methods, Mailed Questionnaire and Interview Schedule – Structured, Unstructured, Open Ended and Closed Ended Questions. Scaling Techniques. Preparation of Schedule – Problems in Measurement of Variables in Agriculture. Interviewing Techniques and Field Problems – online survey methods.

Unit V: Data Analysis and Report Writing

Coding, Editing – Tabulation – Validation of Data. Tools of Analysis – Data Processing. Hypotheses-Testing of Hypothesis – Parametric and Non–Parametric Testing. Multivariate analysis–factor analysis 'PCA' cluster analysis. Interpretation of Results – Preparing Research Report/ Thesis–Universal Procedures for Preparation of

Bibliography – Writing of Research Articles – publication ethics - plagiarism–reference management.

PRACTICALS

Exercises in Problem Identification. Project Proposals – Contents and Scope. Formulation of Objective and Hypotheses. Assessment of Data Needs – Sources of Data – Methods of Collection of Data. Methods of Sampling – Criteria to Choose – Discussion on Sampling under Different Situations. Participatory Rural Appraisal Techniques. RCT & Experimental methods. Scaling Techniques – Measurement of Scales. Preparation of Interview Schedule - Field Testing. Method of Conducting Survey. Exercise on Coding, Editing, Tabulation and Validation of Data. Preparing for Data Entry into Computer. Hypothesis Testing – Parametric and Non-Parametric Tests. Multivariate analysis–factor analysis 'PCA' cluster analysis. Exercises on Format for Thesis/ Report Writing. Presentation of the Results.

LECTURE SCHEDULE

Unit I

1 Importance and Scope of Research in Agricultural Economics

2 Types of Research – Fundamental vs Applied Research. Qualitative vs Quantitative Research

3 Concept of Researchable Problem – Research Prioritization – Selection of Research Problem

Unit II

4 Approaches to Research – Assumptions and Limitations of Research Process

5 Project Proposals – Contents and Scope – Different Types of Projects to Meet Different Needs–Trade-Off Between Scope and Cost of the Study

6 Review of Literature. Purpose Statement. Research Design and Techniques – Types of Research Design

7 Framing and Testing Hypothesis – Meaning – Characteristics – Types of Hypothesis – Setting of Objectives and Hypotheses – testing of hypothesis. Sampling Theory and Sampling Design – Sampling Error

8 **Mid semester examination**

Unit III

9 Methods of Sampling – Probability and Non-Probability Sampling Techniques Criteria to Choose. Sampling Distribution – z, t, χ^2 and F. tests

10 Methods of Conducting Survey – Reconnaissance Survey and Pre-Testing

Unit IV

11 Data Collection – Assessment of Data Needs – Sources of Data Collection – Discussion on Sampling under Different Situations, Participatory Rural Appraisal (PRA) Techniques, Experimental methods – Randomized Control Trails – Natural Experimental methods and Quasi Natural Experimental

Methods

12 Mailed Questionnaire and Interview Schedule – Structured, Unstructured, Open Ended and Closed Ended Questions

13 Scaling Techniques

14 Preparation of Schedule – Problems in Measurement of Variables in Agriculture. Interviewing Techniques and Field Problems

Unit V

15 Coding, Editing – Tabulation – Validation of Data. Tools of Analysis – Data Processing. Hypotheses – Testing of Hypothesis – Parametric and Non–Parametric Testing

16 Multi variate analysis – factor analysis 'PCA' cluster analysis

17 Interpretation of Results – Preparing Research Report/ Thesis – Universal Procedures for Preparation of Bibliography – Writing of Research Articles

PRACTICAL SCHEDULE

1 Exercises in Problem Identification

2 Project Proposals – Contents and Scope

3 Formulation of Objective and Hypotheses

4 Assessment of Data Needs – Sources of Data – Methods of Collection of Data

5 Methods of Sampling – Criteria to Choose – Discussion on Sampling under Different Situations

6 Participatory Rural Appraisal Techniques

7 Participatory Rural Appraisal Techniques

8 RCT & Experimental methods

9 Scaling Techniques – Measurement of Scales

10 Preparation of Interview Schedule – Field Testing

11 Method of Conducting Survey

12 Exercise on Coding, Editing, Tabulation and Validation of Data. Preparing for Data Entry Into Computer

13 Hypothesis Testing – Parametric and Non-Parametric Tests

14 Multi variate analysis – factor analysis 'PCA' cluster analysis

15 Exercises on Format for Thesis/ Report Writing

16 Presentation of the Results

17 **Final practical examination**

LEARNING OUTCOME

After the successful completion of this course, student will be able to understand fundamentals of research. How to carefully plan out the research work and conduct it?

SUGGESTED READING

1 Kothari, C.R. 2004. Research Methodology- Methods and Techniques. Wishwa Prakashan, Chennai.

2 Ranjith Kumar, 2011, ResearchMethodology-astepbystepguideforbeginners, 3rd Edition, SAGE Publications.
3 Nirmal Ravi Kumar, K. 2015, Research Methodology in Agricultural Economics, Daya Publishing House.
4 Black, T.R. 1993. Evaluating Social Science Research – An Introduction. SAGE Publications
5 Rao, K.V. 1993. Research Methodology in Commerce and Management. Sterling Publications.
6 Singh, A.K.1993. Tests, Measurements and Research Methods in Behavioural Sciences. Tata McGraw-Hill Publications.
7 Dhondyal, S.P.1997. Research Methodology in Social Sciences and Essentials of Thesis Writing. Amman Publishing House, NewDelhi.
8 Venkatasubramanian, V. 1999. Introduction to Research Methodology in Agricultural and Biological Sciences. SAGE Publications.
9 Creswell, J.W. 1999. Research Design - Qualitative and Quantitative Approaches. SAGE Publications.

SUGGESTED WEBSITES

1 https://www.ebooks.comResearchMethodology.C.R.Kothari.
2 http://www.sociology.kpi.ua/wp-content/uploads/2014/06/Ranjit_Kumar-Research Methodology-A_Step-by-Step_G.pdf

MINOR COURSES

AEC 506 AGRICULTURAL DEVELOPMENT AND POLICY ANALYSIS 2+0

WHY THIS COURSE?

This course is required to upscale the knowledge of students about Development Economics, Economic growth models.

AIM OF THE COURSE

To provide orientation to the students regarding the concepts and measures of economic growth and development; to provide orientation on Theories of economic growth and relevance of theories in developing countries; to make them understand the agricultural policies and its effect on sustainable agricultural development and to make them to understand the globalization and its Impact on agricultural development.

THEORY

Unit I: Development Economics – Concepts and Measurement

Development Economics – Scope and Importance – Economic development and economic growth – divergence in concept and approach – Indicators and Measurement of Economic Development – GNP as a measure of economic growth –

New Measures of Welfare – NEW and MEW – PQLI – HDI – GDI – Green GNP – Trade for peace and global peace index. Criteria for underdevelopment – Characteristics of less developed nations – Obstacles to economic development–Economic and Non-Economic factors of economic growth.

Unit II: Theories of Economic Growth and Development

Economic development–meaning, stages of economic development, determinants of economic growth. Theories of economic growth–Classical Approach: AdamSmith, Ricardo, Marx and Schumpeter – Neoclassical approach; Meade's model, Robinson, Solow, Kaldor and Harrodand Domar. Theories of Economic Development, Rostow, Rosenstein -Roden, Nurske, Hirschman, Leibenstien and Arthur Lewis, Aminand Frank (Dependency school). Utilitarian and Welfarist approach to social development and A.K.Sen'scritique. Sen's capability approach to economic development. Basics of Endogenous Growth Theory. Optimal Economic Growth –Recent Experiences of developing country economies in transition – Role of state in economic development – Government measures to promote economic development. Introduction to development planning.

Unit III: Agricultural Policies

Role of agriculture in economic / rural development – theories of agricultural development – Population and food supply – need for sound agricultural policies – resource policies–credit policies –input policy, marketing policies, Price policies. Economic policies for pandemic/ disaster management Federal and state policies – Tamil Nadu State policies.

Unit IV: Sustainable Agricultural Development

Development issues, poverty, inequality, unemployment and environmental degradation –Models of Agricultural Development – Induced Innovation Model – policy options for sustainable agricultural development – Case studies related to Sustainable Development.

Unit V: Globalization and Its Impact on Agricultural Development

Globalization and the relevance of development policy analysis – The dilemma of free trade? – Free trade versus Protectionism- Arguments for protection. Arguments against protection. Role of protection in Developing Countries. Theory of Tariffs – Regional trade arrangements – Financial Crisis – Asian financial crisis 1997, Global financial crisis2008, Euro Zone crisis - Causes and impacts; WTO Agreement on Agriculture – Contradictions of free trade – proponents and opponent's policies in vulnerable sectors like agriculture – Lessons for developing countries.

LECTURESCHEDULE

Unit I

1 Introduction to Development Economics – Scope and Importance - Economic growth and Development – concepts and approaches

2 Indicators and Measurement of Economic Development - Measures of economic growth /Development–Gross National Product and other measures

3 New Measures of Welfare – NEW and MEW – PQLI – HDI – Green GNP Trade for peace and Global peace index

4 Criteria for underdevelopment – Obstacles to economic development – Economic and Non-Economic factors of economic growth

Unit II

5 Economic development – meaning, stages of economic development – Marx and Rostow, determinants of economic growth.

6 Theories of economic growth – Classical theories –Adam Smith growth model, Ricardian Growth model, Marx and Schumpeter

7 Theories of economic growth – Neo Classical theories – Harrod-Domar model, The Kaldor model

8 Theories of economic growth – Neo Classical theories - Meade's model, Robinson, Solow – Optimal Economic growth

9 Theories of Economic Development - Rostow, Rosenstein-Roden, Nurske

10 Theories of Economic Development- Hirschman, Leibenstien and Arthur Lewis, Amin and Frank

11 Utilitarian and Welfarist approach to social development and A.K. Sen'scritique. Sen's Capability approach to economic development

12 Recent Experiences of developing country economies in transition

13 Role of state in economic development – Need, Status and Problems

14 Government measures to promote economic development – Development planning

Unit III

15 Role of agriculture in economic/ rural development – Developing and Developed country perspectives

16 Theories of agricultural development – Population and food supply – status and issues –food policy

17 **Mid semester examination**

18 Need for Agricultural policies – Policy analysis framework

19 Resource policies–land reform policy ,irrigation policy

20 Resource policies–fisheries policy and forestry policy

21 Resource policies-Credit policies, Input policies

22 Resource policies – Marketing policies, Policies related to agricultural prices Economic policies for pandemic/ disaster management Federal and state policies – Tamil Nadu State policies

Unit IV

23 Development issues - poverty, inequality
24 Development issues – Unemployment and environmental degradation
25 Models of Agricultural Development – Induced Innovation model
26 Policy options for sustainable agricultural development
27 Case studies discussion related to Sustainable Development

Unit V

28 Globalization and the relevance of development policy analysis
29 The dilemma of Free trade? – Free trade versus Protectionism - livelihood security of Peasants, Artisans – Country experiences
30 Protectionism – Arguments for/ against protectionism – Role of protection in Developing countries
31 Theory of Tariffs – Regional trade arrangements
32 Financial Crisis - Asian financial crisis 1997, Global financial crisis 2008, Euro Zone crisis -Causes and impacts
33 WTO and Agreement on Agriculture – Various provisions and implications
34 Contradictions of Free trade – proponents and opponents policies in vulnerable sectors likeAgriculture Discussion and Review – Lessons for Developing Countries

LEARNING OUTCOME

After successful completion of the course, the student will be able to understand the development Economics, economic growth models, agricultural policies, globalization and its impact on agriculture.

SUGGESTED READING

1 K.K. Diwett, "Modern Economic Theory" (New Delhi: S.Chand & Company limited), 2002.
2 Naqvi Syed Nawab Haider, "Development Economics – Nature and Significance" (New Delhi: Sage Publications), 2002.
3 Jhingan, M.L., "The Economics of Development and Planning", (New Delhi: Vrinda Publication), 1998.
4 Eicher, K.C. and John M. Staatz, "International Agricultural Development" (Baltimore: The Johns Hopkins University Press), 1998.
5 Pretty N.J ules, "Regenerating Agriculture – Polices and Practice for Sustainability and Self Reliance"(New Delhi: Vikas Publishing House),1995.
6 Ellis Frank, "Agricultural Polices in Developing Countries" (New York: Cambridge University Press), 1992.

SUGGESTED WEBSITES

1 http://www.economicsonline.co.uk/Global_economics/Growth_theories.html

2 www.danielsolis.webs.com/Classic.pdf
3 web.uvic.ca/~ramanik/320s/chapter4.ppt
4 http://wps.aw.com/aw_todarosmit_econdevelp_8/4/1111/284635.cw/index.html
5 www.cato.org/pubs/journal/cj29n2/cj29n2-2.pdf
6 https://mises.org/books/economic_development_robbins.pdf

AEC 511 INTERNATIONAL ECONOMICS 1+1

WHY THIS COURSE?

The era of Globalisation, liberalization and privatization has unified the whole world. There is trade across national boundaries and one economy has effect on the other. Getting familiar with national economy is not sufficient to understand the mechanism of trade and economic aspects. Thus, this course is designed to teach student about the trade as international level

AIM OF THE COURSE

The major objective of this course is to give an insight of the interactions between national economies. What are the theories governing the trade across national boundaries. The methods Involved to regulate the international trade and institutions involved.

THEORY

Unit I: Scope and Importance of International Economics

Scope and Significance of International Economics - Role of trade - General Equilibrium in a Closed Economy (Autarky Equilibrium) – Equilibrium in a Simple Open Economy – Possibility of World Trade – Trade gains and Trade Equilibrium.

Unit II: Trade Policy Instruments & Barriers

Trade policy instruments - Tariff, Producer Subsidy, Export Subsidy, Import Quota and Export Voluntary Restraints – Case of Small Country and Large Country and National Welfare.

Unit III: Trade Models

Ricardian Model of Trade – Specific Factors Model - Heckscher-Ohlin Model-Trade Creation and Trade Diversion – Offer Curve – Export Supply Elasticity and Import Demand Elasticity – Comparative Advantage and Absolute Advantage – New Trade Theory (NTT) and its implications.

Unit IV: International Finance

Official Exchange Rate and Shadow Exchange Rate – Walras Law and Terms of Trade – Trade Blocks. Balance of Payment, Foreign Direct Investment and Exchange Rate relationships and determination.

Unit V: Trade Institutions

IMF, World Bank – International Trade agreements – FTA/ RTA – Uruguay Round – GATT –WTO – Agreement on Agriculture (AoA).

PRACTICALS

Producer's Surplus, Consumer's Surplus, National Welfare under Autarky and Free Trade Equilibrium with small and large country assumption- Estimation of Trade Gains- Estimation of competitive and comparative measures like NPC, EPC, ERP and DRC- Estimation of Offer Curve Elasticity - Estimation of Effect of Tariff, Export Subsidy, Producer Subsidy, Import Quota and Export Voluntary Restraints on National Welfare – Estimation of Ricardian Model – Estimation of Effect of Trade under Specific Factor Model – Estimation of trade Equilibrium under Heckscher-Ohlin model – Trade Creation and Diversion – Exchange Rate determination.

LECTURE SCHEDULE

Unit I

1 International Economics – scope and importance
2 Gains of trade and reasons for nations to trade
3 Comparative Advantage and Absolute Advantage
4 Offer Curve - Export Supply Elasticity and Import Demand Elasticity – community in difference curve
5 General Equilibrium in a Closed and open Economy (Autarky Equilibrium)
6 Trade creation and diversion – net welfare

Unit II

7 Trade policy instruments – Tariff and nontariff measures
8 **Mid semester examination**
9 Case of Small Country and Large Country and National Welfare

Unit III

10 Trade models – classical and neo classical: Ricardian Model of Trade- Specific Factors Model-Heckscher –Ohlin Model
11 New Trade Theory (NTT)and welfare implications

Unit IV

12 Official Exchange Rate and Shadow Exchange Rate
13 Walras Law and Terms of Trade – Trade Blocks.
14 Balance of Payment, Foreign Direct Investment and Exchange Rate

relationships and determination.

Unit V

15 IMF, World Bank – International trade organizations

16 Trade agreements–FTA/RTA

17 Uruguay Round–GATT–WTO–Agreement on Agriculture (AoA).

PRACTICAL SCHEDULE

1 Estimation of absolute and comparative advantage

2 Estimation of producer & consumer surplus

3 National welfare under open & closed economy

4 Welfare measures under small country assumptions

5 Welfare measures under large country assumptions

6 Trade estimation under neo classical models

7 Trade estimation under New Trade models

8 Deriving trade elasticity for major traded commodities-I

9 Deriving trade elasticity for major traded commodities-II

10 Measuring export competitiveness–I

11 Measuring export competitiveness–II

12 Estimation of terms of trade

13 Impact of RTA/FTA and sectoral analysis

14 Balance of payment and exchange rate determination

15 Impact of WTO

16 Impact of Agreement on Agriculture

17 **Final practical examination**

LEARNING OUTCOME

After successful completion of the course the student will be able to – Understand how trade take place between nations. Be able to work out strategies to maintain a favourable trade balance. Understand how the institutions play role in regulating the cross country trade and deal with the issues.

SUGGESTED READING

1 Dennis R. Apple Yard and Alfred J.Field Jr.1995. International Economics – Trade, Theory And Policy Irwin, Chicago.

2 Steven Husted and Melvin, Michael. 2012 International Economics 9th edition. Prentice Hall Publications.

3 Krugman PR & Obstfeld M. 2000. International Economics – Theory and Policy. Addison -Wesley

SUGGESTED WEBSITES

1 http://www.internationalecon.com/Trade/Tch5/Tch5.php

2 http://ocw.mit.edu/courses/economics/14-581-international-economics-i-spring-2013/

3 **http://catalog.flatworldknowledge.com/catalog/editions/suranovic-international-economics-** theory-and-policy-1-0

AEC 513 NATURAL RESOURCE AND ENVIRONMENTAL ECONOMICS 1+1

WHY THIS COURSE?

Sustainable development is the need of the hour. The economic activities affect not only the society but also the environment. Every activity has its social cost. The students hence will be taught about the economic aspect of environment.

AIM OF THE COURSE

- To introduce economics principles related to natural resource and environmental economics.
- To explore the concept of efficiency and the efficient allocation of natural resources.
- To understand the economics of why environmental problems occur.
- To explore the concept of efficiency and the efficient allocation of pollution control and pollution prevention decisions.
- To understand the environmental policy issues and alternative instruments of Environmental policies.

THEORY

Unit I: Basic Foundation

Concepts, Classification and Problems of Natural Resource Economics–Economy Environment interaction – The Material Balance principle, Entropy law - Resources Scarcity – Limits to Growth –Measuring and mitigating natural resource scarcity – Malthusian and Recardian scarcity – scarcity Indices – Resource Scarcity and Technical Change.

Unit II: Theories and Economics of Natural Resources

Theory of optimal extraction of exhaustible or nonrenewable resources – economic models of oil extraction - efficiency - time path of prices and extraction - Hotelling's rule, Solow- Harwick's Rule – Theory of optimal extraction of renewable resources – economic models of forestry and fishery.

Unit III: Market failures and Environmental Issues

Market failures – externalities – types – property rights – transaction costs – Coase's theoremandits critique - public goods - common property and open access resource management – Collective action – Environmental perspectives -

biocentrism, sustainability, anthropocentrism - Environmental problems and quality of environment - Sources and types of pollution - air, water, solid waste, land degradation – environmental and economic impacts-Economics of pollution control – efficient reduction in environmental pollution.

Unit IV: Environmental Regulations

Environmental regulation – economic instruments – pollution charges – Pigovian tax–tradable permits – indirect instruments – environmental legislations in India.

Unit V: Sustainability Aspects

Concept of sustainable development – Economic Perspective - Indicators of sustainability Relation between development and environment stresses – Environmental Kuznet's curve –Environmental Accounting – resource accounting methods – International Environmental Issues –climate change – likely impacts – mitigation efforts and international treaties.

PRACTICALS

Exhaustible resource management – optimum rate of oil extraction. Renewable resource management – optimum harvest of Forestry/ fishery. Exercise on pollution abatement –I. Exercise on pollution abatement – II. Concepts in valuing the environment. Taxonomy of valuation techniques. Productivity change method – substitute cost method - Hedonic price method – Travel cost method –Contingent valuation methods. Discount rate in natural resource management. Environment impact assessment. Visit to Pollution Control Board

LECTURE SCHEDULE

Unit I

1 An introduction to natural resource economics - Concepts, Classification and Problems of Natural Resource Economics
2 The Material Balance principle and Entropy law- Resources Scarcity and Limits to Growth
3 Measuring and mitigating natural resource scarcity – Malthusian and Ricardian scarcity –Scarcity indices – Resource Scarcity and Technical Change

Unit II

4 Theory of optimal extraction of exhaustible or non renewable resource s– economic models of oil extraction
5 Efficiency-time path of prices and extraction - Hotelling’s rule, Solow-Harwick's Rule
6 Theory of optimal extraction of renewable resources -Economic models of forestry and fishery

Unit III

7 Market failures – Externalities and its types - Environmental problems and quality of environment

8 **Mid semester examination**

9 Property rights – transaction costs – Coase's theoremandits critique

10 Common property and open access resource management – Collective action

11 Introduction to Environmental Economics - Environmental perspectives - biocentrism, sustainability, anthropocentrism

12 Sources and types of pollution – air, water, solid waste, land degradation – environmental and Economic impacts

13 Economics of pollution control – efficient reduction in environmental pollution

Unit IV

14 Environmental regulation – economic instruments - Pollution charges – Pigovian tax – Tradable permits – indirect instruments – environmental legislations in India

Unit V

15 Concept of sustainable development - Economic Perspective-Indicators of sustainability

16 Relation between development and environment stress-Environmental Kuznet's curve

17 Environmental Accounting – resource accounting methods - International Environmental Issues – Climate change –likely impacts-mitigation efforts and international treaties

PRACTICAL SCHEDULE

1 Exhaustible resource management–optimum rate of oil extraction

2 Exhaustible resource management–optimum rate of oil extraction

3 Renewable resource management–optimum harvest of Forestry/fishery

4 Renewable resource management–optimum harvest of Forestry/fishery

5 Exercise on pollution abatement-I

6 Exercise on pollution abatement-II

7 Concepts in valuing the environment

8 Taxonomy of valuation techniques

9 Productivity change method – substitute cost method

10 Hedonic price method

11 Travel cost method

12 Contingent valuation methods.

13 Discount rate in natural resource management

14 Environment impact assessment

15 Environment impact assessment

16 Visit to Pollution Control Board

17 **Final practical examination**

LEARNING OUTCOME

After successful completion of this course, the student will be able to-Work out the plan for extraction/use of natural resource in most economical way. Understand the environment and its pollution. Learn how markets are affected if environment is not taken into consideration. Gain Proficiency in rules and regulation governing economic aspect of environment.

SUGGESTED READING

1 Pearce, David W and Kerry Turner, (1990). Economics of Natural Resources and the Environment, Baltimore: John Hopkins University Press.

2 Prato, Tony.(1998), Natural Resource and Environmental Economics, Ames: Iowa State University Press, ebook.

3 James Kwak (2017) Economism: Bad Economics and the Rise of Inequality, Pantheon book series.

4 Tom Tietenberg and Lynne Lewis (2018) Environmental and Natural Resource Economics, 11th edition, Pearson education, e-book.

5 Peter M. Schwarz (2018) Energy Economics, 1stedition, Routledge publications.

6 Krutilla, J. V and A. C. Fisher (1975), The Economics of Natural Environments: Studies in the Valuation of Commodity and Amenity Resources, Baltimore: The Johns Hopkins University Press.

7 Baumol, W.J. and Wallace E Oates. (1988). The Theory of Environmental Policy, 2nded Cambridge: Cambridge University Press.

8 Ahmad,Y.,S. ElSerafy and E.Lutz(eds)(1989),Environmental Accounting for Sustainable Development, Washington,D.C.: World Bank.

9 Mitchell, R.C. and R.T. Carson (1989), Using Surveys to Value Public Goods: The Contingent Valuation Method, Washington, D.C.: Resources for the Future.

10 Freeman, A.M. The Measurement of Environmental and Resource Values. Resources for the Future Press, Baltimore. 1993.

11 Kahn, J.R. 1995. The Economic Approach to Environmental and Natural Resource Economics.Orlando:Dryden,HarcourtBrace.501p.

12 Kerr, J.M., D.K. Marothia, Katarsingh, C. Ramasamy and W.R. Bentley (1997), Natural Resource Economics: Theory and Applications in India, New Delhi: Oxford & IBH Publishing Co.

13 Hartwick, J.M. and N.D. Olewiler. (1998). The Economics of Natural Resource Use,2nd ed. Reading, MA: Addison- Wesley Educational Publishers, Inc.

14 Conrad, Jon M. (1999). Resource Economics, New York: Cambridge University Press.

15 Kolstad, CharlesD.(2000)Environmental Economics, Oxford: Oxford University Press.

16 Hackett, S.C. 2001. Environmental and Natural Resource Economics: Theory, Policy, and the Sustainable Society. M.E.Sharpe, Armonk, NY.
17 Ehrlich, P.R. and A.H. Erhlich. 2002. Environment and Development Economics 7(2002): 158-170.

SUGGESTED WEBSITES

1 www.rff.org
2 www.rmi.org
3 www.worldbank.org
4 www.oecd.org
5 www.epa.gov
6 www.moef.gov.in
7 www.greenosai.org

AEC 514 COMMODITY FUTURES TRADING 2 + 0

WHY THIS COURSE?

The era of Globalisation, liberalization and privatization has unified the whole world. There is trade across national boundaries and one economy has effect on the other. Getting familiar with national economy is not sufficient to understand the mechanism of trade and economic aspects. Thus, this course is designed to teach student about the trade as international level.

AIM OF THE COURSE

This course is aimed at providing the basic understanding and the value of futures markets for the stakeholders who in turn will manage the commodity price risk and price discovery process in the commodity markets.

THEORY

Unit I: Introduction to Commodity Markets

History and Evolution of commodity markets – Terms and concepts: spot, forward and futures Markets – factors influencing spot and future markets. Speculatory mechanism in commodity futures

Unit II: Functioning of Commodity Markets

Transaction and settlement – delivery mechanism – role of different agents – trading strategies - Potential impact of interest rate, Foreign Exchange, FDI in Commodity Markets.

Unit III: Risks in Trading Commodity Futures

Risk in commodity trading, importance and need for risk management measures – managing market price risk: hedging, speculation, arbitrage, swaps – pricing and their features.

Unit IV: Market Regulation

Important global and Indian commodity exchanges - contracts traded – special features - Regulation of Indian commodity exchanges - SEBI and its role.

Unit V: Technical Analysis

Fundamental Vs Technical analysis – construction and interpretation of charts and chart patterns for analyzing the market trend – Market indicators – back testing. Introduction to technical analysis software – analyzing trading pattern of different commodity groups.

LECTURE SCHEDULE

Unit I

1 History and evolution of commodity markets
2 Terms and concepts – spot and forward markets
3 Futures markets
4 Factors influencing spot markets
5 Factors influencing futures markets
6 Speculatory mechanism in commodity futures

Unit II

7 Process of hedging
8 Trading in commodity futures
9 Clearing process in commodity futures

10 Settlement procedures.
11 Role of market participants in commodity ecosystem
12 Trading strategies
13 Impact of FDI, exchange rate on markets

Unit III

14 Major risks of trading in commodity futures.
15 Managing risks: Arbitrage
16 Managing risks: Swaps, Options
17 **Mid semester examination**
18 Need for price risk management and price discovery
19 Pricing mechanism in commodity futures

Unit IV

20 Major national and international commodity exchanges
21 Nature of contracts traded
22 Regulation of commodity exchanges
23 Role of SEBI - FMC

Unit V

24 Fundamental Analysis
25 Technical analysis
26 Construction of charts
27 Interpretation of charts
28 Chart patterns for trading
29 Market indicators
30 Back testing
31 Introduction to analytical softwares – technicalanalysis I
32 Introduction to analytical softwares – technicalanalysis II
33 Trading pattern of commodity groups
34 Dissemination of market information

LEARNING OUTCOME

After successful completion of the course the students will be able to understand the functioning of Commodity futures in India, regulation of commodity markets and technical analysis for understanding the hidden pattern in the commodity price movements.

SUGGESTED READING

1 Kaufman PJ.1986. The Concise Handbook of Futures Markets. John Wiley & Sons.
2 Leuthold RM, Junkus JC & Cordier JE.1989. The Theory and Practice of Futures Markets. LexingtonBooks.
3 Purcell WD. 1991. Agricultural Futures and Options: Principles and Strategies. Macmillan Publ.

4 Wasendorf RR & Mc Cafferty 1993. All about Commodities from the Inside Out. McGraw-Hill. LoftonT. 1993. Getting Started in Futures. 3rd Ed.JohnWiley&Sons,1993.

SUGGESTED WEBSITES

1 http://www.sebi.gov.in
2 http://mcxindia.com
3 http://ncdex.com
4 www.moneycontrol.com
5 www.commodityonline.com

AEC 515 DEVELOPMENT ECONOMICS 2+0

WHY THIS COURSE?

Development is more important than growth. The development of a nation ensures that condition of welfare prevails. The students have to understand different measures of development. How to measure them and relevant theories.

AIM OF THE COURSE

To develop concept of growth and development. Methods and theories of measuring development. Study of different developed economies will give exposure towards measures to create economic upliftment.

THEORY

Unit I: Conceptions of Development

Development Economics – Scope and Importance - Economic development and economic growth - divergence in concept and approach - Indicators and Measurement of Economic Development – GNP as a measure of economic growth – New Measures of Welfare – NEW and MEW – PQLI – HDI – Green GNP.

Unit II: Sustainable Economic Development

Criteria for under development – Obstacles to economic development – Economic and Non- Economic factors of economic growth, Development issues, poverty, inequality, unemployment and environmental degradation.

Unit III: Theories of Economic Development

Classical theories- Adam smith - Ricardo- Malthus, Marx's theory of economic development; Schumpeter's theory, Approaches to development- low income equilibrium trap – critical minimum effort- The Strategy of economic development- Balanced vs. Unbalanced growth, choice of technique, investment criteria, big push theory.

Unit IV: Theories of Economic Growth

Rostow's stages of Economic Growth, unlimited supply of labour; social and technological dualisms; roles of capital accumulation, human capital and technological change in economic development, Models of economic growth Harrod-Domar, Kaldor, Mahalanobis, Lewis, FeiRanis, Input-Output, multisectoral models.

Unit V: Comparative Economic Development

Countries selected for case studies -USA, Japan, China and India; Overview of economic development is selected countries; agrarian surplus and the role of the peasantry in economic development; industrial revolution; division of labour, organisation of work and industrial production, the role of the State in developmental transition; SDGs and Economic Development.

LECTURE SCHEDULE

Unit I: Development Economics – Scope and Importance

1. Under developed, Developing and Developed Economy-Meaning and Characteristics
2. Economic development and economic growth- Divergence in concept and approach
3. Obstacles to economic development
4. Factors affecting economic growth: economic and non-economic factors - capital, labour and technology
5. Indicators and Measurement of Economic Development
6. New Measures of Welfare – NEW and MEW – PQLI – HDI – Green GNP

Unit II: Development issues, poverty, inequality

7. Unemployment and environmental degradation

Unit III: Classical theory of development – contributions of Adam smith

8. Ricardian theory and Economic development
9. Classical theory of development- Malthus
10. Karl Marx and development of capitalistic economy – theory of social change, surplus value and profit; Immutable laws of capitalist development
11. Schumpeter's theory, Approaches to development
12. Low income equilibrium trap - Critical minimum effort thesis
13. Big push Theory
14. **Mid semester examination**

Unit IV: Balanced growth, unbalanced growth theory

15. Rostow's stages of Economic Growth
16. Technical Dualism and Roles of capital accumulation
17. Human capital and technological change in economic development
18. Harrod-Domar model of economic growth
19. Kaldor Models of economic growth

20. Mahalanobis Models of economic growth
21. Lewis Unlimited supply of Labour and Fei-Ranis growth models
22. Input-Output analysis and multi-sectoral models

Unit V: Countries selected for case studies for Economic Development -USA, Japan

23. Countries selected for case studies for Economic Development - China
24. Agricultural Development and transformation in India
25. Agrarian surplus and the role of the peasantry in economic development
26. Industrial revolution and Economic Development
27. Organisation of work and industrial production
28. Role of the State in developmental transition
29. Sustainable Development Goals (SDGs) in Economic Development

LEARNING OUTCOME

After successful completion of this course, the student will be able to Measure the development using different methods. Understand the theories of development and relate it to real world

SUGGESTED READING

1. Blaug. M.1986. Economic History and the History of Economic Thought
2. Hollis B chenery & TN Srinivasan Handbook of Development Economics
3. Robert E. Baldwin Economic Development and Growth. John Willey, New York
4. M.L Jhingan (2015), The Economics of Development and Planning, 40th edition Vrinda publications (P)Ltd, New Delhi
5. Ghatak, S. (1986), An Introduction to Development Economics, Allen and Unwin, London.

SUGGESTED WEBSITES

1. http://www.economicsonline.co.uk/Global_economics/Growth_theories.html
2. **http://wps.aw.com/aw_todarosmit_econdevelp_8/4/1111/284635.cw/index.htl**]
3. https://mises.org/books/economic_development_robbins.pdf
4. ecagdev.agecon.vt.edu/ppts/3204-6-Development%20theories.ppt
5. http://www.economicsonline.co.uk/Global_economics/Growth_theories.html

AEC 516 RURAL MARKETING 2+0

WHY THIS COURSE?

This course is to develop understanding regarding issues in rural markets like marketing environment, consumer behaviour, distribution channels, marketing strategies, etc.

AIM OF THE COURSE

To create awareness about the applicability of the concepts, techniques and processes of Marketing in rural context. To familiarize with the special problems related to sales in rural markets, and to help understand the working of rural marketing institutions.

THEORY

Unit I: Rural Economy

Rural Economy – Rural – Urban disparities – policy interventions required – Rural face to Reforms – The Development exercises in the last few decades.

Unit II: Rural Marketing – Concepts

Rural Marketing – Concept and Scope – Nature of rural markets – attractiveness of rural markets – Rural Vs Urban Marketing – Characteristics of Rural consumers – Buying decision process –Rural Marketing Information System – Potential and size of the Rural Markets.

Unit III: Selection of Markets

Selection of Markets – Product Strategy – Product mix Decisions – Competitive product strategies for rural markets.

Unit IV: Pricing strategy

Pricing strategy - pricing policies - innovative pricing methods for rural markets – promotion Strategy – appropriate media – Designing right promotion mix – promotional campaigns.

Unit V: Distribution

Distribution – Logistics Management – Problems encountered- selection of appropriate channels- New approaches to reach out rural markets – Electronic choupal applications.

LECTURE SCHEDULE

Unit I

1 Introduction to Indian Rural Marketing: Definition, scope of rural marketing, concepts, classification of rural markets, rural vs urban markets

2 Rural marketing environment: Population, occupation pattern, income generation, location of rural population, expenditure pattern, literacy level, land distribution, land use pattern, irrigation

3 Rural development programs, infrastructure facilities

Unit II

4 Rural credit institutions, rural retail outlets, print media in rural areas, rural areas requirement, rural demand and rural market index, problems in rural marketing

5 Rural Consumer behaviour: Consumer buying behaviour models, Factors affecting Consumer Behaviour, Social factors, Technological Factors, Economic Factors, Political Factors

6 Characteristics of Rural consumer – Age and Stages of the Life cycle, Occupation and Income, Economic circumstances, Lifestyle, Personality and Brand Belief

7 Information Search and pre-purchase Evaluation, Rise of Consumerism

8 Consumer Buying Process, Opinion Leadership Process, Diffusion of Innovation, Brand Loyalty

9 Researching Rural Market: Sensitizing rural market, Research design – reference frame, Researchapproach

Unit III

10 Rural Marketing of FMCG's: Indian FMCG industry, characteristics of Indian FMCG sector, Challenges in the FMCG industry

11 Rural Marketing of FMCG's: Select case studies Rural Marketing of Consumer durables: Issues related to consumer durables in the rural market, Rural Marketing of Consumer durables: Select case studies

12 Rural marketing of financial services: Marketing objectives and approaches

13 Evolution of rural banking after independence, Challenges in marketing for banking services in rural, opportunities for banking in rural areas, marketing strategies for banking services

14 NABARD, Regional Rural Banks

Unit IV

15 Marketing of agricultural inputs: Agrochemicals, Bioinputs, Indian tractor industry: A brief overview, Challenges for Indian tractor industry, factors suggesting better future prospects for tractor industry

16 Marketing strategies for tractor industry Fertilizer industry in India: Marketing of fertilizer industry, classification of fertilizer industry, Challenges for marketing offer tilizer industry, marketing strategies for fertilizer industry

17 **Mid semester examination**

18 Indian agrochemical market: Marketing environment for agrochemicals in India, factors affecting agrochemicals market growth, structural challenges faced by Indian agrochemical industry, marketing strategiesfor agrochemicals

19 Marketing of agricultural produce: Profiling of Indian agricultural produces marketing, challenges in marketing of agricultural produce, Strategies to promote marketing of Agricultural produce Marketing of rural artisan products

20 Characteristics of Indian handicrafts industry, Challenges for rural artisan sector, Government policy towards handicrafts sector, marketing strategies for the development of rural artisansector

Unit V :

21 Distribution Strategy: Introduction Accessing Rural Markets, Coverage Status in Rural Markets, Channels of Distribution, Evolution of Rural

Distribution Systems- Wholesaling, Rural Retail System, Vans, Rural Mobile Traders: Haats/ Shandies

22 Public Distribution System, Co-operative Societies Behaviour of the Channel, Prevalent Rural Distribution Models – Distribution Models of FMCG Companies, Distribution Model of Durable Companies

23 Emerging Distribution Models – Corporate – SHG Linkage, Satellite Distribution, Syndicated Distribution, ITC's Distribution Model, and Extension counters, Barefoot agents, Agricultural
agents, Agricultural input dealers,Other channels

24 Ideal distribution model for Rural Communication strategy: Challenges in Rural Communication

25 Deciding the promotion mix, Creating advertisement for rural audiences rural media

26 Mass media, Non-Conventional Media, Personalized media, Rural Media: The importance of the two-step flow of communication Media Typology

27 Corporate sector in agri-business: Reasons for increased interest of corporate sectorin agribusiness, opportunities, in the agri-business, benefits of corporate driven agri-business System involvement of corporate sector in agri-business: select case studies

28 Digitalizing the Indian rural markets - e-rural marketing: select case studies - ITC e-choupal, TARA haat, EIDParry's India agriline

29 MicroFinance Institutes and their services in catering rural market

30 Rural marketing mix 4As (Awareness, Acceptability, Adaptability and Affordability)

31 Product mix, pricing policy and pricing strategy, distribution strategy

32 Contract farming – History, models, advantages and disadvantages

33 Organizing personal selling in rural market in India

34 Innovation in rural marketing

LEARNING OUTCOME

After successful completion of the course the students will be able to understand the where about of agricultural marketing, the different forms of marketing existing in this sector. Gain expertise in market intelligence and price forecasting.

SUGGESTED READING

1 Balaram Dogra & Karminder Ghuman, Rural Marketing: Concept & Cases, Tata McGraw – Hill Publishing Company, New Delhi,2008.

2 A.K. Singh & S. Pandey, Rural Marketing: Indian perspective, New Age International Publuishers,2007.

3 CSG Krishnamacharylu & Lalitha Ramakrishna - RURAL MARKETING, Pearson EducationAsia. 2009.

4 Philip Kotler, MARKETING MANAGEMENT, Prentice-Hall India Ltd. New Delhi.

5 AgarwalA.N, INDIAN ECONOMY, Vikas Publication, New Delhi.
6 Ruddar Dutt Sundaram, INDIAN ECONOMY, Tata McGraw Hill Publishers, New Delhi.

SUGGESTED WEBSITES

1 https://www.iimcal.ac.in/sites/all/files/pdfs/rural-marketing.pdf
2 http://ebooks.lpude.in/management/mba/term_4/DMGT509_RURAL_MARKETING.pdf