

**POST GRADUATE STUDIES REGULATIONS**  
**and**  
**COURSE DESCRIPTION**

**(SECTION- I & II)**

**M.Tech. and Ph.D.**

**Effective from 2016-17**



**COLLEGE OF TECHNOLOGY AND ENGINEERING**  
**MAHARANA PRATAP UNIVERSITY OF AGRICULTURE & TECHNOLOGY**  
**UDAIPUR (Rajasthan) 313001**

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# **VISION & MISSION OF THE INSTITUTE**

## **VISION**

To create an institute of technical education of international standards and conducting research at the cutting edge of technology to meet the current and future challenges of technological developments.

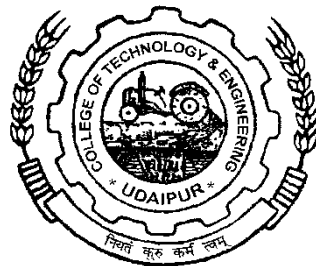
## **MISSION**

- Promise excellence, foster high standard and orient the educational program towards future needs and opportunities through strong Academia-Industry-Stakeholders linkages.
- Strengthen the curricula and add frontier engineering areas such as information and communication technology, environmental engineering, precision farming, energy conservation, dimensional stone technology, robotics, artificial intelligence, instrumentation and control.
- Provide opportunities for post doctoral research, continuing education, faculty up gradation and development of human resources in new and cutting edge technological areas especially through international collaboration.
- Strengthen non-formal training to promote entrepreneurial skills and commercialization of agriculture and promote client oriented on-farm research and technological assessment, refinement and transfer through participatory approaches by promoting the institute Village Linkage Program.

**POST GRADUATE STUDIES REGULATIONS**  
**(SECTION-I)**

**M. Tech. and Ph.D.**

**Effective from 2016-17**



**COLLEGE OF TECHNOLOGY AND ENGINEERING**  
**MAHARANA PRATAP UNIVERSITY OF AGRICULTURE & TECHNOLOGY**  
**UDAIPUR (Rajasthan) 313001**

# SECTION- I

## ACADEMIC REGULATIONS (POST GRADUATION COURSES)

### UPDATED RULES AND REGULATIONS FOR POST GRADUATE STUDIES (2015)

The students admitted shall be governed by the relevant rules as indicated below and amendments made from time to time in future.

#### 1.0 DEFINITIONS

- 1.1 "Academic Year" or "Academic Session" of the University shall ordinarily be between July to June and shall consist of two semesters.
- 1.2 "Semester" is an academic term of normally 110 days including examinations (with a minimum of 16 weeks of instructional days).
- 1.3 "Course" means a unit of instruction or a segment of a subject matter to be covered in a semester. Each course is assigned a specific number, title and credits.
- 1.4 "Credit Hour" also written as "Credits" imply that each credit hour will represent an hour of lecture or two to three hours of laboratory / field practical each week in a semester.
- 1.5 "Grade Point" is a numerical number which denotes student's performance in a course.
- 1.6 "Credit Point" is the product of credit hours and grade point obtained by the student in a course.
- 1.7 "SGPA" (Semester Grade Point Average) is the average of the credit points of a semester.
- 1.8 "OGPA" is the overall cumulative grade point average obtained by the student in the courses taken in all the semesters completed by him / her.

$$\text{OGPA} = \frac{\text{Sum of the products of grade point earned and credit hours of all the courses offered}}{\text{Sum of the credit hours of all the courses offered}}$$

- 1.8.1. For obtaining equivalent percentage of OGPA under 10 point scale, the OGPA will be multiplied by factor 10 (Ten). The division of Post Graduate students shall be determined by the OGPA at the end of successful completion of programme as follows-

OGPA	Division
6.50-6.99	II- Division
7.00-7.99	I- Division
8.00 and above	I- Division with distinction

Further, the OGPA, at the end of the programme will be calculated up to third decimal digit but will be awarded up to two decimal digits. However in case, third decimal digit is 5 or above, the OGPA will be rounded to next higher digit i.e. an OGPA of 6.995 and above will be considered as 7.00.

1.8.2 Conversion of OGPA into percentage or vice-versa:

- A. Percent of marks obtained under traditional system be converted to OGPA under 10 point scale by dividing it by 10 (ten).
- B. OGPA obtained under grading system (like 4 or 5 point scale etc.) be converted to OGPA in 10 point scale or the percentage using following formulae:

(i)  $OGPA \text{ under } 10 \text{ point scale} = 9G / N$

(ii)  $\text{Percentage of marks} = 90G / N$

Where G is the OGPA under grading system and N is the value of scale like 4 in 4 point scale, 5 in 5 point scale and likewise.

1.9 "Year" means an academic session consisting of two semesters. Say, first year means the first academic session of the prescribed course of a degree programme. Similarly, second year, third year, and fourth year mean second, third and fourth academic session, respectively.

1.10 The University awards medals to meritorious students of which details are as follows-

**A. Chancellor's Gold Medal**

This is the highest honour bestowed on one meritorious student in the field of academics every academic year starting from 2016-17. The Chancellor's Gold Medal will be given each year in any one faculty at Post-graduate level by rotation. The student obtaining highest OGPA in any faculty across the department will be awarded Chancellor's Gold Medal. The rotation of the faculty will be on the alphabetical order i.e. Agriculture, Engineering & Technology, Fisheries and Home Science. A student being awarded University Gold Medal, if found eligible will also be awarded Chancellor's Gold Medal.

**B. University Gold Medal**

Ph.D. Degree Programme- One Gold Medal for Ph.D. degree programme in the faculty of Engineering & Technology. For Rules and Guidelines for award of Gold Medal refer *Appendix XXIV*.

Master's Programme- For awarding Gold Medal at least three candidates should have completed the degree and that the candidate, who has been selected for award of Gold Medal, should possess a minimum OGPA of 7.5. The Gold Medals should be awarded on the basis of academic performance in each discipline.

**C. Jain Irrigation Medal**

'Jain Irrigation Medals' sponsored by M/S Jain Irrigation Systems Ltd., Jalgaon (Maharashtra) are provided to the meritorious students of the University in the faculty of Engineering & Technology, as specified-

- i) B. Tech. (Ag.)- 1 Medal
- ii) M. Tech. (Ag.) Soil & Water Conservation Engineering- 1 Medal
- iii) M. Tech. (Ag.) Irrigation and Water Management- 1 Medal
- iv) Ph.D. (Ag.) Irrigation Water Management- 1 Medal

## **2.0. MAJOR FIELD OF STUDY**

The following shall be the Degrees and Major Fields of Studies there-in to be awarded in Faculty of Technology & Engineering:

### **2.1 Master's Degree (M. Tech.)**

Major fields of study:-

- i. Farm Machinery & Power Engineering
- ii. Soil & Water Conservation Engineering
- iii. Irrigation Water Management Engineering
- iv. Renewable Energy Engineering
- v. Processing & Food Engineering
- vi. Mining Engineering (Mine Planning)
- vii. Mechanical Engineering (CAD/CAM)
- viii. Electrical Engineering (Power Electronics)
- ix. Electronics & Communication Engineering (Communication Engineering)
- x. Computer Science & Engineering
- xi. Civil Engineering (Structural Engineering)

### **2.2 Ph.D. Degree by course work**

Major fields of study:-

- i. Farm Machinery & Power Engineering
- ii. Soil & Water Conservation Engineering
- iii. Irrigation Water Management Engineering
- iv. Renewable Energy Engineering
- v. Processing & Food Engineering
- vi. Electrical Engineering
- vii. Computer Science & Engineering
- viii. Electronics & Communication Engineering
- ix. Mechanical Engineering
- x. Mining Engineering

## **3.0 GENERAL ADMISSION RULES**

### **3.1 Mode of admission:**

- i). Master's programme – On the basis of valid GATE Score w.e.f. academic session 2017-18. In case of non-availability of GATE candidates, seats shall be filled on the basis of Merit cum Interview, as per the criterion fixed by the University.
- ii). Ph.D. programme – Through Written Entrance Test w.e.f. academic session 2017-18 & subsequently on the basis of Merit cum Interview, as per the criterion fixed by the University.

3.2 For Master's programme, a candidate must possess a Bachelor's degree (B.E./B.Tech.), with minimum 60% or equivalent marks in respective/ related subject (as approved by Academic Council) for General and 55% for SC/ST/OBC/SBC (Non Creamy Layer).



- 3.3 For Ph.D. by course work programme, a candidate must possess a Master's degree in the respective/ related subject and faculty from MPUAT, Udaipur or a degree declared equivalent thereto from a recognized University or Institute with 6.50/10.00 or equivalent OGPA for General and 5% relaxation for SC/ST/OBC/SBC (Non Creamy Layer) candidates in Technology & Engineering.
- 3.4 Admission shall be open in the first semester of the academic year for Master's degree and Ph.D. degree.
- 3.5 No student shall be entitled to join more than one programme of studies concurrently anywhere.
- 3.6 Admission to any University programme can not be claimed by a candidate as a matter of right.
- 3.7 Admission committee may refuse admission to any candidate on valid ground(s) to be recorded. However, in case a person obtaining qualifying marks in pre-entry examination is refused admission by the admission committee, it would be after the candidate has been given a hearing by the admission committee. The candidate may file appeal to the Vice-Chancellor. Decision of the Vice-Chancellor shall be final.
- 3.8 An applicant suppressing or giving wrong information or facts or forging signature of parents or attaching false certificates shall forfeit admission in addition to any other punishment that may be awarded to him / her.
- 3.9 Candidate who applies under a reserved quota shall be considered as per existing State Government rules and amended from time to time, hereafter.
- 3.10 Following candidates shall not be given admission in the University or its constituent Colleges, even if they are qualified for it:-
- a) A candidate against whom a FIR has been lodged by the University or any of the constituent colleges or by any other competent authority / officer of the University.
  - b) A candidate who has been convicted of a criminal offence or has been released on bail in connection with a criminal offence and against whom a case is pending in a court of law.
  - c) A candidate who has indulged in misbehavior with his Teacher / staff or with any authority of the University.
- 3.11 Foreign students are normally admitted under the category of ICAR nominee. No self-financing foreign student shall be given admission unless his case is supported either by the Government of India / International Organisations / respective Governments and approved by the ICAR provided they fulfill other prescribed qualifications and requirements.
- 3.12 Foreign students sponsored / nominated through ICAR shall be required to pay institutional economic fee as prescribed from time to time in addition to the normal fees charged by the College / University from Indian students.
- 3.13 Following categories of candidates are exempted from appearing in the written test:
- i) Seats reserved under ICAR nominee.
  - ii) Candidates who have qualified for JRF and nominated by ICAR.
  - iii) Other sponsored candidates deputed by the MPUAT, Udaipur or the Government of Rajasthan.

- 3.14 Admission in M. Tech.\* in faculty of Technology and Engineering shall be based on valid GATE Score w.e.f. academic session 2017-18. In case of non-availability of GATE candidates the seats shall be filled on the basis of Merit cum Interview, as per the criterion\*\* fixed by the University as follows-

	Secondary	Sr. Secondary	UG (B.E./ B.Tech.)	GATE	Experience	Interview	Total
M.Tech.**	10% (10)	10% (10)	50% (50)	10% (10)	10% (10)	10% (10)	100% (100)

\*As per Notification No. CTAE/Gen./2016/5051-57 dated 16.08.2016.

\*\*As per letter no. F.MPUAT/DRI/ME/2008/1464 dated 20.08.2008.

- 3.15 Admission in Ph.D.\* in faculty of Technology and Engineering shall be through written (screening) test. Those candidates who score 50% or above marks in the written test shall only be eligible for admission based on merit-cum-interview as per the criterion\*\* fixed by the University as mention below. The Sponsored candidates need not to appear in the written test.

	Secondary	Sr. Secondary	UG (B.E./B.Tech.)	PG (M.E./M.Tech.)	Experience	Interview	Total
Ph.D.**	10% (10)	10% (10)	30% (30)	30% (30)	10% (10)	10% (10)	100% (100)

\*As per Notification No. CTAE/Gen./2016/5051-57 dated 16.08.2016.

\*\*As per MPUAT/AC-36/2012-02/05.

**Note:**

- For admissions in Agricultural Engineering disciplines/branches, combined merit list shall be prepared for all the Agricultural Engineering disciplines/ branches namely FMPE, REE, SWE, IWM and PFE; as a student is eligible to apply in any branch of these.
- For experience, two marks for minimum one year of experience and thereafter for each additional year's or part of years' experience, two marks proportionately will be given, subject to maximum marks of ten. For consideration of experience, production of Form '16' from concerned organisations where the candidate has worked will be mandatory.

- 3.16 Eligibility qualifications for admission in faculty of Technology and Engineering: Master's Programme (M.Tech.) and Doctoral Programme (Ph.D.)

S.No.	Branch/Discipline	Specialization	Code	Seats	Qualifying Degree
<b>Master of Technology (M.Tech.) Programs</b>					
1.	Agricultural Engineering	Farm Machinery & Power Engineering	FMP	6	BE/B.Tech.(Ag./Mech.)
2.	Agricultural Engineering	Renewable Energy Engineering	REE	6	BE/B.Tech.(Ag./Mech./Elect./ Chemical/ Electronics/Civil/ Renewable Energy & Environmental Engg.)
3.	Agricultural Engineering	Soil & Water Conservation Engineering	SWC	6	BE/ B.Tech.(Ag.)
4.	Agricultural Engineering	Irrigation Water Management Engineering	IWM	6	BE/ B.Tech.(Ag./Civil)

S.No.	Branch/Discipline	Specialization	Code	Seats	Qualifying Degree
5.	Agricultural Engineering	Processing & Food Engineering	PFE	6	BE/ B.Tech. (Ag./Chemical/ Mech./ Electrical)
6.	Mechanical Engineering	CAD/ CAM	ME	8	B.E./ B.Tech. (Mechanical/ Production & Industrial Engg.)
7.	Electrical Engineering	Power Electronics	EE	8	B.E./ B.Tech. (Electrical / Electronics & Communication)
8.	Electronics & Comm. Engineering	Communication Engineering	ECE	8	B.E./ B.Tech. (Electronics & Communication Engg.); Graduateship (AMIETE) examination of IETE
9.	Computer Science & Engineering	Computer Science & Engineering	CSE	8	B.E./ B.Tech. (CSE /CE/IT)
10.	Mining Engineering	Mine Planning	MI	8	B.E./ B.Tech. (Mining )
11.	Civil Engineering	Structural Engineering	CE	8	B.E./ B.Tech.in Civil Engg.
<b>Doctoral (Ph.D.) Programs</b>					
1.	Agricultural Engineering	Farm Machinery & Power Engineering	FMP	4*	ME / M.Tech(Ag. Engg.) in FMP/ REE
2.	Agricultural Engineering	Renewable Energy Engineering	REE	4*	ME / M.Tech (Ag. Engg.) in FMP/REE/PFE; ME /M.Tech in Electrical/Electronics/ Mech./ Chemical/ Civil
3.	Agricultural Engineering	Soil & Water Conservation Engineering	SWC	4*	ME/ M.Tech.(Ag. Engg.) in SWC/ IWM; ME/ M.Tech.in Hydraulics/ Irrigation/ Aquatic/ Aquaculture Engg.
4.	Agricultural Engineering	Irrigation Water Management Engineering	IWM	4	ME/ M.Tech. (Ag. Engg.) in SWC/ IWM; ME / M.Tech. in Hydraulics/ Irrigation
5.	Agricultural Engineering	Processing & Food Engineering	PFE	4*	M.E./ M.Tech. (Ag. Engg.) in PFE
6.	Mechanical Engineering	Mechanical Engineering	ME	4	M.E./ M.Tech. (Mechanical)
7.	Electrical Engineering	Electrical Engineering	EE	3*	M.E./ M.Tech. (Electrical Engg)
8.	Electronics & Communication Engineering	Electronics & Communication Engg.	ECE	4	ME/ M.Tech.( Electronics & Comm. Engg.)
9.	Computer Science & Engineering	Computer Science & Engineering	CSE	4	M.E./ M.Tech.(CSE/ IT)
10.	Mining Engineering	Mining Engineering	MI	4	M.E./ M.Tech. (Mining Engg./ Rock Mechanics / Environmental Engg.)

\* Two additional seats are available in each of these specializations from the Academic Session 2017-18 under Quality Improvement Programme for teachers of AICTE approved Degree level Engineering Institutions. The admission procedure shall be as per norms & guidelines of QIP.

**Notes:**

- i) The actual number of admission/seats may be decreased or no admissions may be made in a particular Ph.D./ Masters' program in a particular year depending upon availability of faculty expertise in a particular programme/ discipline.
- ii) In M.Tech. programme, there is provision of supernumerary seats as per past practice in each programme for sponsored candidates (as approved by MPUAT/AC-36/2012-02/06).
- iii) There is provision of 2 supernumerary seats in each Ph.D. programme across the faculties for in-service candidate's w.e.f. 2012-13 session (as per the academic council's decision i.e. MPUAT/AC-35/2012-01/08).
- iv) The candidates seeking admission in M.Tech.(Ag.Engg.) or Ph.D. (Ag. Engg.) programmes from discipline other than Agricultural Engineering, will be required to take additional pre-requisite courses, as per rules.
- v) The candidates seeking admission under Sponsored Category Seats in M.Tech. and Ph.D. shall have to satisfy the following requirements:
  - (a) The candidates must have a minimum of two years of full-time work experience in responsible capacity in a Registered Firm/Company/ Industry/Educational and Research Institution/Govt./Quasi Govt./ Autonomous Organisation in the relevant field in which admission is being sought.
  - (b) In case of Industry, the Firm/Company/Industry shall either be a public sector undertaking or a public limited company registered in a stock exchange or a private concern whose annual turnover during the past two years exceeds Rs. 5 crores. Further, the Industry sponsored candidates shall be required to pay a higher fee of 1.25 times the normal fees.
  - (c) The Educational Institution should be recognized by AICTE/ICAR.
  - (d) Letter of appointment and Form – 16 for two years of service is required from the employer at the time of written test / interview. In addition, the candidate must submit an undertaking that he/she will continue to submit Form – 16 for the subsequent years till he/she completes the programme.
  - (e) The candidate shall be required submit a suitable undertaking for sponsoring by the sponsoring institution.
- vi) The candidates applying as Sponsored candidates shall not be considered for non-sponsored seats. They should submit a separate application with fee, if they want to be considered for normal seats. However, they still have to submit sponsorship certificate and other documents as required for sponsored candidates.

**4.0 ADVISORY SYSTEM**

- 4.1 A major advisor shall be assigned to each student admitted in the P.G. programme by the respective departmental committee. A Major advisor can have maximum of 5 candidates under his / her supervision irrespective of M.Tech. / Ph.D. at any point of time. The HOD shall invite application from each PG student in choosing the field of research, indicating preferences of 3 fields in the department. The departmental committee shall consider the preferences of the students on the basis of vacancy and availability of Major advisor on the basis of merit. There is no ban on having major advisor from the outside station considering the problems of research, facilities available at out station in which the major advisor is to be appointed and preference of the student.

- 4.2 There shall be an advisory committee for each P.G. student constituted by the Director, Resident Instructions (After making such changes as he deems necessary) on the recommendation of the major advisor in consultation with the Head of Department.
- 4.3 The advisory committee shall consist of minimum 3 accredited teachers from the P.G. faculty which shall consist normally of the major advisor and one advisor from major and minor field each and a nominee of Director, Resident Instructions (from the same or related faculty/fields) in master's programme. The advisory committee of the candidate for Ph.D. degree will consist of minimum 4 accredited members with a major advisor and one member from major field, 2 from minor/supporting fields and 1 DRI nominee. Major advisor will be the Chairman of the committee. The advisory committee should be constituted within one month of 1<sup>st</sup> Semester.
- 4.4 If the student's programme of study so requires, he may have an additional major advisor, called co-major advisor. Such co-major advisor would be compulsory if student undertakes post-graduate programme in which MPUAT, Udaipur and some other SAU or institute collaborate.
- 4.5 Major advisor, Co-major advisor shall be teachers accredited for guiding master's or Ph.D. thesis and members of P.G. faculty.
- 4.6 Major advisor shall convene the meeting of the advisory committee at least once in each semester to assess the progress of the student and shall maintain a record of it. It should advise the student in such a manner as it deems fit and to ensure that the student can complete the work within the stipulated time.
- 4.7 The advisory committee will function until the student graduates from that particular programme or is dropped from the rolls of University or College. The DRI nominee must keep a keen eye on the role of advisory committee and would apprise the DRI about the deviations made, if any, from the prescribed procedure. He will also submit a confidential report to DRI.
- 4.8 The Director, Resident Instructions can replace a member of advisory committee during a programme, if the member including major advisor or co-advisor:-
- i) ceases to be member of P.G. faculty.
  - ii) has requested to be replaced.
  - iii) is prevented by illness to function properly.
  - iv) any other valid reasons.
- 4.8.1 In case of retirement/leaving of chairman next senior person in the discipline in the advisory committee will become chairman of the students' advisory committee and for advisor/member, another member would be recommended by the Head of the Department.
- 4.8.2 The caretaker HOD/ Dean is permitted to sign the thesis whenever regular HOD/ Dean is out of station or on leave even for a single day after going through the relevant records of the concerned students. Whenever such situation arises, permission be obtained from the competent authority in individual case.

- 4.8.3 An alternative to major advisor will be provided for conducting viva-voce at a time when major advisor is out of station or he / she is not available for some unavoidable reasons. Whenever such situation arises, permission of HVC should be sought.
- 4.8.4 The requirement of attending synopsis seminar, pre-thesis seminar and viva-voce on the part of co-major advisor from other institute / organisation is relaxed.
- 4.9 Function of Advisory Committee:-
- 4.9.1 The advisory committee shall prepare a programme of study of the student after giving due consideration to his/her academic background and aptitude. He/she may also be required to undertake non-credit courses to overcome any deficiency in his/her academic standard. Successful completion of such non-credit courses would be compulsory.
- 4.9.2 It shall also discuss the research problem of the student and guide him/her to prepare synopsis and recommend the same through Head, for approval by the Director, Resident Instructions after the student has given a seminar on the subject.
- 4.9.3 It shall monitor the progress of the student during the programme and advice him/her for maintaining his/her academic standing by suggesting courses to be taken and to plan his/her schedule. For this a meeting of the advisory committee shall be scheduled by major advisor once in each semester and proper record of proceedings be kept.
- 4.9.4 It shall examine the student for comprehensive or preliminary examination.
- 4.9.5 It shall approve the standard and quality of the thesis before submission of the thesis to Director, Resident Instructions for external evaluation after the student has presented the work in a seminar.
- 4.9.6 It shall examine the student in a viva-voce examination on the thesis after due recommendation of the external examiner(s).
- 4.9.7 No change in the programme of studies shall normally be permitted. However under special circumstance, the Director Resident Instructions on the recommendation of the Advisory Committee, Head of the Department and the Dean of the College concerned with specific reasons to be specified may permit change in the programme of studies.

## **5.0 ADMISSION TO DEGREE PROGRAMME**

- 5.1 A student admitted to a post-graduate programme shall have to successfully complete the following before award of a degree:
- a) An approved programme of study prepared by his/her advisory committee.
  - b) A comprehensive or preliminary examination.
  - c) Pre-thesis seminar
  - d) Submission of thesis and its evaluation.
  - e) Thesis viva-voce examination.
  - f) Minimum residential requirement.
  - g) Minimum OGPA requirement.

- 5.2 A student for master's programme shall be required to complete a minimum of 57 credit hours for the degree

Title	Approved Load
Major courses (Core & optional)	20-27 Credit Hours (with 12 credit as core)
Minor & Supporting Courses	9-14 Credit Hours
Seminar	1 Credit Hour
Non-Credit Compulsory Courses	2 Credit Hours (as proposed by ICAR)
<b>Total</b>	<b>37</b>
Comprehensive	NC
Research	20 Credit Hours

- 5.3 A student of Ph.D. programme shall be required to complete a minimum of 74 credit hours for the degree. The distribution of courses for Ph.D. would be as under:

Title	Approved Load
Major courses (Core & optional)	18 Credit Hours (with 6 credit as core)
Minor & Supporting Courses	9 Credit Hours
Seminar	2 Credit Hour
Non-Credit Compulsory Courses*	2 Credit Hours (as proposed by ICAR)
<b>Total</b>	<b>29</b>
Preliminary	NC
Research	45 Credit Hours

*\*Exempted for those who have cleared these in Master's programme*

**Note:**

- a) Preliminary will be held but will not be graded / credited towards credit load of the student.
- b) Research will be graded as satisfactory.

- 5.4 The minimum duration of Ph.D. and master's programme shall be 6 and 4 semesters, respectively.

**Note:** The period for engineering graduates to complete master's programme including remedial courses will be two and half years i.e. 5 semesters.

- 5.5 A student for master's and Ph.D. programme shall be required to complete a minimum period of 4 semesters and 5 semesters in residence, respectively. However, in case of MOUs with other University, where the research scholar will complete their research work in their parent University, they will be allowed after completion of comprehensive examination. No M.Tech. or Ph.D. student shall be allowed to discontinue the academic programme without completing minimum residential requirement and research work. For PG diploma residence requirement would be at least 2 semesters. However, this shall not debar the University from developing residential instructions in varying proportions for the future P.G. courses.

- 5.6 A student shall have to complete all the requirements including submission of thesis within 8 and 12 semesters for Master's and Ph.D. programmes, respectively, which will also include period of scholastic probation or temporary withdrawal from the semesters, failing which the admission shall stand cancelled. However, extra semesters with penalty fee will be allowed for 2 semesters in both Master's and Ph.D. programmes.

- 5.7 A student shall be required to secure a grade point 6.0 out of 10.00 for passing in any course and a minimum OGPA of 6.50 out of 10.00 for the degree.

## **6.0 REGISTRATION**

- 6.1 A student admitted to a programme shall have to register in the college in the semester admitted within the stipulated time indicated in the notice of admission, failing which his admission will stand cancelled.
- 6.2 Every post graduate student in good academic standing, unless granted a formal temporary withdrawal by the Dean of College, shall be required to register with the College of his admission in each semester until the completion of all requirements for the degree for which he is admitted.
- 6.3 A regular student shall be allowed to register upto 18 credit hours but not less than 9 credit hours of courses in any semester. However, in M.Tech. (Ag.) and in the last semester of course work of other programmes he/she may be permitted to register upto 20 credit hours to complete the programme of study.
- 6.4 The minimum limit of credit hours to be registered in a semester shall not apply to students after completion of minimum residential requirement.
- 6.5 A Ph.D. student shall be permitted to add courses within 2 weeks or withdraw from courses within 10 weeks of commencement of the semester in such a way that the limits of maximum/ minimum credit hours in that semester have not been crossed.
  - 6.5.1 Attendance in courses joined later shall however, be counted from the date of registration in the semester and it will be the responsibility of the student to maintain minimum attendance requirement.
- 6.6 Temporary withdrawal from the programme:
  - 6.6.1 A student with good academic standing shall be permitted by the Dean of the College to withdraw from a programme for a specific period not exceeding two semesters on the recommendations of the Major Advisor and Head of the Department, provided he/she makes a written request. Withdrawal in first semester of a programme is not permissible.
  - 6.6.2 The Vice-Chancellor on a written formal application submitted by the student seven days before the expiry of the withdrawal period and duly recommended by the Head of Department and the Dean of College may further grant an extension of withdrawal for one more semester to him/her on the grounds of some compelling situation to be specified.
  - 6.6.3 Failure to register or to obtain formal permission to withdraw from university/ college will constitute presumptive evidence that a student has withdrawn from the college and his/her admission shall stand cancelled.
    - 6.6.3.1 No student shall leave the College/ University without obtaining formal permission from the Dean of the College.
  - 6.6.4 Students granted formal permission of temporary withdrawal may be exempted from all fees during the period of their withdrawal. If he/she withdraws in the middle of a semester, the semester fee will not be refunded. Those who do not obtain formal permission shall be charged full fees for the semesters missed before re-registration.

## **7.0 AWARD OF GRADES**

- 7.1 Grade point 0 to 10.0 shall be awarded to a student in each course on the basis of marks obtained by him/her in mid-term test and the final semester examination.



For other cases following abbreviations shall be used to denote the performance of a student in a course:

F-	Fail	US-	Unsatisfactory (for thesis & Preliminary / Comprehensive only)
W-	Withdrawn	NC-	Non Credit courses
R-	Repeated	DE-	Detained
S-	Satisfactory (for thesis & Preliminary/ Comprehensive only)	UM-	Unfair means

- 7.2 Grade DE shall be awarded to a student in a course in which he/she is detained from appearing in the final semester examination on account of shortage in attendance. Grade "DE" will also be equivalent to point "0" (Zero) in 10 point for calculation of "OGPA".
- 7.3 Grade "W" shall be awarded to a student in a course from which he/she drops from his/her schedule within the time stipulated i.e. 10 weeks from the commencement of semester. Credit hours for this course will not be included for computing OGPA.
- 7.4 Grade "UM" shall be awarded to a student who has used unfair means in test/final semester examination, and that shall be treated as "0" (Zero) in 10- point scale.
- 7.5 A student shall be awarded zero in examination/ tests in which he/she fails to appear for any reasons whatsoever. The final grade shall be reported on the basis of marks obtained in other tests/ examinations and the final grade point shall be reported accordingly.

## **8.0 ACADEMIC STATUS AND SCHOLASTIC PROBATION**

- 8.1 A student shall be required to secure at least a grade point 6.0 in a course for its successful completion.
- 8.2 A student shall be required to attain a minimum OGPA of 6.5 separately in credit and non-credit courses (deficiency) without F/DE/UM in any course to be on good academic standing.
- 8.3 A student awarded grade 'F' in a course shall repeat the course to pass it, the grade of repeat course shall replace the earlier one with an 'R' associated with it.
- 8.4 A student with grade 'F' in a course shall be permitted to appear in both the theory and practical examination along with the final semester examination of the consecutive semester. This permission shall be granted for two courses only at a time provided a written request is made within 10 weeks of date of registration in the semester.
- 8.5 A student with grade 'DE' in courses shall be permitted to repeat it as a regular in the next semester when offered before taking up new courses without affecting the normal schedule of the courses offered in that semester. In case of clash, he/she shall drop the new course (s).
- 8.6 A student who could not obtain an OGPA of 6.5 at the end of any semester shall be permitted to take a maximum of two courses as back log including the one in which he/she secured GPA of less than 6.5 whenever next offered. The grade of repeated course shall replace the original one with 'R' associated with it.

- 8.7 A student with an OGPA of less than 6.0 at the end of 1st academic year and onwards, he/she will be automatically dropped.
- 8.8 A student with an OGPA of 6.0 to 6.49 or grades "F", "DE", "UM" in any course at the end of a semester shall be placed on scholastic probation in the subsequent semester. The period of scholastic probation shall be for one semester only.
- 8.9 A student after being on scholastic probation for three times and dropped from the college, shall be permitted to apply for a mercy petition to the Vice - Chancellor through Dean of the college within 5 days from the date of registration of the next semester. A committee constituted by the Vice – Chancellor, after considering all aspects of the case, shall either recommend the continuation of the student on scholastic probation for one more semester or reject the mercy petition. The committee may review its decision on detection of a patent error or facts.
- 8.10 A student recommended to continue for one more semester on scholastic probation shall be registered without late fee within seven days of the order and with prescribed fee (revised time to time) for a further period of 3 days or up to last date of registration with late fee whichever is later.

## **9.0 ATTENDANCE RULES**

- 9.1 A student shall be permitted to appear in the final semester examinations after a minimum attendance of 75% separately for theory and practical in each course from the date of registration in that course.
- 9.2 Enmasse absence shall be treated as absent in the attendance record of the student.
- 9.3 A further relaxation of 10% may be granted on the minimum attendance of 75% by the Vice-Chancellor on cogent grounds on the recommendation of the Dean of the College.
- 9.4 Attendance to the extent of number of lectures/ practicals missed in a course with a maximum of 8 days of absence in a semester shall be credited on production of certificate to the student deputed to represent college and University in co/extra curricular activities of the college/district/state/national level.

## **10.0 TESTS AND EXAMINATIONS**

- 10.1 There shall be one mid term tests of 20 marks. Courses with theory as well as practical components and courses with theory only shall be examined in written mid term test. Courses with only practicals shall be examined in practicals in the test.  

If any student fails to appear in the mid term test on account of hospitalisation (duly supported by hospitalisation certificate from a Govt. Hospital) or for any legitimate reason (including student's deputation for University official programme) duly recommended by course teacher and HoD and approved by the Dean, he/she shall be given the advantage of proportionate marks based on his/her performance in final theory/practical examination as the case may be.
- 10.1.1 Mid term test shall be held in the mid of the semester and on completion of about 50% of the course.
- 10.1.2 The duration of Mid semester theory examination (for courses having theory and practical) shall be of one hour. If a course consists entirely of practical, the Mid semester test will be based on practical and will of two hour duration.
- 10.2 There shall be a final semester examination at the end of a semester consisting of written theory examination of 2 hours duration and practical examination of 3 hours duration or more.

10.3 The distribution of marks in the test and final semester examination shall be:

Mid term test theory/practical	20 Marks
Final Semester Examination	80 Marks
a) Theory	50
b) Practical	30

Where there is no practical prescribed, the final theory examination shall be of 80 marks and vice - versa.

10.4 Final semester theory examination shall be conducted by the University.

10.4.1 The external examination for theory portion of PG level core courses shall be conducted by the University. While, the practical will be conducted by a senior faculty member and one more teacher to be nominated by HOD. Where the core paper is totally practical, an external examiner shall be nominated.

10.4.2 The question papers of optional papers shall be set confidentially for each course by the concerned teacher.

10.4.3 The evaluation of answer books of these optional papers shall be done internally by the concerned teachers and grades awarded by them.

10.4.4 Question papers shall contain short and detailed subjective questions as given in the guideline. No choice except internal shall be given.

10.5 Mid term test and practical examination shall be conducted by the office of the Dean of the College on scheduled dates as announced in the academic calendar.

10.6 General Rules:

10.6.1 No tests/examinations shall be postponed on the grounds of failure of electricity supply.

10.6.2 No special test/examination shall be held for students who miss it on grounds like being in police custody or attendance in a court.

10.6.3 Separate rules are prescribed for cases of unfair means and indiscipline in the test/examination.

10.6.4 The coordination committee of the Vice-chancellors has decided that the decision to reconduct the examination in the papers in which students have staged walk out or boycott shall rest with the Chancellor. The students therefore, need not approach the university authority in this regard.

10.6.5 Interested PG students may be shown their answer book(s) within two days of declaration of results for checking totaling and for marking if any answer has been left unmarked.

## 11.0 SEMINARS

A student in master's programme shall deliver one seminar in 3<sup>rd</sup> semester.

The course number and number of seminars to be given in Ph.D. programme for 2 credits of seminar allotted should be given as abbreviation of the department followed with 691 & 692 with a credit load of 1 to each seminar course. The students will give 2 seminars under each course. The average/ total marks of 2 seminars will be considered for grade point.

## **12.0 COMPREHENSIVE EXAMINATION FOR MASTER'S DEGREE**

- 12.1 A student on good academic standing shall be allowed to appear in a comprehensive examination whenever next scheduled after successful completion of at least 75 per cent of course work prescribed.
- 12.2 The comprehensive examination will consist of two parts; a written examination will be followed by oral examination. The written part will consist of two papers of 100 marks each. The first paper will include questions from major subjects and the second paper will include questions from minor subjects. The papers will be set internally and shall be evaluated internally. The minimum pass marks for written examination shall be 60% in major and minor separately.
- 12.3 The oral comprehensive examination, in which a student shall be graded as satisfactory / unsatisfactory, shall be conducted by the student's advisory committee under the overall control of the Head of Department.
- 12.4 If the student's performance is found unsatisfactory, he/she shall re-appear in the comprehensive examination whenever scheduled in the next semester but not earlier than 3 months of first examination.
- 12.5 No student who has not passed comprehensive examination and all semester examinations, and has not achieved satisfactory grades in each course (Including non-credit deficiency or compulsory courses) shall not be permitted to submit thesis.

## **13.0 PRELIMINARY EXAMINATION FOR Ph. D. DEGREE**

- 13.1 A student on good academic standing shall be allowed to appear in a preliminary examination, whenever next scheduled after successful completion of 75% course work prescribed.
- 13.2 The preliminary examination shall consist of two parts, a written examination followed by an oral examination. The written examination shall consist of three papers of 100 marks each. The first two papers will include questions from major subjects and the third paper will include questions from minor subjects. The papers will be set internally and shall be evaluated internally. The minimum pass marks for written examination shall be 60% in each paper separately.
- 13.3 A student shall appear in oral preliminary examination, if eligible whenever scheduled after the written examination preferably within two months to be conducted by the student's advisory committee and an external examiner and attain a satisfactory performance.
- 13.4 If a student's performance in oral preliminary examination was unsatisfactory, he shall be required to reappear in oral examination whenever, scheduled next but not earlier than 3 months of previous examination.
- 13.5 No student shall be permitted to submit thesis unless, he/she achieves satisfactory performance in preliminary examinations.

## **14.0 SYNOPSIS OF PROPOSED RESEARCH WORK**

- 14.1 A student shall select as far as possible a research topic for his thesis having relevance to the need of the state of Rajasthan.
- 14.2 The objective of the master's degree research should be to train the student in the research methodology and to develop his/her potential in conducting research,

whereas the Ph.D. degree research should be indicative of the student's capacity for independent constructive thinking and interpretation as well as independent research work. The research work carried-out for Ph.D. degree should be a definite contribution to the advancement in the area and of a quality meriting publication in national and international journals of repute.

- 14.3 A student shall prepare a synopsis of proposed research work under the guidance of the Major Advisor and the supervision of the advisory committee in the prescribed format and submit the same after giving a seminar in the department where presence of all the members of the advisory committee is must, within the time period prescribed. The synopsis would also have to include in addition to the work plan and justification for taking up the thesis subject, a survey of existing literature on the subject and a list of references.
- 14.4 The synopsis shall be got examined and shall have to be recommended by the University professor in the subject in MPUAT, Udaipur before final approval by the respective Dean for Master's and by the Director, Resident Instructions for Ph.D. (after making changes, if needed). In the absence of a Professor in the University the Ph.D. research synopsis shall be referred to an outside expert of the rank of University Professor and above for his recommendation about the scope and suitability of the proposed research work. The synopsis of master's degree research shall be recommended by the concerned Head of the Department.
- 14.5 The synopsis for Master's and Ph.D. programme should be got approved in II semester.
- 14.6 The minimum time between synopsis approved and thesis submission shall be two years for Ph.D. and one semester for Master's programme.
- 14.7 Once the synopsis has been approved, major changes in the title and/or in the detailed outline shall not be allowed without prior permission of the Director, Resident Instructions. If the major changes are permitted, the student shall submit thesis only after 4 months of approval of the changes. Whereas the minor changes, which do not affect the quantum and quality of work and has been permitted by the Director, Resident Instructions, the time bar shall not be applicable.
- 14.8 A student shall not start the research work prior to final approval of the synopsis by the Director, Resident Instructions.
- 14.9 The research work shall normally be carried-out at the campus of student's registration. However, if the departmental committee on the advice of major advisor recommends the conduct of research work at any approved research stations of MPUAT, Udaipur or elsewhere, where facilities for it exist, the student shall be permitted to work there.

## **15.0 THESIS PREPARATION AND SUBMISSION**

- 15.1 The student's advisory committee shall approve the quantum and quality of research work as per the synopsis approved in a seminar to be given by the student, before he/she starts writing the thesis. The seminar will be open to all the students and faculty members.
- 15.2 A student shall submit 3 copies of paper bound thesis for master's degree and 5 copies of paper bound thesis for Ph.D. degree along with a soft copy in computer CD together with abstract and required certificates to the Director, Resident Instructions through Major Advisor, Head of Department and Dean of the College.

- 15.3 The last day for submission of thesis in a semester shall be the last working day, which shall be a day prior to the start of next semester.
- 15.4 A student shall be permitted to write his thesis in either English or Hindi. A thesis written in English should also carry its title and abstract in Hindi and vice-versa. However for student wanting to submit thesis in Hindi his Major Advisor would have to be satisfied that the particular thesis topic is such that thesis can be written in Hindi and that sufficient literature and Hindi technical words exist regarding the particular topic.
- 15.5 A student who has successfully completed all requirements including completion of entire research work and presentation of a seminar there on except submission of thesis may be permitted by the Director Resident Instructions to withdraw from the College to resume duties or to accept an employment (this will not be applicable to in-service candidates who have been permitted to carryout research work at the main campus or elsewhere under rule 14.9). He/ She shall, however, have to submit the thesis after completion of all the requirements including comprehensive examination for master's degree and preliminary examination for Ph.D. degree subject to the maximum permissible period prescribed for each degree programmes. He/she shall be required to register in the semester in which thesis has to be submitted
- 15.6 A student for master's degree may submit thesis within the maximum permissible period after completion of all the requirements. He/she shall be required to register in the semester in which thesis has to be submitted.
- 15.7 At the time of submission of unbound thesis for evaluation, a student will be required to submit proof and copies of research paper (one from Master's and two from Ph.D. thesis) submitted for publication in a reputed journal.
- 15.8 The format for thesis laser typing will be as under:
- (i) Font size 12 on one and half spacing.
  - (ii) 1½ inch margin on left and one inch in all other three sides.
  - (iii) Times New Roman font style.
- 15.9 It is mandatory for the students to acknowledge Major advisor, members of advisory committee, HOD and Dean by name in the acknowledgement page of thesis as per the proforma outlined in Appendix- XXII .

## **16.0 COLLABORATIVE PROGRAMME**

- 16.1 A student may be permitted to complete course requirement or research work for his degree in part or full at any ICAR or other institutions having similar programmes provided a MOU to be signed between MPUAT, Udaipur and these institutions on reciprocal basis after approval by the Academic Council on the recommendation of P.G. Faculty. The period spent by the student at these institutions shall be counted towards his/her residential requirement.
- 16.1.1 A candidate may be sent to any research station of the University or Institute of repute where research facilities and staff are available for conducting research work if in the opinion of the departmental committee the field of candidate's specialization is available away from the campus. The co-major advisor shall be required to be stationed at the place where the candidate carries out research investigation, subject to condition that the scientist is also accredited. The co-major advisor will have to attend synopsis seminar, pre-thesis seminar and thesis viva-voce

examination of the concerned student. The TA and DA for attending these activities will be born from the source of his/her salary.

- 16.1.2 Internal staff appointed as co-major advisor, advisor and who are posted outside the headquarter on their attending these activities (synopsis seminar, pre-thesis seminary and viva-voce) will draw their TA and DA from the source of their salary. The Officer Incharge should invariable relieve them for these activities.
- 16.2 A candidate from other SAUs admitted to a Ph.D. degree programme may be permitted to carry out research work for the thesis in his/her home University after completion of all requirements including preliminary examination under an approved and qualified co-advisor of his/her home University on reciprocal basis provided a MOU has been signed.
- 16.3 When a student is permitted to migrate from any SAUs to MPUAT, Udaipur in the middle of a programme. He shall submit a character certificate, transcript of courses taken and grades obtained in that institution. The Director Resident Instructions shall appoint a committee to examine his/her case and make recommendations about the exemption of credits after a proficiency test, if considered necessary. The exemption of credits permitted by the Director Resident Instructions shall not be greater than 12 credit hours.
- 16.3.1 The overall grade point average shall be based on the course(s) taken and grades obtained in this University.
- 16.3.2 The residential requirement for such student shall be determined by the Dean and approved by the Director Resident Instructions in each case separately and shall not be less than two semesters.

## **17.0 SCHOLARSHIPS PROVIDED BY THE UNIVERSITY**

- 17.1 A student must obtain minimum OGPA of 7.0 out of 10.0 in the first semester at Master's and Ph.D. level. For continuance of scholarship, the candidate is required to maintain OGPA more than 7.0 during Master's and Ph.D. courses. The scholarship shall be discontinued if the student obtains OGPA less than 7.0 but shall be restored on obtaining OGPA more than 7.0 in subsequent examination.
- 17.2 The SRFs working in Research Schemes may be allowed to pursue their Ph.D. being on fellowship subject to following conditions:
  - a) The candidate cannot be allowed to complete coursework while being SRF. If he/she is admitted in Ph.D., he/she has to leave the SRF.
  - b) A Ph.D. scholar can avail SRF only after he/she completes the course work prescribed for Ph.D. However, in such cases the consent of Major Advisor as well as P.I. of the concerned project is mandatory.

## **18.0 AUTHORITY TO INTERPRET THE RULES**

Any question about interpretation of these rules shall be decided by the Vice-chancellor, who may if he so desires consult the Board of Management to seek any necessary clarification.

**Note:** For any other rules & regulations which have not been covered herein, the students shall refer PROSPECTUS of MPUAT, which is published annually by the University.

**Format for Accreditation of Teachers for P. G. Teaching & Guiding  
Maharana Pratap University of Agriculture & Technology, Udaipur**

**Application for approval for Post Graduate Teaching and Thesis Guiding**

I, hereby apply for the approval of one or more of the following:- (Cross out whichever is not required and if you are already approved for any of the following. Mention order: Notification number and date.)

S.No.	PROGRAMME	CODE	Reference of Approval
1.	Teaching Master's degree programme Only	(R-01)	
2.	Teaching & Guiding Master's degree programme	(R-02)	
3.	Teaching & Guiding Master's degree programme and Teaching Ph.D.'s degree programme.	(R-03)	
4.	Teaching and Guiding Master's and Ph.D. degree programme	(R-04)	

1. Name of the applicant \_\_\_\_\_
2. Designation \_\_\_\_\_
3. Department \_\_\_\_\_
4. Place of present posting \_\_\_\_\_
5. Present address (Official) \_\_\_\_\_
6. Academic qualification:

Examination/degree	Year	Board/University	Division & % of marks obtained (OGPA)
Bachelor's .....			
Master's .....			
Ph.D. ....			
Specify other details (if any)			

7. Titles of thesis submitted for any degree with year of submission:  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



8. Experience:

A. Teaching    Period No. of Years    PG.UG.    Class    Institution

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B. Research/Extension Period No. of Years    Institution Remarks

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(Attach a list of Research papers published with journals).

9. Number of Students guided:- (a) Master's. \_\_\_\_\_ (b) Ph.D. \_\_\_\_\_

10. Mention below the field of your specialisation and number of years in each:

1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_

Dated : \_\_\_\_\_

**Signature of applicant**

Recommendation of the Head of Department with justification:

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**PROF. & HEAD OF THE DEPARTMENT**

Remarks of the Dean/Director

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**DEAN/DIRECTOR**

**OFFICE OF THE DIRECTOR RESIDENT INSTRUCTIONS**

Approved For \_\_\_\_\_

Code No. \_\_\_\_\_

DIRECTOR  
RESIDENT INSTRUCTIONS  
MPUAT, UDAIPUR

----- ( Name of department)  
**College of Technology and Engineering**  
**Maharana Pratap University of Agriculture & Technology, Udaipur**

No. \_\_\_\_\_

Dated : \_\_\_\_\_

**PROFORMA FOR THE APPROVAL OF THE ADVISORY COMMITTEE OF PG STUDENTS**

Name of the Student : \_\_\_\_\_  
 Registration No. : \_\_\_\_\_  
 Degree Programme (with subject) : \_\_\_\_\_  
 Name of the Major advisor : \_\_\_\_\_  
 No. of student under guidance of major advisor (Including present one) : Masters\_\_\_\_\_ Ph.D\_\_\_\_\_

Proposed Advisory Committee:

S.No.	Name & Designation	Department	Status	PG Code No.	Signatures
1.					
2.					
3.					
4.					
5.					

**Signature of the Major Advisor**

No. \_\_\_\_\_

Date : \_\_\_\_\_

Forwarded and recommended to the Dean, CTAE.

**Professor and Head**

No. \_\_\_\_\_

Date : \_\_\_\_\_

Forwarded and recommended to the Director, Resident Instructions, Maharana Pratap University of Agriculture & Technology, Udaipur for nominating his nominee and approval of the advisory committee.

**DEAN**

No. DRI/MPUAT/

Dated: \_\_\_\_\_

Nominee of Director of Resident Instructions

Name & Designation

Department

PG Code No.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Proposed Advisory committee is approved

**Director, Resident Instructions**  
**MPUAT, Udaipur**

**College of Technology and Engineering**  
**Maharana Pratap University of Agriculture & Technology, Udaipur**

**FORMAT FOR APPROVAL OF MASTER'S COURSE PROGRAMME**

1. Degree in which admitted ..... Subject ..... Faculty .....
  2. Name of the student in full (Block letters) .....
  3. Father's Name .....
  4. College of admission .....
  5. Semester and Year of Admission ..... Category .....
  6. Registration: (a) Date ..... (b) Reg.No. .... (c) Enroll No. ....
  7. Permanent address (brief) .....
  8. Institution last attended .....
  9. Date and place of Birth .....
  10. Qualifying degree ..... Aggregate % or OGPA .....
  11. Employer's name, if any .....
- Above information's are correct.

Signature of student .....

Certified that the academic attainments of the student prior to joining of the aforesaid programme have been assessed properly and the advisory committee recommends the course mentioned in this form including compulsory, deficient, non-credit and or exempted courses

**ADVISORY COMMITTEE**

S. No	Status	Name & Designation	Deptt.	PG Code No.	Signature
1.	Major Advisor				
2.	Member/ Co Major advisor				
3.	Member				
4.	Member				
5.	Member				

For Courses see on the reverse.

Signature of Clerk

Contd.....

**MASTER'S COURSE PROGRAMME APPROVED BY THE ADVISORY COMMITTEE**

Course No.	Title of the Course	Credit Hrs.
	<b>MAJOR COURSES</b> <b>(A) Core (12 Cr. Hrs.)</b>	
	<b>(B) Optional (8 to 15 Cr. Hrs.)</b>	
	Total	
	<b>MINOR &amp; RELATED COURSES (9 to 14 Cr. Hrs.)</b>	
	Total	
	Non Credit Courses (Minimum 2 Cr. Hrs.) : If exempted, write order No. and date	
	Remedial Courses, if any	
	Seminar.....	01
	Comprehensive Non Credit	NC
	Research.....	20
	(Minimum 57 Cr. Hrs. are required)	
	<b>Grand Total</b>	

Forwarded & Recommended

**Dean**  
**(Name & Signature)**

Above course Programme is approved.

**Head**  
**(Name & Signature)**

**Director, Resident Instructions**

**College of Technology and Engineering**  
**Maharana Pratap University of Agriculture & Technology, Udaipur**

**FORMAT FOR APPROVAL OF Ph.D.'S COURSE PROGRAMME**

1. Degree in which admitted Ph.D.....Subject.....Faculty.....
2. Name of the Student in full ( Block Letters) .....
3. Father's Name .....
4. College of admission .....
5. Semester and Year of Admission .....Category .....
6. Registration : (a) Date. .... (b) Reg. No. .... (c) Enroll No. ....
7. Permanent address (brief) .....
8. Institution last attended .....
9. Date and place of Birth .....
10. Qualifying degree ..... Aggregate % or OGPA .....
11. Employer's name, if any .....  
 Above information's are correct.

Signature of student .....

Certified that the academic attainments of the student prior to joining of the aforesaid programme have been assessed properly and the advisory committee recommends the course mentioned in this form including compulsory, deficient, non-credit and or exempted courses :

**ADVISORY COMMITTEE**

S.No	Status	Name & Designation	Deptt.	PG Code No.	Signature
1.	Major Advisor				
2.	Member/ Co Major advisor				
3.	Member				
4.	Member				
5.	Member				
6.	Member				

For Courses see on the reverse.

Signature of Clerk

Contd.....

**Ph.D. COURSE PROGRAMME APPROVED BY THE ADVISORY COMMITTEE**

<b>Course No.</b>	<b>Title of the Course</b>	<b>Credit Hrs.</b>
	<b>MAJOR COURSES</b> <b>(A) Core (6 Cr. Hrs.)</b>	
	<b>(B) Optional (Minimum 12 Cr. Hrs.)</b>	
	Total	
	<b>MINOR &amp; RELATED COURSES (Minimum 9 Cr. Hrs.)</b>	
	Total	
	<b>NON CREDIT COURSES (Minimum 2 Cr. Hrs.) :</b> <b>If exempted, write order No. and date</b>	
	Seminar .....	02
	Preliminary .....	NC
	Research .....	45
	(Minimum 74 Cr. Hrs. are required) <b>Grand Total</b>	

Forwarded & Recommended

**Dean**  
**(Name & Signature)**

Above course Programme is approved.

**Head**  
**(Name & Signature)**

**Director, Resident Instructions**

Format for submission of Ph.D. Synopsis  
**Maharana Pratap University of Agriculture & Technology, Udaipur**

**SYNOPSIS**

1. Name of Scholar \_\_\_\_\_ Class \_\_\_\_\_
2. Registration No. \_\_\_\_\_ Date of Registration \_\_\_\_\_
3. Title of Thesis \_\_\_\_\_
4. Department and College \_\_\_\_\_
5. Expected duration of the work \_\_\_\_\_  
 (give the period from ..... to .....)
6. Objectives
7. Importance of proposed investigation.
8. Review of Literature.
9. Proposed Plan of work
10. Facilities existing including farm, equipment, laboratories etc. with details.
11. Location of area, if field work
12. Literature cited (Signature of the student at the end of Literature cited with date & place).
13. Certificate in the format given below:

The members of Advisory Committee of Mr./Miss/Mrs..... met on ..... at ..... in which the candidate presented the synopsis of his/her research work entitled ..... to be carried out for Ph.D. degree in ..... in the form of a seminar. After discussion, the committee has recommended the synopsis for approval.

**ADVISORY COMMITTEE**

S.No.	Name & Designation	Status	P.G. Code No.	Signature
1.		Major Advisor		
2.		Advisor		
3.		Advisor		
4.		Advisor		
5.		DRI Nominee		

We have gone through synopsis critically and fully satisfied with the quantum and quality of proposed research work for Ph.D. (course work) and the same is recommended and forwarded for approval.

**Dean**  
 College of Technology and Engineering

**Head**  
 Department of .....  
 College of Technology and Engineering

The synopsis is hereby approved/not approved/to be revised.

**Director, Resident Instructions**

Format for submission of Master's Synopsis  
**Maharana Pratap University of Agriculture & Technology, Udaipur**

**SYNOPSIS**

1. Name of Scholar \_\_\_\_\_ Class \_\_\_\_\_
2. Registration No. \_\_\_\_\_ Date of Registration \_\_\_\_\_
3. Title of Thesis \_\_\_\_\_
4. Department and College \_\_\_\_\_
5. Expected duration of the work \_\_\_\_\_  
 (give the period from ..... to .....)
6. Objectives
7. Importance of proposed investigation
8. Review of Literature
9. Proposed Plan of work
10. Facilities existing including farm, equipment, laboratory etc. with details
11. Location of area, if field work
12. Literature cited (Signature of the student at the end of Literature cited with date & place)
13. Certificate in the format given below:

The members of Advisory Committee of Mr./Miss/Mrs..... met on ..... at ..... in which the candidate presented the synopsis of his/her research work entitled ..... to be carried out for Master's degree in ..... in the form of a seminar. After discussion, the committee has recommended the synopsis for approval.

**ADVISORY COMMITTEE**

S.No.	Name & Designation	Status	P.G. Code No.	Signature
1.		Major Advisor		
2.		Advisor		
3.		Advisor		
4.		DRI Nominee		

I have gone through synopsis critically and fully satisfied with the quantum and quality of proposed research work for Master's degree and the same is recommended and forwarded for approval.

**Head**  
**Department of .....**  
**College of Technology and Engineering**

The synopsis is hereby approved/not approved/to be revised.

**Dean**  
**College of Technology and Engineering**



Format of Certificate for submission of report of Comprehensive Examination  
**CERTIFICATE OF COMPREHENSIVE EXAMINATION FOR MASTER’S PROGRAMME**

**SEMESTER I / II, 20\_\_\_\_\_**

This is to certify that Mr./ Miss/ Mrs. \_\_\_\_\_ a student of the College of Technology and Engineering in the subject of \_\_\_\_\_ was examined by the following members of the committee for oral comprehensive examination held on \_\_\_\_\_ at the College of Technology and Engineering. On the basis of his/her performance, the members of the committee have awarded her/him the following marks and grade:

Comprehensive (for Master’s degree):

			Marks obtained
a)	Written examination:	Major (MM 100) =	.....
		Minor (MM 100) =	.....
b)	Oral examination:	(MM 100) =	.....
	Satisfactory / Unsatisfactory		

1. Major Advisor  
(Name & Signature)

4. Advisor  
(Name & Signature)

2. Advisor  
(Name & Signature)

3. Advisor  
(Name & Signature)

Head of Department  
(Name & Signature)

No. ....

Date: .....

- CC: i) The Director, Resident Instructions, Maharana Pratap University of Agriculture & Technology, Udaipur.  
ii) The Controller of Examinations, Maharana Pratap University of Agriculture & Technology, Udaipur.  
iii) The Dean, College of Technology and Engineering, Udaipur  
iv) The Student’s file in the department.

**HEAD OF DEPARTMENT**

Format of Certificate for submission of report of Preliminary Examination  
**CERTIFICATE OF PRELIMINARY EXAMINATION FOR Ph.D. DEGREE**

**SEMESTER I/II, 20\_\_\_\_\_**

This is to certify that Mr./ Miss/ Mrs. \_\_\_\_\_ a student of the College of Technology and Engineering in the subject of \_\_\_\_\_ was examined by the following members of the committee for oral preliminary examination held on \_\_\_\_\_ at the College of Technology and Engineering. On the basis of his/her performance, the members of the committee have awarded her/him the following marks and grade:

Preliminary (for Ph.D. degree):

		Marks obtained
a)	Written examination: Major I (MM 100) =	.....
	Major II (MM 100) =	.....
	Minor (MM 100) =	.....
b)	Oral examination: (MM 100) =	.....
	Satisfactory / Unsatisfactory	

1. Major Advisor  
(Name & Signature)

4. Advisor  
(Name & Signature)

2. Advisor  
(Name & Signature)

5. Advisor  
(Name & Signature)

3. Advisor  
(Name & Signature)

External Examiner  
(Name & Signature)

Head of Department  
(Name & Signature)

No. ....

Date: .....


- CC: i) The Director, Resident Instructions, Maharana Pratap University of Agriculture & Technology, Udaipur.  
 ii) The Controller of Examinations, Maharana Pratap University of Agriculture & Technology, Udaipur.  
 iii) The Dean, College of Technology and Engineering, Udaipur.  
 iv) The student's file in the department.

**HEAD OF DEPARTMENT**

Format of thesis to be followed

1. Title cover-outer (Covered with plastic sheet)
2. Title cover-inner
3. Title page
4. Certificate - I (Comprehensive/Preliminary Examination)
5. Certificate - II
6. Certificate - III
7. Certificate - IV (Correction Certificate)
8. Acknowledgement
9. Contents
10. List of Tables
11. List of figures and graphs
12. List of appendices
13. Introduction
14. Review of Literature
15. Material and Methods (May be divided into
16. Results suitable chapters
17. Discussion depending upon the
18. Summary problems)
19. Literature cited
20. Abstract in English
21. Abstract in Hindi
22. Appendices

- Note :-**
- (i) The size of the thesis should be A4 (8 ½" x 11")
  - (ii) Thesis should be submitted with computer laser typesetting in 1½ spacing using 12 point size letter.
  - (iii) The page from Introduction to Literature cited are numbered in Arabic and appendices in Roman (bold face) numbers.
  - (iv) The bound thesis should have a plastic cover.
  - (v) The faculty-wise colour-coding of the title cover be as follows:
    - a) Agriculture : Light Green / Olive Green
    - b) Technology & Engineering : Sky blue / Light blue**
    - c) Home Science : Light Pink / Pink
    - d) Dairy & Food Science Technology : Cream
    - e) Fisheries : Navy Blue
    - f) Horticulture & Forestry : Golden

Hint	Format of outer & inner Cover of Master's Thesis
Title in English	<b>Design Development and Performance Evaluation of Low Cost Hybrid Dryer cum Cooker for Household Usage</b>
Title in Hindi	<b>घरेलू उपयोग के लिए कम लागत संकर शुष्कक कुकर की संरचना, विकास और प्रदर्शन मूल्यांकन</b>
Full Name of Student	<i>Chaudhary Rameshbhai Harjibhai</i>
Full Name of Degree (Subject)	<b>Thesis Master of Technology in Agricultural Engineering (Renewable Energy Engineering)</b>
Emblem of the University	
Year	<b>2016</b>
Name of the Department & College	<b>Department of Renewable Energy Engineering College of Technology and Engineering Maharana Pratap University of Agriculture &amp; Technology, Udaipur</b>

Format of title page of Master's Thesis

Hint

Title in English

**Design Development and Performance Evaluation of Low Cost Hybrid  
Dryer cum Cooker for Household Usage**

Title in Hindi

**घरेलू उपयोग के लिए कम लागत संकर शुष्कक कुकर की संरचना,  
विकास और प्रदर्शन मूल्यांकन**

Requirement of

**Thesis**

**Submitted to the**

**Maharana Pratap University of Agriculture & Technology, Udaipur**

Name of Degree  
in Full

**In Partial Fulfillment of the Requirement for  
the Degree of**

(Subject)

**Master of Technolgy in Agricultural Engineering  
(Renewable Energy Engineering)**

Emblem of the  
University



Full Name of the  
Student

By

*Chaudhary Rameshbhai Harjibhai*

Year of  
Submission

2016

Format of outer & inner Cover of Ph.D. Thesis

Hint

Title in English

**Studies on Air Assisted Variable Rate Spraying with  
Ultrasonic Scanning for Orchard Crops**

Title in Hindi

**फलों के बागों हेतु अल्ट्रासोनिक स्कैनिंग युक्त वायु सहायक  
परिवर्तनीय दर छिड़काव का अध्ययन**

Mr. Sachin Vilas Wandkar

Full Name of  
Student

**Thesis**

Full Name of  
Degree  
(Subject)

**Doctor of Philosophy in Agricultural Engineering  
(Renewable Energy Engineering)**

Emblem of the  
University



Year of  
submission

**2016**

Name of the  
Department &  
College

**Department of Farm Machinery and Power Engineering  
College of Technology and Engineering  
Maharana Pratap University of Agriculture & Technology, Udaipur**

Format of title page of Ph.D. Thesis

Hint

Title in English

**Studies on Air Assisted Variable Rate Spraying with  
Ultrasonic Scanning for Orchard Crops**

Title in Hindi

**फलों के बागों हेतु अल्ट्रासोनिक स्कैनिंग युक्त वायु सहायक  
परिवर्तनीय दर छिड़काव का अध्ययन**

**Thesis**

Requirement of

**Submitted to the  
Maharana Pratap University of Agriculture & Technology, Udaipur**

Name of Degree  
in Full

**In Partial Fulfillment of the Requirement for  
the Degree of  
Doctor of Philosophy in Agricultural Engineering  
(Farm Machinery and Power Engineering)**

(Subject)

Monogram of  
the University



By

Full Name of the  
Student

Mr. Sachin Vilas Wandkar

Year of  
Submission

2016

Format of Certificate - I to be included in the Thesis

**COLLEGE OF TECHNOLOGY AND ENGINEERING  
MAHARANA PRATAP UNIVERSITY OF AGRICULTURE & TECHNOLOGY, UDAIPUR**

**CERTIFICATE - I**

Date: \_\_\_\_\_

This is to certify that \_\_\_\_\_ student of \_\_\_\_\_ had successfully completed the comprehensive/preliminary examination held on \_\_\_\_\_ as required under the regulation for Post-Graduate Studies.

(Signature & Date)

Name of the Head of Deptt.

College of Technology and Engineering

**Note:** While typing include what is applicable only.



Format of Certificate - II to be included in the Thesis

**COLLEGE OF TECHNOLOGY AND ENGINEERING  
MAHARANA PRATAP UNIVERSITY OF AGRICULTURE & TECHNOLOGY, UDAIPUR**

**CERTIFICATE - II**

Date: \_\_\_\_\_

This is to certify that this thesis entitled \_\_\_\_\_  
\_\_\_\_\_ submitted for  
the degree of \_\_\_\_\_ in the subject of  
\_\_\_\_\_ embodies bonafide research work carried-out by  
Mr./Miss/Mrs. \_\_\_\_\_

(first name) (middle name) (surname)

under my guidance and supervision and that no part of this thesis has been submitted to any other degree. The assistance and help received during the course of investigation have been fully acknowledged. The draft of the thesis was also approved by the advisory committee on \_\_\_\_\_ .

.....  
(Head of Department)  
Name & Signature

.....  
(Major Advisor)  
Name & Signature

.....  
(Dean of the College)  
Name & Signature

Format of Certificate - III to be included in the Thesis

**COLLEGE OF TECHNOLOGY AND ENGINEERING  
MAHARANA PRATAP UNIVERSITY OF AGRICULTURE & TECHNOLOGY, UDAIPUR**

**CERTIFICATE - III**

Date: \_\_\_\_\_

This is to certify that this thesis entitled \_\_\_\_\_  
\_\_\_\_\_ submitted by  
Mr./Miss/Mrs. \_\_\_\_\_ to Maharana Pratap  
University of Agriculture & Technology, Udaipur in partial fulfillment of the requirement for the  
degree of \_\_\_\_\_ in the subject of \_\_\_\_\_ after  
recommendation by the external examiner was defended by the candidate before the following  
members of the examination committee. The performance of the candidate in the oral  
examination held on \_\_\_\_\_ was found satisfactory, we therefore, recommend that the  
thesis be approved.

.....  
(Major Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Head of the Department)  
Name & Signature

.....  
Dean

Approved  
**DIRECTOR RESIDENT INSTRUCTION  
MPUAT, UDAIPUR**

Format of Certificate - IV to be included in the Thesis

**COLLEGE OF TECHNOLOGY AND ENGINEERING  
MAHARANA PRATAP UNIVERSITY OF AGRICULTURE & TECHNOLOGY, UDAIPUR**

**CERTIFICATE - IV**

Date: \_\_\_\_\_

This is to certify that Mr./Miss/Mrs. \_\_\_\_\_  
student of \_\_\_\_\_(class) \_\_\_\_\_ (Department)  
has made all corrections / modifications in the thesis entitled \_\_\_\_\_  
\_\_\_\_\_ which were suggested by the external examiner and the  
advisory committee in the oral examination held on \_\_\_\_\_. The final copies of the  
thesis duly bound and corrected were submitted on \_\_\_\_\_.

.....  
(Head of Department)  
Name & Signature

.....  
(Major Advisor)  
Name & Signature

**APPENDIX - XVII**

Format of Certificate for Submission of Viva-Voce Report of Master's thesis

..... (Name of department)

**COLLEGE OF TECHNOLOGY AND ENGINEERING**

**MAHARANA PRATAP UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, UDAIPUR**

Date \_\_\_\_\_

This is to certify that the thesis entitled \_\_\_\_\_  
submitted by Mr./Miss./Mrs./ \_\_\_\_\_ to the Maharana Pratap  
University of Agriculture & Technology, Udaipur, in partial fulfillment for Masters degree in  
\_\_\_\_\_ and recommended by the external examiner was examined  
orally by the committee consisting of undersigned. The committee recommends that:

- \* (i) The performance of the candidate has been found satisfactory. We recommend the acceptance of the thesis for the award of degree.
- \* (ii) The performance of the candidate has been found unsatisfactory. The candidate be asked to re-appear in the oral examination.

.....  
(Major Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

Forwarded by the Head, Department of \_\_\_\_\_ to:-

1. The Director Resident Instructions, MPUAT, Udaipur with five copies of bound thesis.
2. The Dean, College of Technology and Engineering, Udaipur.

Head of Department  
(Name & Signature)

\* Do not include, which is not applicable or strike-out.

\*\* Please note that full name of the Head, Major Advisor and Advisors must be printed.

Format of Certificate for Submission of Ph.D. Thesis Viva-Voce Report

.....(Name of Department)

**COLLEGE OF TECHNOLOGY AND ENGINEERING**

**MAHARANA PRATAP UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, UDAIPUR**

Date\_\_\_\_\_

This is to certify that the thesis entitled \_\_\_\_\_  
submitted by Mr./Miss./Mrs. \_\_\_\_\_ to the  
Maharana Pratap University of Agriculture & Technology, Udaipur, in partial fulfillment of the Ph.D.  
degree in \_\_\_\_\_ (subject) of the faculty of \_\_\_\_\_ and  
recommended by both the external examiners was examined orally by the committee consisting of  
undersigned. The committee recommends that:

- \* (i) The performance of the candidate has been found satisfactory. We recommend the acceptance of the thesis for the award of degree.
- \* (ii) The performance of the candidate has been found unsatisfactory. The candidate be asked to re-appear in the oral examination.

.....  
(Major Advisor)  
Name & Signature

.....  
Director Resident Instructions/  
Dean of the College

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(External Examiner)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

.....  
(Advisor)  
Name & Signature

Forwarded by the Head, Department of .....to:-

1. The Director Resident Instructions, MPUAT, Udaipur with five copies of bound thesis and the certificate of incorporation of corrections & suggestions.
2. The Dean, College of Technology and Engineering, Udaipur.

Head of Department  
(Name & Signature)

\* Do not include, which is not applicable or strike-out.

\*\* Please note that full name of the Head, Major Advisor, Advisors and Dean must be printed.

**POST GRADUATE SCHEDULE**

**MASTER’S PROGRAMME**

<b>Semester</b>	<b>Activities</b>	<b>Time limits</b>
First	a) Fresh admission and registration	As scheduled
	b) Appointment of Major Advisor	15 days
	c) Formation of Advisory Committee and its approval from Director Resident Instructions	First month
	d) Meeting of Advisory Committee to chalk course programme	Second month
	e) Course program approval from Director, Resident Instructions	Third month
Second	a) Registration in second semester as per the course programme approved by Director, Resident Instructions	As scheduled
	b) Allotment of research problem	First month
	c) Seminar on synopsis.	Second month
	d) Submission of synopsis of the research problem for approval of Director Resident Instructions.	Third month
Third	a) Request for comprehensive examination	Last month
	b) Beginning of the research	
Fourth	a) Beginning of the research	
	b) Comprehensive examination.	
	c) Thesis submission.	Last month
Fifth	Thesis submission *	

\*Issue of warning to student, if not submitted.

**Note:** Above time limits are the upper limits by which specified activities must be completed. Efforts be made to adhere with the above prescribed schedule so that all the requirements are timely fulfilled. In case of unusual delay, reason (s) for the same be recorded.

**POST GRADUATE SCHEDULE**

**Ph.D. PROGRAMME**

<b>Semester</b>	<b>Activities</b>	<b>Time limits</b>
First	a) Appointment of Major Advisor and Advisory Committee	15 days
	b) Approval of advisory Committee by Director, Resident Instructions	First month
	c) Meeting of Advisory Committee to chalk-out course programme	Second month
	d) Course program approval from Director, Resident Instructions	Third month
Second	a) Registration to second semester as per the course programme approved by DRI	As scheduled
	b) Allotment of research problem	First month
	c) Seminar to finalize synopsis of the research work and approval of synopsis by Director, Resident Instructions	Second month
Third	a) Beginning of the research	First month
	b) Request for preliminary examination	
	c) Written preliminary examination	Second month
	d) Oral preliminary examination	Third month
Fourth	Thesis work	
Sixth	Thesis submission*	

\*Issue of warning to student, if not submitted.

**Note:** Above time limits are the upper limits by which specified activities must be completed. Efforts be made to adhere with the above prescribed schedule so that all the requirements are timely fulfilled. In case of unusual delay, reason (s) for the same be recorded.

**PROFORMA TO BE USED FOR SIGNING M.O.U. FOR COLLABORATIVE STUDENT'S PROGRAMMES  
MEMORANDUM OF UNDERSTANDING**

Between ..... and MPUAT, Udaipur for carrying out research work at ..... for Master's and Doctoral Degrees.

1. This memorandum of understanding is executed on ..... (date) between Maharana Pratap University of Agriculture and Technology, Udaipur (hereinafter referred to as the First Party) and ..... (hereinafter referred to as the Second Party) for Doctoral and Master's Degrees Research in the field of .....
2. Master's and Doctoral research project will be carried out at the premises of the First Party and the Second Party as per the requirement. The students will complete the project work and prepare the thesis and submit it to the First Party for their respective degrees.
3. There may be periodical meetings of the supervisor at the premises of Second Party or First Party by mutual consultation of both the parties. All the expenditures towards TA/DA of the supervisors to attend such meetings will be borne from the source of the salary.
4. Second party will provide hostel facilities to the students and guest house facilities to the supervisor on payment basis subject to the availability of accommodation in the hostel / guest house.
5. The Second Party would make available the existing facilities like Library, Laboratory, Workshop, fields, etc. to the student for their project works during such timings as are applicable to other institute's employees. There will be no financial liability on the part of First Party (MPUAT) on account of chemicals / glassware or any other expenditure incurred by the second party during the course of Master's/ Doctoral research work.
6. After the thesis is submitted and viva-voce is over, the First Party will provide two copies of the thesis to the Second Party, one for Library and the other for the Co-Major Advisor.
7. The information generated through such project work shall deem to be the credit of both the First Party and the Second Party. In the event of any publication of these results / data, the Co-Major Advisor of Second Party will be one of the authors.
8. The Co-major Advisor will have to attend in person following activities pertaining to Master's/ Doctoral programme of the concerned student for which TA/DA and other expenditure will be charged from the source of his salary:
  - a) Synopsis Seminar
  - b) Pre-thesis Seminar
  - c) Thesis Viva-voce

(Signature of First Party)

(Signature of Second Party)

DEAN

Dean / Associate Dean

DIRECTOR  
RESIDENT INSTRUCTION, MPUAT, UDAIPUR

Dean (PG) / Director Instruction

REGISTRAR

REGISTRAR



**ACKNOWLEDGEMENT**

I take it to be my proud privilege to avail this opportunity to express my sincere and deep sense of gratitude to my learned major advisor \_\_\_\_\_ for his stimulating guidance, constructive suggestions, keen and sustained interest and incessant encouragement bestowed during the entire period of investigation, as well as critically going through the manuscript.

I am gratified to record sincere thanks to the members of the advisory committee;  
Dr. \_\_\_\_\_ Department of \_\_\_\_\_,  
Dr. \_\_\_\_\_ Department of \_\_\_\_\_,  
Dr. \_\_\_\_\_ Department of \_\_\_\_\_, College of \_\_\_\_\_ and  
Dr. \_\_\_\_\_, Associate Professor (Department \_\_\_\_\_) DRI Nominee for their generous gestures and valuable suggestions in planning and execution of this study.

The author is indebted to Dr. \_\_\_\_\_ Professor & Head, Department of \_\_\_\_\_, College of \_\_\_\_\_, Udaipur for providing me facilities and encouragement during the course of investigation.

I am privileged to express sincere and deep sense of gratitude to Dr. \_\_\_\_\_, Dean, College of \_\_\_\_\_, Udaipur for his due attention and encouragement during the study period and also for providing me the necessary facilities during the course of research.

Words can hardly register the sincere and heartfelt feeling which I have for Dr. \_\_\_\_\_, Dr. \_\_\_\_\_, Dr. \_\_\_\_\_ and other staff members for their kind cooperation and help as and when needed.

I am much obliged to thank \_\_\_\_\_ in providing me the necessary funds for my post-graduate studies.

I can not forget to thank \_\_\_\_\_ for his ever willing co-operation and nice laser typesetting of the manuscript.

I feel short of words to express my gratitude to my family members for their utmost co-operation, sacrifice and encouragement during the course of this work.

Place: Udaipur  
Date: \_\_\_\_\_

(Signature & Name of student)

## LITERATURE CITED

Variation in "**Literature Cited**" chapter in synopsis / thesis have been observed. In order to maintain uniformity, henceforth following pattern in chapter "Literature Cited" be followed:

- Sharma, A.K. and Gautam, B.P. 1999. Integrated pest management strategy against bollworm complex of cotton. *Indian Journal of Entomology* **64** : 623-626.
- Rajkhowa, D.J., Kandali, R., Barua, I.C, and Deka, N. C. 2005. Integrated weed and nutrient management practices in wheat + rapeseed intercropping system. *Indian Journal of Weed Science* **37** : 139-141.
- Sankaran, S., Jayakumar, R. and Kempuchetty, N. 1993. Herbicide residues. Gandhi Book House, Coimbtore pp. 79-85.
- Tiwari, J.P., Kurchania, S.P. and Paradhkar, N.R. 1995. Impact of small canary grass dominated weed eco-system on wheat and effect of isoproturon on sustainable yield. *In : Proceedings of Biennial Conference, Indian Society of Weed Science* held at Annamalai during February 9-10,1995, pp. 34-35.
- Bellaki, M.A., Badanur, V.P., Faroda, A.S., Joshi, N.L., Kathju, S. and Kar, Amal. 1999. Integrated nutrient management for sustainable crop production. *In: Proceedings of Symposium on Recent Advances in Management of Arid Ecosystem* held at Jodhpur in March,1997. Faroda, A.S., Joshi, N.L. and Kathju, S. (Eds) pp 271-276.
- Jat, R.S. 2002. Effect of weed control and method of sowing on productivity of wheat (*Triticum aestivum* L.) in sub-humid southern plain and Aravalli hills zone of Rajasthan. Ph.D. thesis submitted to Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan.

Therefore in concise way following points be taken into consideration:

- \* Surname of authors be pointed first. Spellings of names of author(s) at two places (text and Literature cited) should correspond
- \* Year without brackets
- \* 2<sup>nd</sup> line from 5<sup>th</sup> letter of 1<sup>st</sup> line
- \* Journal Symposium/ Conference name in full and in italic letters
- \* Vol. No. should be bold
- \* Avoid issue number
- \* Pages 139-141 instead 139-41
- \* Pages for book ref. as pp. 79-85

**DIRECTORATE OF RESIDENT INSTRUCTIONS**

Maharana Pratap University of Agriculture and Technology, Udaipur

**Rules and Guidelines for award of Gold Medal during University Convocation**

**Eligibility**

1. Each faculty will nominate students double the number of gold medal to be awarded by the respective faculty.
2. Ph.D candidates who have obtained a minimum OGPA of 7.5 or above. The course work should have been completed in semester programme without any “F” grade/ Backlog and any in disciplinary case against him/her.
3. Thesis is compulsory requirement, one extra semester may be allowed for completion and approval of thesis. (Total 7 Semesters).
4. Gold Medal will be given faculty-wise to Ph.D students after competition; minimum number of students for eligibility should not be fixed.

**Nomination of names from faculty**

1. The names of such selected candidates from each College will be identified by respective Chairman of the faculty through faculty level screening based upon academic achievements, thesis evaluation report submitted by the external examiner and presentation of the research work through seminar by the students in front of the Committee constituted by the Chairman of the faculty.
2. Names of nominated students should be submitted by due date.

**Criteria and procedure for final selection of Ph.D. candidates for Gold Medal award**

1. For awarding Gold Medal at Ph.D degree level students will be identified through University level screening considering following three criteria as under:
  - Academic record
  - Thesis work of the student and Examiners report
  - Presentation of research work
2. The weightage given to these 3 components would be:

	<b>Ph.D.</b>
Academic record	50%-50 marks
Thesis work and report	20%-20 marks
Seminar Presentation	30%-30 marks

3. For award of marks in Academic record, OGPA of the student is to be multiplied by 5. It will form the score of participant's academic record.
4. For award of 20 marks in thesis work, thesis and its evaluation report by external examiner will be given to a committee common for all the faculties. The committee under the chairmanship of DRI shall have 3 Deans nominated by Hon'ble Vice- Chancellor as members. Committee members will individually assign marks out of 20. The marks assigned by the 3 members will be pooled for overall assessment.
5. For remaining 30 marks, students will present a seminar for 10 minutes duration before all the faculty members.
6. The evaluation of students seminar will be done by the Jury approved by Hon'ble Vice-Chancellor comprising of very senior scientist or educationist / technocrats. One of these will act as Chairman of this Jury. The Jury will comprise of 4 members including chairman.
7. The assessment of seminar presentation will be based on following criteria:

			<b>Ph.D.</b>
i.	Language	20 %	6 marks
ii.	Articulation	20 %	6 marks
iii.	Research findings	40%	12 marks
iv.	Conclusion	10%	3 marks
v.	Use of AV aids	10%	3 marks
<b>Total</b>		100%	30 marks

8. Each member of the jury will assess the performance of the student individually, which will be pooled for overall assessment.
9. In case of tie, the gold medal will be awarded on the basis of academic achievements at UG/ Masters' level and Ph.D. level as the case may be.
10. At stage, warning lights will be arranged where green, yellow and red bulbs will indicate comfortable time, warning time and time up period respectively. Comfortable time will be of 8 minutes. After 8 minutes, yellow light will indicate the warning period and just at the end of 10<sup>th</sup> minute the red light will signal for time up. A timer bell to indicate the comfortable, warning and time up period will be used in case the lights are not possible. A grace of 15 seconds shall be allowed to finally stop the presentation. After this grace period, negative marking will start; the negative marking will be in the form of deduction of one mark each 15 second slot and the fraction thereof.
11. The evaluation criteria will be explicitly announced in the hall before the start of competition.
12. The cut off for awarding Gold Medal will be as per eligibility criteria i.e. 75 % or more.

## Dress Code in the University Convocation

क्र.सं.	श्रेणी	ड्रेस कोड
1.	कुलपति एसं कुलसचिव	<p>(i) पुरुष— सफेद/ऑफ व्हाइट/क्रीम कलर का जोधपुरी सूट, मेवाड़ी पगड़ी एवं काले जूते</p> <p>(ii) महिला— सफेद/ऑफ व्हाइट क्रीम कलर की साड़ी मय लाल कलर का बॉर्डर व ब्लारुज एवं काले सेंडिल/स्लीपर</p> <p>इस श्रेणी हेतु लाल कलर का स्टॉल्स (मय चमकीला बॉर्डर) एवं बैज उपयोग करेंगे।</p>
2.	विश्वविद्यालय के अधिकारी/प्राधिकारी	<p>(i) पुरुष— सफेद/ऑफ व्हाइट/क्रीम कलर का जोधपुरी सूट, मेवाड़ी पगड़ी एवं काले जूते</p> <p>(ii) महिला— सफेद/ऑफ व्हाइट क्रीम कलर की साड़ी मय लाल कलर का बॉर्डर व ब्लारुज एवं काले सेंडिल/स्लीपर</p> <p>इस श्रेणी हेतु लाल कलर का स्टॉल्स (मय चमकीला बॉर्डर) एवं बैज उपयोग करेंगे।</p>
3.	बिन्दु संख्या 2 के अतिरिक्त अन्य प्राधिकारी यथा जन प्रतिनिधि, विभिन्न नामित व्यक्ति (Non-officials)	<p>(i) पुरुष— सफेद/ऑफ व्हाइट/क्रीम कलर का जोधपुरी सूट, मेवाड़ी पगड़ी एवं काले जूते</p> <p>(ii) महिला— सफेद/ऑफ व्हाइट क्रीम कलर की साड़ी मय लाल कलर का बॉर्डर व ब्लारुज एवं काले सेंडिल/स्लीपर</p> <p>इस श्रेणी हेतु लाल कलर का स्टॉल्स (मय चमकीला बॉर्डर) एवं बैज उपयोग करेंगे।</p>
4.	डिग्री / मैडल प्राप्त करने वाले विद्यार्थी	<p>(i) पुरुष— सफेद कलर का कुर्ता-पायजामा/पेंट-शर्ट/धोती-कुर्ता तथा काले जूते</p> <p>(ii) महिला— सफेद साड़ी/सलवार-सूट लाल कलर का बॉर्डर व ब्लारुज एवं चुन्नी/दुपट्टा एवं काले सेंडिल/स्लीपर</p> <p>इस श्रेणी हेतु लाल कलर का स्टॉल्स (मय चमकीला बॉर्डर) एवं बैज उपयोग करेंगे।</p>

नोट: सर्दियों के मौसम में गहरे मैरून रंग का जैकट उपयोग में लिया जाये।

**College of Technology and Engineering**

Maharana Pratap University of Agriculture & Technology, Udaipur

Guidelines/ Summary of PG Rules to be followed by the PG students during their course of studies  
(indicative only, subject to change)

Semester	Particulars	M. Tech.	Ph.D	Remarks
	Core Courses	4	2	Resolution No. MPUAT/AC/24/2008-01/07
I	Admission & Registration	As per schedule	As per schedule	
	Appointment of Major Advisor	15 days	15 days	
	Advisory committee formation & it's approval	1 <sup>st</sup> month	1 <sup>st</sup> month	
	Meeting of advisory committee to chalk out course programme	2 <sup>nd</sup> month	2 <sup>nd</sup> month	
	Course programme approval from DRI	3 <sup>rd</sup> month	3 <sup>rd</sup> month	
II	Registration	As per schedule	As per schedule	
	Allotment of research problem	1 <sup>st</sup> month	1 <sup>st</sup> month	
	Seminar to finalize synopsis of the research work	2 <sup>nd</sup> month	2 <sup>nd</sup> month	
	Submission of Synopsis & it's approval	3 <sup>rd</sup> month	2 <sup>nd</sup> month	For M.Tech. submit five copies, approval by DRI. For Ph.D. initially send only one copy to the DRI (only when there is no professor in the department)
III	Beginning of the research	√	1 <sup>st</sup> month	
	Request for comprehensive examination	Last month	-	To Dean for written and oral
	Request for preliminary examination	-	1 <sup>st</sup> month	To Dean for written and to DRI for oral for appointment of external examiner (thro' the Dean).
	Written preliminary examination	-	2 <sup>nd</sup> month	Resolution No. MPUAT/AC/24/2008-01/14
	Oral preliminary examination	-	3 <sup>rd</sup> month	By the external examiner appointed by DRI

IV	Research	Continued	-	
	Comprehensive examination	1 <sup>st</sup> month	-	By the advisory committee
	Written preliminary examination	-	2 <sup>nd</sup> month	
	Thesis submission	Last month	-	
	Oral examination	Through LCD presentation in front of the advisory committee	-	After evaluation & receipt of thesis from the external examiner
	Final bound thesis submission	After oral examination	-	Incorporating necessary corrections. Also submit 2 sets of requisite certificates
V	Thesis, if not submitted	*	-	
IV-VI	Research / Thesis work	-	Continued	
VI	Thesis submission	-	*	
	Ph.D. thesis viva-voce	-	Through LCD presentation in front of the external examiner & advisory committee	After evaluation & receipt of the thesis from the external examiners
	Final bound thesis submission	-	After Ph.D. thesis viva-voce	Incorporating necessary corrections. Also submit 2 sets of requisite certificates

\*Issue of warning to student, if not submitted.

**Note:**

1. Above time limits are the upper limits by which specified activities must be completed. Efforts be made to adhere prescribed schedule so that all the requirements are timely fulfilled. In case of unusual delay, reason(s) for the same be recorded.
2. Guidelines for conduct of M.Tech./Ph.D. thesis viva-voce you may refer DRI letter No.F/DRI/MPUAT/2008/1046-85 Dt.04.04.08.
3. For PDC/Result, submit 2 sets of requisite certificates (along with letter of approval from DRI) to the Dean, CTAE.

### **IMPORTANT**

Any dispute arising out of anything connected with the University/ College and its activities including admission/ operation of semester rules will be subject to the jurisdiction of the courts situated in Udaipur.

### **DISCLAIMER**

The statement made in the “Post Graduate Studies Regulations and Course Description” and all information contained herein is believed to be correct at the time of publication. However the university, the DRI and the college reserves the right to make any change and/or addition to the regulations, conditions governing the conduct of students, requirement for degree, fee and any other information, or statements contained in this at any time without notice. No responsibility will be accepted by the university or the College for any hardship or expenses incurred by its students or any other person or persons for such changes, additions, omissions or errors, no matter how they are caused.

□□□



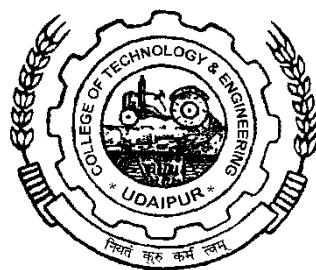
# **COURSE DESCRIPTION**

**(SECTION- II)**

## **M. Tech. and Ph.D.**

**RENEWABLE ENERGY ENGINEERING**

**Effective from 2016-17**



**COLLEGE OF TECHNOLOGY AND ENGINEERING**  
**MAHARANA PRATAP UNIVERSITY OF AGRICULTURE & TECHNOLOGY**  
**UDAIPUR (Rajasthan) 313001**

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## DEPARTMENT OF RENEWABLE ENERGY ENGINEERING



### VISION

To be a centre of excellence which integrates all facets of Renewable Energy, entrepreneurship and environmental management and be recognized as the focal point for catalyzing the growth of the energy and agriculture, renewable energy engineering and related industries; and to produce skilful and high quality post graduate engineers supported by up-to-date curriculum and scientific and industrial research to suit the industry, to enhance the energy saving potential by providing databank, testing facilities, suitable consultancy and training services.

### MISSION

Impart education and updated knowledge to PG students so as to make them competent enough in the areas of renewable energy engineering, environmental management by offering the courses and training programmes of global standards with optimal mix of inputs on renewable energy engineering, energy auditing, energy conservation, energy production from alternate means, bio fuels & environment engineering; management and entrepreneurship.

Fully committed to provide need based quality education in all the major areas to the students so that they can not only contribute to their personal development and prosperity of the society, state and the nation as a whole but also build a leading and successful career in this field and can work in rural areas for the development of farmers community as well as aid in relieving the pressure of energy deficiency.

### Programme Educational Objectives

1. To provide students with a sound foundation in the renewable energy engineering fundamentals. A post graduate must be able to understand renewable energy technologies and to engage in an integrated system-level design.

2. A post graduate student must have sound understanding of the energy and related fields and necessary perspective to pursue work in renewable related industries and fields so as to cover the whole spectrum of renewable energy engineering.
3. To develop the analytical and logical aptitude among students to quickly adapt to new work environments, assimilate new information, and solve new problems.
4. To provide exposure of new cutting edge technologies to the students and to motivate them to take up new challenges to solve the problems faced by society and nation through research and development.

### **Programme Outcome**

1. Develop skill and expertise amongst post graduate scholars to design, install and commission projects on waste management and natural renewable resource utilization for energy recovery and environmental friendly disposal.
2. Generate adequate trained man power for implementing national mission and policies of government related to renewable energy harnessing in our country.
3. Prepare cadre of research scholars for achieving entrepreneurial skills and self employment opportunities in renewable energy sector.

Semester-wise Scheme for Post Graduate Programme in Renewable Energy Engineering  
**Details of courses offered for the award of M.Tech. (Ag.), REE**

Course Title	Course No.	Credit Hours	Semester			
			I	II	III	IV
<b>Core Courses:</b> Total 12 credits; 2 courses in first semester (6 credits) and 1 course each in second and third semester (3 credits each) to be evaluated externally.						
Solar Energy Utilization	REE 511	3(2+1)	3	-	-	-
Bio-energy Conversion & Processing of Wastes	REE 512	3(2+1)	3	-	-	-
Biogas Technology & Mechanism	REE 521	3(2+1)	-	3	-	-
Renewable Sources of Energy	REE 531	3(2+1)	-	-	3	-
<b>Optional Courses:</b> Total 15 credits; two courses in first & second semester each (6 credits in each semester) and one course in third semester (3 credits).						
Energy Conservation & Management	REE 513	3(2+1)	3	-	-	-
Waste Recycling and Resources Recovery Systems	REE 514	3(2+1)	3	-	-	-
Agro-Energy Audit and Management	REE 515	3(2+1)	3	-	-	-
Wind Energy Utilization	REE 516	3(3+0)	3	-	-	-
Design and Analysis of Renewable Energy Conversion Systems	REE 522	3(3+0)	-	3	-	-
Energy Management in Food Processing Industries	REE 523	3(3+0)	-	3	-	-
Alternate Fuels & Applications	REE 524	3(3+0)	-	3	-	-
Energy, Ecology & Environment	REE 525	3(3+0)	-	3	-	-
Solar Refrigeration and Air Conditioning	REE 526	3 (3+0)	-	3	-	-
Direct Energy Conversion Technologies	REE 535	3(2+1)	-	-	3	-
Energy Lab	REE 536	3(0+3)	-	-	3	-
Energy Management in Agriculture	REE 537	3(3+0)	-	-	3	-
<b>Minor &amp; Supporting Courses:</b> Total 9 credits; one course in first, second and third semester each (3 credits in each semester).						
Statistical Methods	AST 510	3(2+1)	3	-	-	-
Advance Programme with C <sup>++</sup>	CSE 511	3(1+2)	3	-	-	-
Engineering Properties of Food Materials	PFE 512	3(2+1)	3	-	-	-
Applied Instrumentation in Farm Machinery & Stress Analysis	FMPE 513	3(2+1)	3	-	-	-
Farm Power and Machinery Management	FMPE 514	3(2+1)	3	-	-	-
Higher Mathematics	BS 515	3(3+0)	3	-	-	-
Drying and Dehydration of Foods	PFE 516	3(2+1)	3	-	-	-
CAD/CAM	MED 518	3(1+2)	3	-	-	-
Methods of Numerical Analysis	BS 521	3(2+1)	-	3	-	-
GIS and Remote Sensing for Land and Water Resource Management	SWC 522	3(2+1)	-	3	-	-
Post Harvest Processing of Grains	PFE 535	3(2+1)	-	-	3	-
<b>Others</b>						
Compulsory Courses; {(0+1) or (1+0)} Non Credit (NC); PGS Series	PGS501/502/...	1	NC	NC		
Seminar (0+1)	REE 532	1	-	-	1	-
Comprehensive	REE 533	NC			NC	
Research (Thesis). Thesis minimum duration 2 semesters	REE 534	20	-	-	-	20
<b>Total credits to be offered (for Master Programme)</b>		<b>57</b>	<b>15</b>	<b>12</b>	<b>10</b>	<b>20</b>

**COURSE SUMMARY**

Courses	No. of Courses					Credit Hours
	Semester					
	I	II	III	IV	Total	
Core	2	1	1	-	4	12
Optional	2	2	1	-	5	15
Minor & Supporting	1	1	1	-	3	9
Seminar	-	-	1	-	1	1
Comprehensive	-	-	-	1	1	Non Credit (graded as satisfactory/non satisfactory)
Research (Thesis)	-	-	-	1	1	20* (graded as satisfactory/ non satisfactory)
Compulsory Courses (PGS Series)	1	1	-	-	2	Non Credit
<b>Total</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>2</b>	<b>17</b>	<b>57</b>

\*Research (Thesis) credit load is not counted in calculation of final OGPA.

## Details of courses offered for the award of Ph.D. (Ag. Engg.), REE

Course Title	Course No.	Credit Hours	Semester			
			I	II	III	IV-VI
<b>Core Courses:</b> Total 6 credits (3 credits in each semester); one course in first semester and one course in second semester to be evaluated externally.						
Renewable Energy for Industrial Application	REE 611	3(2+1)	3		-	-
Solar Energy Utilization for Heating & Cooling	REE 621	3(2+1)	-	3	-	-
<b>Optional Courses:</b> Total 12 credits (6 credits in each semester); two course in first and second semester each.						
Energy Conservation & Management	REE 513	3(2+1)	3	-	-	-
Waste Recycling and Resources Recovery Systems	REE 514	3(2+1)	3	-	-	-
Agro-Energy Audit and Management	REE 515	3(2+1)	3	-	-	-
Wind Energy Utilization	REE 516	3(3+0)	3	-	-	-
Design and Analysis of Renewable Energy Conversion Systems	REE 522	3(3+0)	-	3	-	-
Energy Management in Food Processing Industries	REE 523	3(3+0)	-	3	-	-
Alternate Fuels & Applications	REE 524	3(3+0)	-	3	-	-
Energy, Ecology & Environment	REE 525	3(3+0)	-	3	-	-
Solar Refrigeration and Air Conditioning	REE 526	3(3+0)	-	3	-	-
Direct Energy Conversion Technologies	REE 535	3(2+1)	-	-	3	-
Energy Lab	REE 536	3(0+3)	-	-	3	-
Energy Management in Agriculture	REE 537	3(3+0)	-	-	3	-
Power System Analysis	REE 612	3(3+0)	3	-	-	-
Thermo chemical Conversion of Biomass	REE 613	3(2+1)	3	-	-	-
Environmental Pollution & Control	REE 614	3(3+0)	3	-	-	-
Management & Utilization of Natural Resources	REE 622	3(3+0)	-	3	-	-
Gender & Energy	REE 623	3(3+0)	-	3	-	-
Renewable Energy Techniques	REE 624	3(2+1)	-	3		
Wind & Human Environment	REE 625	3(3+0)	-	3	-	-
<b>Minor &amp; Supporting Courses:</b> Total 9 credits; two courses in first semester (6 credits) and one course in second semester (3 credits).						
Statistical Methods	AST 510	3(2+1)	3	-	-	-
Advance Programme with C <sup>++</sup>	CSE 511	3(1+2)	3	-	-	-
Engineering Properties of Food Materials	PFE 512	3(2+1)	3	-	-	-
Applied Instrumentation in Farm Machinery & Stress Analysis	FMPE 513	3(2+1)	3	-	-	-
Farm Power and Machinery Management	FMPE 514	3(2+1)	3	-	-	-
Higher Mathematics	BS 515	3(3+0)	3	-	-	-
Drying and Dehydration of Foods	PFE 516	3(2+1)	3	-	-	-
CAD/CAM	MED 518	3(1+2)	3	-	-	-
Methods of Numerical Analysis	BS 521	3(2+1)	-	3	-	-
GIS and Remote Sensing for Land and Water Resource Management	SWC 522	3(2+1)	-	3	-	-

Post Harvest Processing of Grains	PFE 535	3(2+1)	-	-	3	-
Finite Element Analysis	MED 612	3(3+0)	3	-	-	-
Advances in Drying of Food Materials	PFE 612	3(2+1)	3	-	-	-
Agricultural Waste and By-Products Utilization	PFE 625	3(2+1)	-	3	-	-
System Engineering and Productivity	SWCE 526	3(2+1)	-	3	-	-
<b>Others</b>						
Compulsory Courses+; {(0+1) or (1+0)} Non Credit (NC); PGS Series	PGS501/ 502/...	1	NC	NC		
Seminar	REE 691/ 692	1(0+1)	1	1	-	-
Preliminary	REE 633	NC			NC	
Research (Thesis). Thesis minimum duration 4 semesters	REE 634	45	-	-	-	45
<b>Total credits to be offered</b>		<b>74</b>	<b>16</b>	<b>13</b>	<b>-</b>	<b>45</b>

**Note:** A Ph.D. student must take two 600 series core courses. A student may choose optional/minor & supporting courses of 500 series courses if not studied during Masters Programme as per ICAR guidelines.

+ Exempted for those who have cleared these in Master's Programme (permission to be sought from the Dean, CTAE).

### **COURSE SUMMARY**

Courses	No. of Courses							Credit Hours
	Semester							
	I	II	III	IV	V	VI	Total	
Core	1	1					2	6
Optional	2	2					4	12
Minor & Supporting	2	1					3	9
Seminar	1	1					2	2
Preliminary			1				1	Non Credit (graded as satisfactory/non satisfactory)
Research (Thesis)						1	1	45* (graded as satisfactory/non satisfactory)
Compulsory Courses** (PGS Series)	1	1					2	Non Credit
<b>Total</b>	<b>7</b>	<b>6</b>	<b>1</b>			<b>1</b>	<b>15</b>	<b>74</b>

\*Research (Thesis) credit load is not counted in calculation of final OGPA.

\*\*Exempted for those who have cleared these in Master's Programme.

# SYLLABUS

## RENEWABLE ENERGY ENGINEERING

### CORE COURSES

#### Solar Energy Utilisation

REE 511

Credit 3(2+1)

**Course Outcome:** The main objective of this course is to provide detail knowledge about working and design of various solar thermal devices like solar cooker, solar dryer, solar water heater, solar still and solar ponds. This course will explore the fundamentals of solar photovoltaic system for power generation. Student will able to design different solar thermal devices and solar photovoltaic system for power generation.

#### Syllabus

**Solar Radiation:** The sun and its characteristics, Structure of the Sun, Extraterrestrial solar radiation, the solar constant. Solar radiation at earth's surface, beam and scattered radiation and air mass, variation in extraterrestrial radiation, diffuse radiation, attenuation of beam and diffused radiation at the ground, Basic Sun Earth Angles, solar time and the equation of time, Day length.

**Solar Radiation Measurement and Estimation:** Solar energy measuring instruments, pyranometer, pyrliometer, sunshine recorder, Estimation of average solar radiation, ratio of beam and total radiation on tilted surface of that on horizontal surface.

**Solar Collectors:** Flat plate collector, Materials for flat plate collector and their properties, Thermal Analysis of Flat-plate Collector and Useful Heat Gained by the fluid, fin efficiency, collector efficiency factor, Heat Removal Factor. Focusing collectors, types and applications of focusing collectors.

**Solar Energy Applications:** Introduction and principle of operation of solar cooker, solar air heater, solar water heater, solar distillation, solar pond, solar thermal power generation, Greenhouse, Solar PV system.

**Storage of Solar Energy:** Types of Energy Storage, Thermal Storage, Electrical Storage, Chemical Storage, Hydro-storage.

#### Practicals

1. Study of flat plate collector.
2. Study of a box type solar cooker and calculation of its thermal efficiency.
3. Study of a solar distillation system.
4. Study of natural convection type solar water heater.
5. Study of natural convection type solar Dryer.
6. Study of forced convection type solar Dryer.
7. Study of Solar Pond.
8. Study of solar animal feed cooker.
9. Study of Solar Greenhouse.
10. Study of Solar Tunnel Dryer.



## Suggested Readings

1. Meinel, A.B and Meinel, M.P.; Applied Solar Energy, Addison Wesley Publishing Company, New York.
2. Duffie, J.A., and Beckman, W.A. Solar Energy Thermal Process, John Wiley and Sons, New York.
3. Sayigh, A. A. M., Solar Energy Engineering Academic Press, New York.
4. Rai, G.D., Solar Energy Utilization, Khanna Publishers, Delhi.
5. Garg, H.P., Treatise on Solar Energy, John Wiley & Sons.
6. Sukhatme S.P., Solar Energy, Tata McGraw Hills P Co.

## Bio-Energy Conversion and Processing of Wastes

REE 512

Credit 3(2+1)

**Course Outcome:** The main objective of this course is to provide fundamentals of utilization of crop residues and agro industrial waste for energy production through different conversion routes and to understanding the biofuels system, renewable feedstock and their production so that following the completion of this course, students will have the expertise to solve agro industrial, social, and environmental problems with appropriate techniques and tools.

### Syllabus

**Biomass Production:** Introduction, Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting. Harvesting of biomass and coppicing characteristics.

**Biomass Characterizations:** Physio-chemical characteristics of biomass, calorific values of solid, liquid and Gaseous fuels.

**Biomass Conversion:** Different routes of conversion of biomass such as

**Physical:** cutting, sizing, drying and storage of wood, twigs and other biomass.

**Biochemical:** Conversion of biomass, sugar, starch and cellulose into alcohol, biodiesel.

**Thermo chemical:** Direct combustion, design of biomass gasifier and improved cookstoves, Briquetting of biomass, pyrolysis, gasification. Dendro thermal

### Practicals

1. Identification of different plant species for energy plantation.
2. Determination of biomass properties such as bulk density, moisture content, volatile solids, ash content, calorific value.
3. Measurement of calorific value of solid, liquid and gaseous fuels.
4. Study of biomass cutter.
5. Study of briquetting machines.
6. Performance evaluation of improved cookstoves.
7. Study on alcohol production from sugar, starch and cellulose.

### **Suggested Readings**

1. Vimal, O.P. Energy from Biomass, AgricolePublishingAcademy, New Delhi.
2. Vimal, O. P. and Bhatt, M.S., Wood Energy System, Agricole, Pub. New Delhi.
3. Rathore N. S., Panwar N. L, Kothari S., Biomass Production and Utilization Technology. Himanshu Production, 2007.

## **Energy Conservation and Management**

**REE 513**

**Credit 3 (2+1)**

**Course Outcome:** The main objective of this course is to help students to acquaint and equip with the sources of energy, conservation of energy and its management. Also study of energy efficiency, energy planning, forecasting and energy economics will help students to prepare energy audits of various industries or sectors. This course also introduces student with fuel conversion, utility techniques, instrumentation in energy conservation and co-generation with waste utilization.

### **Syllabus**

**Energy Conservation:** Status and significance with respect to developing and developed countries, concept and thermo dynamics and energy conservation, second law of thermo dynamics and efficiency analysis of system, thermal insulation.

**Energy Audit:** Type of energy auditing, walk through, minimum and maximum- (a) Energy accounting and analysis; input, output and impact variance, (b) Energy auditing of different sectors; Industrial tools, agriculture fields and electrical auditing.

**Fuel and Process modification, Control and Instruments in Energy Conservation:** Energy conservation in water pumping and other agricultural operations/machinery, food process industries and domestic appliances.

**Co-generation:** Waste heat recovery, co-generation with alternate energy system, Dual cycle, steam economy.

### **Practicals**

1. Study of different energy audit techniques.
2. Study of instrumentation required for energy audit.
3. Energy audit of selected industry.
4. Scope of renewable energy techniques in industries.

### **Suggested Readings**

- 1 Vogt, F; Energy Conservation and use of Renewable Energies in the Bio-Industries.
- 2 Pratap Singh et. al Sustainable Development through Renewable Energy Sources Yash Publications, Bikaner, 2004
- 3 Shinkey, F.J. Energy Conservation through control.

## Waste Recycling and Resources Recovery Systems

REE 514

Credit 3 (2+1)

**Course Outcome:** The main objective of this course is to help students to acquaint and equip about the sources of waste, conversion of waste into energy and its management. Due to heavy urbanization it is very important to recycle waste. This course covers bio-methanation, gasification, alcoholic fermentation, hydrogen reduction, agrochemical fuel extraction, etc. suitable for organic by products & wastes, their management approach, application and acceptability.

### Syllabus

**Introduction:** Sources of different wastes, their nature and characteristics; quantum of industrial, agricultural, municipal, bio-medical and other organic wastes/by products and its management needs.

**Waste to Energy Conversion Technologies:** viz. biomethanation, gasification, alcoholic fermentation, hydrogen reduction, agrochemical fuel extraction, etc. suitable for organic by products & wastes, their management approach, application and acceptability.

**Economics of Waste disposal** to energy conversion, advantages & disadvantages.

**Design** of a suitable waste disposal plant based on local needs/village case study.

### Practicals

1. Identification of industrial, bio-medical and agricultural wastes/by-products under local conditions causing environmental hazards.
2. Study of existing practices for waste disposal.
3. Study of advanced organic/carbonic waste management technologies.
4. Development of a suitable waste management process for an identified organic waste / by-product suitable under local conditions.
5. To evaluate economics of waste disposal/handling process via advanced technique vis-à-vis conventional method.

### Suggested Readings

1. Pratap Singh et. al., Sustainable Development through Renewable Energy Sources, Yash Publications, Bikaner, 2004.
2. Rathore N.S., Kurchania A.K. Biomethanation Technology, Apex Publications, Udaipur, 2006.

## Agro-Energy Audit and Management

REE 515

Credit 3(2+1)

**Course Outcome:** The main objective of this course is to help students to acquaint and equip with the sources of energy, conservation of energy and its management. This course also covers energy use scenario in agricultural production system, agro-based industry which is helpful in understanding energy scenarios in agriculture and allied industry. Also study of energy efficiency, energy planning, forecasting and energy economics will help students to prepare energy audits of various industries or sectors.

### Syllabus

#### Objective

To acquaint and equip about the sources of energy, conservation of energy and its management. Energy use scenario in agricultural production system, agro-based industry. Study of energy efficiency, energy planning, forecasting and energy economics.

#### Theory

Energy resources on the farm: conventional and non-conventional forms of energy and their use. Heat equivalents and energy coefficients for different agricultural inputs and products. Pattern of energy consumption and their constraints in production of agriculture. Direct and indirect energy. Energy audit of production agriculture, and rural living and scope of conservation. Identification of energy efficient machinery systems, energy losses and their management. Energy analysis techniques and methods: energy balance, output and input ratio, resource utilization, conservation of energy sources. Energy conservation planning and practices. Energy forecasting, Energy economics, Energy pricing and incentives for energy conservation, factors effecting energy economics.

#### Practicals

1. Study of energy audit techniques.
2. Study of energy use pattern and management strategies in various Agro-industries.
3. Assessment of overall energy consumption, production and its cost in selected agro industries.
4. Visit to related Agro-industry.

#### Suggested Readings

1. Kennedy WJ Jr. & Wayne C Turner.1984. Energy Management. Prentice Hall.
2. Pimental D. 1980. Handbook of Energy Utilization in Agriculture. CRC.
3. Fluck RC & Baird CD.1984. Agricultural Energetics. AVI Publ.
4. Rai GD. 1998. Non-conventional Sources of Energy. Khanna Publ.
5. Twindal JW & Anthony D Wier 1986. Renewable Energy Sources. E & F.N. Spon Ltd.
6. Verma SR, Mittal JP & Surendra Singh 1994. Energy Management and Conservation in Agricultural Production and Food Processing. USG Publ. & Distr., Ludhiana.

## Wind Energy Utilization

REE 516

Credit 3(3+0)

**Course Outcome:** The students will acquire knowledge regarding mechanism of wind energy and different types of wind machines available to harness wind power. The students will be able to learn basics required to design wind turbine for irrigation as well as for power generation.

### Syllabus

**Wind Energy-** Introduction, history of development, applications of wind energy, wind velocity, wind mapping minimum, maximum and averaging.

**Wind Power-** Power produced due to wind current, effect of height, obstacle and valley- Criterion for selection of site for wind power harnessing. Wind power equipment such as pumps, generator storage of wind energy, wind power plant and supply of wind power to consumer/grid.

**Wind Measuring Instruments and Controls-** Different systems of measuring and recording wind velocity, wind tower, controls used in wind machines.

**Wind Machines-** Types of wind mills, systems of wind machine, different parts such as rotor, structure, plunger, rod and their design, Different power transmission systems and design, Wind blade and its configurations, forces on wind blade, drag and lift, load matching, speed range selection, Selection of material for different parts.

### Suggested Readings

1. More and Maheshwari; Wind Energy Utilization in India
2. Lysen, E.H. Introduction to Wind Energy
3. Dunn, P.D. Renewable Energy Sources, Conversion and Application
4. Veziroglu, Najat, T., Alternate Energy Sources, Vol. IV Indirect Solar Energy.

## Biogas Technology and Mechanism

REE 521

Credit 3(2+1)

**Course Outcome:** The students will be able to learn about biogas production technology, different types of biogas plants, its design and utilization of produced biogas for domestic as well as for commercial purpose. Slurry mechanism, handling of solid as well as liquid fertilizers, its importance and future scope will also be covered in the course.

### Syllabus

**Biogas Technology:** Introduction, potential of Biogas in the Energy Scenario of India Biogas in Relation to Environment, Ecology, Agriculture, Health and Sanitation. Digestion process, factors enhancing/inhibiting biogas production.

**Bio-chemical and Microbial Aspects:** Biogas mechanism, enhancement of Biogas production by different additives (Chemicals, organic substances, enzymes) pretreatment process, etc. Scrubbing process, bottling, need for bottling of biogas, liquefaction of biogas. Various Uses of Biogas and its Merits and Demerits.

**Biogas Plant:** Systems, Types of biogas plants, classification, design of a biogas plant (cow dung and organic waste) and structural strength, selection of site and size, construction technique material requirement, recent advances in high rate bio-methanation reactors design and material, night soil linked biogas plant. Cold Condition Biogas Plant Design Concept Cost and Financial Viability.

**Biogas Distribution and Utilization:** Properties of biogas, different uses, design of biogas distribution system, pressure and flow measuring devices, safety devices, biogas fittings, principles of dual fuel biogas engines, its limitations, biogas appliances including thermal and cooking efficiency test.

**Effluent:** Handling of effluent of biogas plant (cow dung based, sanitary latrine attached and agro industrial wastes), effluent treatment and management effect of slurry on crop and fish production. Integrated recycling of organic wastes.

**Alternate Feed Material:** Study of biogas plant for distillery and sugar mills effluent, willow dust, agro-wastes, agro and processing industry wastes.

**Repair and Maintenance:** Repair and maintenance of biogas plants.

### **Practicals**

1. Study of different Equipments in lab
2. Study on different models of biogas plants.
3. Determination of N, P and K contents of the fresh and digested slurry by chemical analysis.
4. Analysis of biogas to determine its constituents (gas chromatography, Orsate gas Analyzer)
5. Study on constructional details of different designs of biogas plants.
6. Testing of biogas burner for heat transfer, thermal and cooking efficiency.
7. Testing of biogas lamp
8. Determination of BOD/COD
9. Determination of calorific value of biogas.
10. Visit to industrial biogas plants.
11. BIS code for efficiency testing of biogas appliances.

### **Suggested Readings**

1. Khandelwal, K.C. and S.S Mahdi.; Biogas Technology: A Practical Hand Book, Tata McGraw Hill Pvt. Co.
2. Chawla, O.P., Advances in Biogas Technology, I.C.A.R., New Delhi
3. Rathore N.S., Kurchania A.K., Biomethanation Technology, Apex Publications, Udaipur, 2006
4. Mathur, A.N. and N.S Rathore; Biogas production management and utilization- Himanshu Publication.

## Design and Analysis of Renewable Energy Conversion Systems

REE 522

Credit 3(3+0)

**Course Outcome:** The students will be able to design different renewable energy systems.

Thermodynamics of energy conversion systems will also be learned. Students also get acquainted with techniques of biogas utilization, biofuel production techniques, gasification systems, alcohols and plant oils.

### Syllabus

Energy cycle of the earth; water flow and storage; ocean currents and tides. Energy heat flow and energy storage; photosynthesis and biomass; renewable energy sources.

Thermodynamics of energy conversion; conversion of solar energy, wind energy, water flows, heat, biomass, etc.; other conversion processes.

Development and use of biogas, alcohols and plant oils, plant oil esters in I.C. engines. Study of various parameters for measuring the performance of the output.

Design of bio-fuel production units: design of gasifiers, gas flow rates, biogas plants. Establishment of esterification plant, fuel blending.

### Suggested Readings

1. Boyle Godfrey. 1996. Renewable Energy: Power for Sustainable Future. Oxford Univ. Press.
2. Culp AW. 1991. Principles of Energy Conservation. Tata McGraw Hill. Duffle JA & Beckman WA. 1991. Solar Engineering of Thermal Processes. John Wiley.
3. Garg HP & Prakash J. 1997. Solar Energy - Fundamental and Application. Tata McGraw Hill.
4. Grewal NS, Ahluwalia S, Singh S & Singh G. 1997. Hand Book of Biogas Technology. Solar Energy Fundamentals and Applications. TMH New Delhi.
5. Mittal KM. 1985. Biomass Systems: Principles & Applications. New Age International.
6. Odum HT & Odum EC. 1976. Energy Basis for Man and Nature. Tata McGraw Hill.
7. Rao SS & Parulekar BB. 1999. Non-conventional, Renewable and Conventional. Khanna Publ.
8. Sukhatme SP. 1997. Solar Energy - Principles of Thermal Collection and Storage. 2nd Ed. Tata McGraw Hill.

## Energy Management in Food Processing Industries

REE 523

Credit 3(3+0)

**Course Outcome:** The main objective of this course is to help students to acquaint and equip with different energy management techniques including energy auditing of food industries. This course also covers energy use scenario in agro-based industry which is helpful in understanding energy scenarios in agriculture and food industry. Also study of energy efficiency, energy planning, forecasting and energy economics will help students to prepare energy audits of food processing industries or sectors.

### Syllabus

Energy forms and units, energy perspective, norms and scenario; energy auditing, data collection and analysis for energy conservation in food processing industries.

Sources of energy, its audit and management in various operational units of the agro-processing units; passive heating, passive cooling, sun drying and use of solar energy, biomass energy and other non-conventional energy sources in agro-processing industries. Reuse and calculation of used steam, hot water, chimney gases and cascading of energy sources. Energy accounting methods, measurement of energy, economics of energy use.

### Suggested Readings

1. Pimental D. 1980. Handbook of Energy Utilization in Agriculture. CRC Press.
2. Rai GD. 1998. Non-conventional Sources of Energy. Khanna Publ.
3. Twindal JW & Anthony D Wier 1986. Renewable Energy Sources. E & F.N. Spon Ltd.
4. Verma SR, Mittal JP & Surendra Singh. 1994. Energy Management and Conservation in Agricultural Production and Food Processing. USG Publ. & Distr., Ludhiana.

## Alternate Fuels and Applications

REE 524

Credit 3(3+0)

**Course Outcome:** The students will able to learn about alternate fuels, its utilization, environmental aspects and economics. Production processes of different alternate fuels its composition, properties and combustion characteristics will be studied under this course. Environment impact by utilization of these alternate fuels as compare to conventional fuels will also be studied.

### Syllabus

**Introduction** to alternate fuels, synthetic fuels, production, composition and properties, combustion characteristics, bio-fuels (alcohol, methanol, ethanol, biogas, producer gas hydrogen) and fuel cell.



**Composition and properties** of alternate fuels, comparison with conventional fuels, potential, possibilities and problems.

**Production** of biogas, producer gas, ethanol, methanol, alcohol and hydrogen.

**Utilization:** Thermal and mechanical applications, utilization in SI and CI engines, modifications needed to convert existing SI and CI engines to run on alternate fuels, utilization for miscellaneous applications.

**Environmental aspects** of alternate fuels: Environmental impact and safety factors, efficiency of different alternate fuels.

**Economics** and commercial considerations.

### **Suggested Readings**

1. Edger J. D.; Biogas Fuel of Future.
2. Robertson E.; Gaseous Fuels.
3. Das R. S. et al; Biogas as a Replacement Fuel to Diesel.
4. Ratnakar G. L.; Utilization of Biogas in IC Engines.
5. Mathur H. B.; Synthetic Fuels.

## **Energy, Ecology and Environment**

**REE 525**

**Credit 3(3+0)**

**Course Outcome:** The students will become an expert in energy, environmental economics, policy and ecology. They will develop an interdisciplinary knowledge base that will enable them to understand and solve contemporary environmental problems.

### **Syllabus**

**Origin** of the earth, Earth's temperature and atmosphere, Sun as a source of energy, biological processes, photosynthesis, food chain, energy, fuel and power.

**Energy sources**, quality and concentration of energy sources, characteristics, temperature, classification of energy sources, renewable energy and non-renewable energy sources, scientific principles of renewable energy, technical and social implications.

**Scope and history** of ecology, nature of environmental responses, community ecology, ecosystem, theory, population ecology, evolutionary and geographical ecology.

**Environment and its relationship** with earth, forest, dams, atmosphere, habitats, health, energy, living resources, agents of change. Environmental degradation, primary and secondary pollutants. Environmental Impact Assessment.

**Micro climatic effects** of pollution, pollution from stationary and mobile sources, ground water pollution, biological effect of radiation, heat and radio activity disposal, Pollution abatement methods, Greenhouse Effect.

### **Suggested Readings**

1. Twidell John W. and A. D. Weir; Renewable Energy Sources.
2. Dune, P. D.; Renewable Energies: Sources, Conversion and Applications.
3. Hopes G. Puppy; Energy and Environment, Mankind and Energy Needs, Elsevir Pub. Co., New York.
4. Rao C. S.; Environmental Pollution Control Engineering.
5. Rathore N.S., Kurchania A.K., Climatic Changes & Their Remedial Measures, Shubhi Publications, Gurgaon, 2001.
6. Mathur A. N., Rathore N. S. and V. K. Vijay; Environmental Awareness.

## **Solar Refrigeration and Air-Conditioning**

**REE 526**

**Credit 3(3+0)**

**Course outcomes:** The main objective of this course is to impart knowledge about principles of producing low temperatures using solar energy. The concepts about designing, installation and servicing of solar refrigeration and air-conditioning systems in residential, commercial and industrial buildings will enable the students to articulate the non-conventional solar cooling systems.

### **Syllabus**

Potential and scope of solar cooling, Types of solar cooling systems, Solar collectors and storage systems for solar refrigeration and air-conditioning, Solar operation of vapour absorption and vapour compression refrigeration cycles and their thermodynamic assessment, Rankine cycle, sterling cycle based solar cooling systems, Jet ejector solar cooling systems, Fuel assisted solar cooling systems, Solar desiccant cooling systems, Open cycle absorption / desorption solar cooling alternatives, Advanced solar cooling systems, Thermal modeling and computer simulation for continuous and intermittent solar refrigeration and air-conditioning systems, Refrigerant storage for solar absorption cooling systems, Solar thermoelectric refrigeration and air-conditioning, Solar thermo acoustic cooling and hybrid air-conditioning, Solar economics of cooling systems

### **Suggested Readings**

1. Kaushik S.C. Solar Refrigeration and Air Conditioning.
2. Arora C.P. Refrigeration and Air Conditioning.
3. Dincer I, Mehmet K. Refrigeration Systems and Applications.

## Renewable Sources of Energy

REE 531

Credit 3(2+1)

**Course Outcome:** This course is undertaken to introduce basic aspects of renewable energy supply presenting fundamental characteristics of the resource base (solar radiation, wind energy, bio energy, etc.) and principles of related technical systems (photovoltaic, wind, biomass power generation, etc.). In a further step an economic analysis of supply technologies will be undertaken. Students will learn to acquire a basic understanding of issues related to renewable energy supply systems.

### Syllabus

**Solar Energy:** Sources, its advantages, availability. Heat transfer processes applicable to solar energy, solar radiation and its analysis, Instruments for measurement of solar energy (Pyranometer / pyrhelimeter), Introduction to basic flat plate and focusing collectors. Solar thermal energy technology application: Solar Cooker and Water Heater, Solar Dryers, Solar Green House, Active/passive Heating, Stills, Solar photovoltaic technology.

**Biogas:** its applications and importance, Biogas plant (types, size their features, merits and demerits) Utilization of biogas-spent slurry.

**Biomass:** Introduction to biomass as source of energy and its advantages, Biomass Classification, Characteristics of biomass (proximate analysis and ultimate analysis).

Harvesting of biomass (coppicing, pollarding, lopping, pruning, thinning)

Biomass conversion technologies (thermo-chemical, bio-chemical and agro-chemical) technology, Briquetting, Biomass gasification technology.

**Improved Cookstoves:** Fundamental & types, techno-economic analysis of renewable energy sources and comparison with conventional energy sources.

**Wind Energy:** Basic principles of wind energy conversion, site selection consideration, Basic components of wind energy conversion system, Type of wind machine.

### Practicals

1. Study of a box type solar cooker,
2. Study of a solar distillation plant.
3. Study of biomass briquetting machine
4. Study of direct and indirect solar dryer
5. Study of a KVIC biogas plant.
6. Study of a Deenbandhu biogas plant.
7. Study of a biomass gasifier.
8. Study and testing of biogas appliances
9. Study and testing of improved cookstoves.

10. Study of Wind Energy Conversion Devices
11. Design of solar water heater.
12. Design of solar dryer.
13. Study on Clean energy Trainer

### **Suggested Readings**

1. Garg H.P. Advances in Solar Energy Technology. D. Publishing Company, Tokyo, 1990.
2. Alan L: Farredbruch & R.H. Buse. Fundamentals of solar Academic Press, London, 1983.
3. Bansal N.K., Kleemann M. & Michael, Meliss, Rene, energy Sources & Conversion Technology. Tata Megras publishing Company, New Delhi, 1990.
4. Mathur, A.N. & Rathore N.S., Biogas Production Management & Utilization. Himanshu Publications, Udaipur. 1992.
5. Khandelwal, K.C. & Mandi, S.S. Practical hand boo Biogas Technology, 1990.
6. Rai, G.D. Non-Conventional Energy Sources, Khanna Publishers, New Delhi.
7. Mathur A.N. & Rathore N.S. Renewable Energy Sources Bohra Ganesh Publications, Udaipur.

## **Direct Energy Conversion Technologies**

**REE 535**

**Credit 3(2+1)**

**Course Outcome:** The main objective of this course is to acquaint students with the basic fundamentals of different energy conversion technologies. Direct power generation from waste heat i.e by thermo electric generator, power from magneto hydro dynamic generator and fuel cell. Students will able to learn design of on-grid as well as off-grid solar photovoltaic system, selection of components, and selection of site.

### **Syllabus**

**Basic Science** of Energy Conversion, Physics of semi-conductor junctions for photo-voltaic conversion of solar energy, solar cell, types of solar cell modules, components of SPV system, details of blocking diode, charge controller, inverter and batteries used, application of solar cell in photo-voltaic power generation system, power output and conversion efficiency, advantages and disadvantages of photo-voltaic solar energy conversion, design of photo-voltaic systems.

**Technologies and physics** of thermo-electric generators, thermo-electric materials and optimization studies.

**Basic concepts and design** consideration of MHD generators, cycle analysis of MHD system, thermo ionic power conversion and plasma, thermo-dynamics and performance of fuel cells and their applications.

## Practicals

1. To demonstrate the I-V and p-V characteristics of PV module with varying tilt angle and temperature level.
2. To demonstrate the I-V and p-V characteristics of series and parallel combinations of PV Module.
3. To show the effect of variation in tilt angle on PV module power.
4. To demonstrate the effect of shading on module output power.
5. To demonstrate the working diode as Bypass diode and blocking diode.
6. Workout power flow calculations of standalone PV system of DC system of DC load with battery.
7. Workout power flow calculations of standalone PV system of AC load with battery.
8. Workout power flow calculations of standalone PV system of DC and AC load with battery.
9. To draw the charging and discharging characteristics of battery.

## Suggested Readings

1. Meinel & Meinel, Applied Solar Energy.
2. Derrick, Francis and Bokalders, Solar Photo-voltaic Products.
3. M. P. Agrawal, Solar Energy.
4. R. H. Taylor Alternate Energy Sources.
5. G. D. Rai, Non-conventional Energy Sources.
6. Pratap Singh et al., Sustainable Development through Renewable Energy Sources, Yash Publications, Bikaner, 2004.

## Energy Lab

**REE 536**

**Credit 3(0+3)**

**Course Outcome:** The students would be able to carry out lab analysis and can operate different analytical equipment independently. They also get acquainted with solar PV systems, solar cell characteristics, solar still and solar refrigeration systems. Students can able to work on GC (gas chromatograph) to determine composition of biogas, producer gas and other flue gases. Testing of dual fuel engine, improved cook stoves and biodiesel operated engine will also be carried out.

## Syllabus

1. Study of Solar cell characteristic.
2. Study of Solar P. V. System.
3. Study of Plank's constant by radiation law.

4. Study of Solar Still and calculation of its efficiency.
5. Study of agricultural wastes fired gasifier for power generation.
6. Study of Solar Powered Refrigeration system.
7. Study of Gas Chromatograph and determination of composition of biogas, producer gas and flue gases.
8. Development of solid and liquid fuel from biomass.
9. Study and testing of dual fuel engine running on biogas and diesel.
10. Development of biodiesel from Jatropha oil.
11. Study of Bomb Calorimeter and measurement of calorific value of different biomass.
12. Study of Proximate and Ultimate analysis of biomass.
13. Testing of portable type of Improved Cook stoves.
14. Study the harnessing the power from wind.
15. Study of Integrated Energy System.

### **Suggested Readings**

1. Rathore N.S., Kurchania A.K., Panwar N.L., Renewable Energy: Theory & Practice, Himanshu Publications, 2006
2. Khandelwal, K.C. & Mahdi, S.S. Biogas Technology, 1990.
3. Rai, G.D. Non-Conventional Energy Sources, Khanna Publishers, New Delhi.

## **Energy Management in Agriculture**

**REE 537**

**Credit3 (3+0)**

**Course Outcome:** The objective of this course is to introduce students to the significance of energy management in agriculture to the total national economy. The student will incline towards conservation of energy through application of efficient devices and practices.

### **Syllabus**

**General aspects of Energy,** Energy Economics, Principles of Energy Conservation, Global Environmental Concerns, Measurement of Energy & Power, Power & Energy Measuring Devices, Rural Energy Action Planning, Rural Project Management, Rural Energy Modeling.

**Energy efficiency** in Thermal Utilities of Agro-industries/Processing Plants, Cogeneration, Power Production from Conventional & Non-Conventional Energy Sources, Energy Efficiency in Electrical Utilities of Agro-industries/Processing Plants, Waste & Heat Recovery, Application of Non-conventional & Renewable Energy Sources, Waste Minimization & Resource Conservation, Energy Performance Assessment for Equipment & Utility Systems, Energy Conversion Act.

## Suggested Readings

1. Donald L. Klass & George M. Emert. 1985. Fuels from Biomass & Wastes. Ann Arbor Science Publishing Inc. Michigan.
2. Colin Parket & Tim Robers. 1983. Energy from Waste – An Evaluation of Conversion Technologies – Elsevier-Applied Science Publishers, London.
3. Murphy W.R. &Mc Kay G. 1982. Energy Management.
4. Rathore N.S., Mathur A.N. & Solanki A.S. 1993. Integrated Rural Energy Planning.
5. Murgai M.P. & Ram Chandra. 1990. Progress in Energy Auditing & Conservation.
6. Victor B. Ottaviano.1993. Energy Management.
7. Craig B. Smith. 1081. Energy Management, Principles, Applications, Benefits and Savings.
8. Richard Porter & Tim Roberts. 1985. Energy Savings by Waste Recycling.
9. Szues. 1980. Similitude & Modeling.

## Renewable Energy for Industrial Application

REE 611

Credit 3(2+1)

**Course Outcome:** This course provides an outline and brief description, including fundamentals, of the different renewable energy technologies, wind, solar, bio-energy, hydro and fuel cells. It provides a general overview of the technologies and their applications. This course provides an ability to understand their strengths and weaknesses and hence to have a better grasp of the benefits available from, and the barriers faced by, these technologies.

### Syllabus

**Solar:** Solar Power Generation, Solar water heating, steam solar cooking system, Industrial solar dryer & solar process heat. Solar cooling system (refrigeration, air conditioning and solar architecture technology), solar furnace & solar green house technology for high-tech cultivation.

**Bio Energy Sources:** Power generation through bio-methanation, gasification & dendro thermal power plant.

**Wind Energy:** aero generator of new era and national and international state of art in wind power generation.

**Other renewable energy sources:** Magneto Hydro Dynamics, solar photo- voltaic technology, Ocean thermal energy conversion technology, fuel cells technology & micro-hydro energy technology.

### Practicals

1. Design of solar dryers.
2. Design of solar Photovoltaic system.
3. Design of gasifiers.

4. Design of combustor (gasifier stove).
5. Study of solar greenhouse.
6. Study of biogas engine generator set.
7. Field visit to NRSE power generation site.

### **Suggested Readings**

1. Pratap Singh et al., Sustainable Development through Renewable Energy Sources, Yash Publications, Bikaner, 2004
2. Rathore N. S., Kurchania A. K., Panwar N. L., Non Conventional Energy Sources, Himanshu Publications, 2007
3. Duffie, J.A., and Beakman, W.A. Solar Energy Thermal Process, John Wiley and Sons, New York.
4. Sayigh, A. A. M., Solar Energy Engineering Academic Press, New York.

## **Solar Energy Utilization for Heating and Cooling**

**REE 621**

**Credit 3(2+1)**

**Course outcome:** The main objective of this course is to provide detail knowledge about solar architecture, green building, solar passive heating and cooling, solar active heating and cooling. The course will help the student to design solar refrigeration system, solar air conditioning system for residential, commercial building and different type of storage system for refrigeration and air conditioning.

### **Syllabus**

Solar Architecture- Thermal comfort, building orientation and design, passive heating concept, passive cooling concepts, heat transfer in buildings, evaporative cooling, Tromb wall.

Solar Refrigeration and Air- conditioning- Potential and scope of solar cooling, types of solar cooling systems, solar collectors and storage system for solar refrigeration and air conditioning, solar operation of vapour absorption and compression, refrigeration cycle and their assessment, solar desiccant cooling systems; open cycle solar absorption/adsorption, solar cooling alternatives.

New Development on the area; some case studies.

### **Practicals**

1. Study of green buildings.
2. Study of heat transfer in passive buildings.
3. Study of energy conservation opportunities in buildings.
4. Study of Solar Refrigeration System.



5. Study of solar vapour absorption cooling system for storage of agricultural produces.
6. Study of various solar gadgets for active systems in buildings.

### **Suggested Readings**

1. Bansal, N.K., Solar Passive building, Science and Design.
2. Kaushik, S.C., Solar Refrigeration and Space conditioning.
3. Pratap Singh et al., Sustainable Development through Renewable Energy Sources, Yash Publications, Bikaner, 2004.

## **Power System Analysis**

**REE 612**

**Credit 3(3+0)**

**Course outcome:** The objective of this course is to provide students with an overview of power system operation. The student will learn about power flow analysis and its role in economic dispatch and generation control. The students will learn basic principles for formulation and application of optimal power flow. In addition, this course deals with the voltage control techniques used for renewable rich distribution feeders.

### **Syllabus**

Load forecasting load characteristics and probability of loss of load. Load flow studies; Fault level analysis; Fundamentals of power system stability; Physical concepts; Synchronous machine power angle relations; swing equation; Stability of small and large disturbances; Numerical techniques for solution of swing equations; Digital computer solution of transient stability; Method of improving transient stability, Microprocessor applications in power systems.

### **Suggested Readings**

1. Culp AW. 1991. Principles of Energy Conservation. Tata McGraw Hill. Duffle JA & Beckman WA. 1991. Solar Engineering of Thermal Processes. John Wiley.
2. Garg HP & Prakash J. 1997. Solar Energy - Fundamental and Application. Tata McGraw Hill.
3. Rao SS & Parulekar BB. 1999. Non-conventional, Renewable and Conventional . Khanna Publ.

## **Thermo Chemical Conversion of Biomass**

**REE 613**

**Credit 3(2+1)**

**Course outcomes:** The main objective of this course is to help students to understand the biofuels system, types of biomass derived fuels and energy, thermo chemical conversion of biomass to heat, power and fuel, value adding of biofuel residues. After completion of this course students will enable to extract the energy from biomass and know how to choose the suitable biomass fuels for different industrial applications.

**Syllabus:** Introduction – Thermo chemical degradation. History of small gas producer Engine system. Chemistry of gasification. Gas producer – type, operating principle. Gasifier fuels, properties, preparation, conditioning of producer gas. Application, shaft power generation, thermal application, economics.

Combustors- construction, operation, wood burning stoves.

Pyrolysis – plant, operation, product recovery, incineration and plant lay out.

Co-generation plant – type, layout, energy recovery.

Instruments related to thermochemical conversion.

### **Practical**

1. Study of producer gas generators such as open core, throat type for shaft power production and thermal application.
2. To study design and drawing of gasifier.
3. To study wood burning stoves.
4. Estimation of pollutant caused by gasification process.
5. Study of pyrolysis plant.
6. Study of charcoal making unit.
7. Study of incinerator and co-generators for power production.
8. Study of instrumentation required for thermal degradation.

### **Suggested Readings**

1. Kauppa, A., 1984. Gasification of Rice hulls – Theory and Practice. Publication of GATE. GmbH, Germany.
2. Rathore, N. S., Panwar, N. L. and Kothari S. 2007, Biomass Production and Utilization Technology, Himanshu Publication, Udaipur.
3. Vimal O. P. and Tyagi, P. D., 1985 Fuel wood from waste land. Agricole Publishing Academy, New Delhi.

## **Environmental Pollution and Control**

REE 614

Credit 3(3+0)

**Course Outcome:** The students will be able to distinguish between various methods of air pollution analysis, water sample analysis and measurement of soil contamination. They will understand air pollution sampling and measurement. Various water treatment methods will also be learned.

**Pollution** – Sources of pollution, consequences of pollution growth, energy problems, air pollution, water pollution, ozone depletion.

**Air Pollution** – Definition, classification, sources of air pollution, effect of air pollution on health, vegetation, material, air pollution measurement, air pollution laws and standards.

**Air pollution analysis** – For sulphur dioxide, nitrogen oxide, carbon mono-oxide, oxidants and ozone, hydrocarbons, particulate matters

**Water Pollution** – Types of water pollution, effect on air temperature, effect on water temperature

**Control** – Air pollution control methods, source correction method, cleaning of gaseous effluents, particulate emission control, control of gaseous emission.

**Water Treatment** – Basic process of water treatment, primary treatment, secondary (biological) treatment, advanced waste water treatment, recovery of material from process effluents.

### Suggested Readings

1. Jhadav, H & Bhosale, V. M.: Environmental Protection & Laws, Himalaya Pub. House, Delhi
2. Rao, M. N. and A. K. Datta, Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd.
3. Rathore N.S, Kurchania A.K., Biomethanation Technology, Apex Publications, Udaipur, 2006
4. Sharma, B. K., Environmental Chemistry. Goel Publishing House, Meerut

## Management and Utilisation of Natural Resources

REE 622

Credit 3(3+0)

**Course Outcome:** This course covers and helps student to understand Water Resources, Energy resources, conventional and non-conventional energy sources, and Mineral resources, Forest Resources, potential & state of art of technology of utilization. This will help in understanding resources on earth and their exploitation, use and effects of them on human.

### Syllabus

**Natural Resources** and its classification. Renewable and Non Renewable resources.

**Water Resources**, status of use and problems associated with over utilization. Surface and ground water potential and future scenario. Problems related to water resources i.e. floods, draughts, and disturbance in natural water cycle, water logging & salinity.

**Energy resources**, conventional and non-conventional energy sources, potential & state of art of technology of utilization. Use of Renewable Energy sources, case studies.

**Mineral resources**, use and exploitation, environmental effect of extracting & using Mineral. Open cast and underground mining, various mineral resources & potential.

**Land resources**- National status of land as a resource, land degradation, landslides, soil erosion, desertification & sand dunes.

**Forest Resources** – Natural scenario of forest, use & over exploitation, deforestation, effect of loss of forest on wood and allied field.

**Food sources**, Growing energy need, modern agriculture techniques, world food problems

**Air resource**, its quality & pollution status, causes, effect & control measures of air pollution

**Management and utilization** of natural resources in equitable manner for sustainable development.

**Role of individuals** in management of natural resources, future strategies for prevention of natural resources.

### **Suggested Readings**

1. Colin Parket & Tim Robers. 1983. Energy from Waste – An Evaluation of Conversion Technologies – Elsevier-Applied Science Publishers, London.
2. Murphy W.R. &Mc Kay G. 1982. Energy Management.
3. Rathore N.S., Mathur A.N & Solanki A.S. 1993. Integrated Rural Energy Planning.
4. Murgai M.P. & Ram Chandra. 1990. Progress in Energy Auditing & Conservation.
5. Victor B. Ottaviano.1993. Energy Management.
6. Craig B. Smith. 1981. Energy Management, Principles, Applications, Benefits and Savings.

## **Gender & Energy**

**REE 623**

**Credit 3 (3+0)**

**Course Outcome:** This course covers goals, framework for gender analytical tool, Engineering Energy Policy, Gender tools for energy projects, gender mainstreaming v/s the women-only approach, MDG goals & targets related to gender & energy. This course is helpful to address gender based energy and will help understanding gender discourse and energy side by side.

### **Syllabus**

Gender concepts, overview of gender & energy planning, identifying gender needs & goals, framework for gender analytical tool, Engineering Energy Policy, Gender tools for energy projects, gender mainstreaming v/s the women-only approach, MDG goals & targets related to gender & energy. Case studies.

### **Suggested Readings**

1. Murphy W.R. & Mc Kay G. 1982. Energy Management.
2. Odum HT & Odum EC. 1976. Energy Basis for Man and Nature. Tata McGraw Hill.

## Renewable Energy Techniques

REE 624

Credit 3(2+1)

**Course Outcome:** The course enables the student to outline the various renewable energy sources and the possible conversion paths to useful form of energy. It describes power generation potential from various renewable energy sources and performance evaluation of these devices.

### Syllabus

**Energy** in house Hold, Energy sources, Application & Present Energy Consumption Pattern, Energy and economical Development, Use of New & Renewable Energy Sources in House Hold.

### Biogas

Biogas Technology and Mechanism, Factors Affecting Biogas Production, Properties of Biogas, Uses, Types of Biogas Plants, Classification Selection of Site, Selection of Size Night Soil based Biogas Plants, Alternative feed material and slurry utilization.

Socio-Economic aspects, Role of women in Propagation Technology, Effect of Environment and Health User's Education / Motivation.

### Solar Energy

Solar Radiation and Measuring Instrument, Solar Collectors, Solar Cooking, Solar drying, Solar Distillation, Solar water Heating, Solar Photovoltaic Power Generation, Quality of Solar Processed Food/Grain.

### Improved Cook-Stove

Various Cooking Options, Traditional Cookstoves and their constraints, Wood combustion Techniques of Biomass, Improved Cook Stoves, Materials for Construction of Improved Cook stoves.

### Practical

1. Study of Solar Cooker.
2. Study of Solar Dryers.
3. Study of Deenbandhu Biogas Plant.
4. Study of Pragati Biogas Plant.
5. Construction of Fixed type Improved Cook Stoves
6. Testing of Fixed type Improved Cook Stoves.
7. Testing of Portable cook Stoves.

### Suggested Readings

1. Rathore N. S., Kurchania A. K., Panwar N. L., Non Conventional Energy Sources, Himanshu Publications, 2007
2. Mathur, A.N. & Rathore N.S., Biogas Production Management & Utilization. Himanshu Publications, Udaipur. 1992.
3. Khandelwal, K.C. & Mandi, S.S. Biogas Technology, 1990.
4. Rai, G.D. Non-Conventional Energy Sources, Kh Publishers, New Delhi.

5. Rathore N. S., Kurchania A. K., Panwar N. L., Renewable Energy Sources: Theory and Practice, Himanshu Publication, 2007
6. Rathore N. S., Kurchania A. K., Panwar N. L., Non Conventional Energy Sources, Himanshu Publications, 2007

## **Wind and Human Environment**

**REE 625**

**Credit 3(3+0)**

**Course Outcome:** The students will be able to learn about the wind and its effect on human environment. They will also be able to understand theory of aerodynamic wind forces and its effect. The effect of wind in natural environment will be learned in the course.

### **Syllabus**

Wind Energy- Symbolism and Mythology' concept and historical progress in the wind energy harnessing techniques.

Wind and it's Effects- Origin of wind, atmospheric circulation, gradient wind geostrophic winds, Hurricanes, Tornado Ratings, tornadoes in various countries, measurements forward velocity, Tangential velocity, Horizontal component of Extricates on maximum pressure differential, rate of pressure change.

Aerodynamic wind forces- Wind loads, velocity pressure, static velocity pressure, wind forces, pressure coefficient, Aerodynamics, airflow Streamlines, Energy flow and Dissipation, Wind loads on buildings. Wind loads on Rigid Frames, Wind load factors and Form response to wind.

Wind in the Natural Environment- Wind over land, Evaporation wind fire interaction, wind effect on climate, wind and nature of wind over water and shores.

Wind in the Urban and Regional Environment- Heat losses by wind, wind effect on sound propagation, wind as recreational resource.

Wind Power- History, Wind conversion (Theoretical values), Power Augmentation, Turbines, Design of Wind Rotor and other accessories, Wind Intermittence and storage systems and its design, wind machine design for maximum efficiency; Wind wave energy; ocean waves energy conversion techniques, present state of art for wind energy utilization; Future development.

### **Suggested Readings**

1. Wind in Architectural and Environmental Design- Michele Melarango Publication, Van Nostr and Rinchold Company.
2. Rathore N.S., Kurchania A.K., Panwar N.L., Renewable Energy: Theory & Practice, Himanshu Publications, 2006.
3. Man and the winds- De la Rue E.A., Philosophical Library.

**Note:**

1. For supporting courses course description, which are offered by other departments, refer separately syllabus of that particular department.
2. For syllabus of Non-Credit Compulsory Courses, see at the end.

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## COMPULSORY NON-CREDIT COURSES

(Compulsory for Master's Programme in all disciplines; Optional for Ph.D. scholars)

CODE	COURSE TITLE	CREDITS
PGS 501	LIBRARY AND INFORMATION SERVICES	0+1
PGS 502	TECHNICAL WRITING AND COMMUNICATIONS SKILLS	0+1
PGS 503	INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN AGRICULTURE (e-Course)	1+0
PGS 504	BASIC CONCEPTS IN LABORATORY TECHNIQUES	0+1
PGS 505	AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES (e-Course)	1+0
PGS 506	DISASTER MANAGEMENT(e-Course)	1+0

**Note:** Any Two from above listed courses as proposed by the ICAR.



# SYLLABUS

## Library and Information Services

**PGS 501**

**0+1**

### **Objective**

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.

## Technical Writing and Communications Skills

**PGS 502**

**0+1**

### **Objective**

To equip the students/scholars with skills to write dissertations, research papers, etc. To equip the students/scholars with skills to communicate and articulate in English (verbal as well as writing).

### **Practical**

**Technical Writing** - Various forms of scientific writings- theses, technical papers, reviews, manuals, etc; Various parts 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.

**Communication Skills** - 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.

### **Suggested Readings**

*Chicago Manual of Style*. 14<sup>th</sup> Ed. 1996. Prentice Hall of India.

*Collins' Cobuild English Dictionary*. 1995. Harper Collins.

Gordon HM & Walter J A. 1970. *Technical Writing*. 3<sup>rd</sup> Ed. Holt, Rinehart & Winston.

Hornby AS. 2000. *Comp. Oxford Advanced Learner's Dictionary of Current English*. 6<sup>th</sup> Ed. Oxford University Press.

James HS. 1994. *Handbook for Technical Writing*. NTC Business Books.

Joseph G. 2000. *MLA Handbook for Writers of Research Papers*. 5<sup>th</sup> Ed. Affiliated East-West Press.

Mohan K. 2005. *Speaking English Effectively*. MacMillan India.

Richard WS. 1969. *Technical Writing*. Barnes & Noble.

Robert C. (Ed.). 2005. *Spoken English: Flourish Your Language*. Abhishek.

Sethi J & Dhamija PV. 2004. *Course in Phonetics and Spoken English*. 2<sup>nd</sup> Ed. Prentice Hall of India.

Wren PC & Martin H. 2006. *High School English Grammar and Composition*. S. Chand & Co.

## **Intellectual Property and Its Management in Agriculture (e-Course)**

**PGS 503**

**1+0**

### **Objective**

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 biodiversity 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 Readings**

- Erbisch FH & Maredia K. 1998. *Intellectual Property Rights in Agricultural technology*. CABI.
- Ganguli P. 2001. *Intellectual Property Rights: Unleashing Knowledge Economy*. McGraw-Hill.
- Intellectual Property Rights: Key to New Wealth Generation. 2001*. NRDC & Aesthetic Technologies.
- Ministry of Agriculture, Government of India. 2004. *State of Indian Farmer. Vol. V. Technology Generation and IPR Issues*. Academic Foundation.
- Rothschild M & Scott N. (Ed.). 2003. *Intellectual Property Rights in Animal Breeding and Genetics*. CABI.
- Saha R. (Ed.). 2006. *Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies*. Daya Publ. House. *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.*

## **Basic Concepts in Laboratory Techniques**

**PGS 504**

**0+1**

### **Objective**

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

### **Practical**

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccumets; washing, drying and sterilization of glassware; Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution; Handling techniques of solutions; Preparation of different agro-chemical doses in field and pot applications; Preparation of solutions of acids; Neutralisation of acid and bases; Preparation of buffers of different strengths and pH values. Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath; Electric wiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability; Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy.

### **Suggested Readings**

- Furr AK. 2000. *CRC Hand Book of Laboratory Safety*. CRC Press.
- Gabb MH & Latchem WE. 1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co.

## **Agricultural Research, Research Ethics and Rural Development Programmes (e-Course)**

**PGS 505**

**1+0**

### **Objective**

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; Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centres (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 II**

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

#### **UNIT III**

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

### **Suggested Readings**

Bhalla GS & Singh G. 2001. *Indian Agriculture - Four Decades of Development*. Sage Publ.

Punia MS. *Manual on International Research and Research Ethics*. CCS, Haryana Agricultural University, Hisar.

Rao BSV. 2007. *Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives*. Mittal Publ.

Singh K. 1998. *Rural Development - Principles, Policies and Management*. Sage Publ.

## Disaster Management (e-Course)

PGS 506

1+0

### Objective

To introduce learners to the key concepts and practices of natural disaster management; to equip them to conduct thorough assessment of hazards, and risks vulnerability; and capacity building.

### Theory

#### UNIT I

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming. Sea Level rise. Ozone Depletion

#### UNIT II

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

#### UNIT III

Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community- based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

### Suggested Readings

Gupta HK. 2003. *Disaster Management*. Indian National Science Academy. Orient Blackswan.

Hodgkinson PE & Stewart M. 1991. *Coping with Catastrophe: A Handbook of Disaster Management*. Routledge.

Sharma VK. 2001. *Disaster Management*. National Centre for Disaster Management, India.

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