

June 2008

ORDINANCE

DOCTOR OF PHILOSOPHY

**FOREST RESEARCH INSTITUTE UNIVERSITY
DEHRA DUN**

ORDINANCE GOVERNING THE PH.D.

1. INTRODUCTION

- 1.1 These ordinances shall be called the Doctor of Philosophy (Ph.D.) Ordinance and shall come into force from the date of Academic Council approve them.
- 1.2 The degree of Doctor of Philosophy (Ph.D.) Forest Research Institute University shall be awarded to those fulfilling the conditions as laid down in the ordinance.

1.3 DEFINITIONS

In this Ordinance unless the context otherwise requires:

- i) Academic Council means, Academic Council of F.R.I. University
- ii) CSIR means, Council of Scientific & Industrial Research
- iii) Director means, Director of Forest Research Institute University
- iv) F.R.I. means, Forest Research Institute, Dehradun.
- v) Head of Division means, Heads of Research Divisions of F.R.I University/ Research Centers.
- vi) Institute means, Forest Research Institute University
- vii) ICAR means, Indian Council of Agriculture Research.
- viii) ICFRE means, Indian Council of Forestry Research & Education.
- ix) Nodal officer means, Nodal Officer of Research Center of F.R.I. University.
- x) Research Center means, Research Center created by F.R.I. University
- xi) R.A.C. means, Research Advisory Committee.
- xii) R.D.C. means, Research Degree Committee.
- xiii) Registrar means, Registrar, Forest Research Institute University
- xiv) UGC means, University Grants Commission.
- xv) External Research Scholar means, Research Scholar who pursues research as in service candidate and employed permanently in a graded pay scale in a government organization/statutory autonomous body. The external research scholar is required to submit a 'no objection certificate' from his/her employer to pursue research in the institute (FRI University).
- xvi) Internal Research Scholar means, Research Scholar who pursues research as a regular candidate.

2. RESEARCH COMMITTEES

2.1 Subject to the general supervision of the Academic Council, all matters connected with the Doctoral programme of a Ph.D. Scholar shall be dealt with in accordance with these ordinances by the following committees:

- i) The Research Degree Committee (RDC)
- ii) The Research Advisory Committee (RAC)
- iii) The Screening Committee

2.2 The **RDC** shall consist of the following:-

- a) Director or his nominee (Chairman)
- ii) Four experts nominated by the Director for two years
- iii) Heads of the concerned Divisions
- iv) Supervisor and Co-supervisor, if any, of the Ph.D. Scholar
- v) The Registrar (Member Secretary)

2.3 The **RDC** shall:

- a) Consider the recommendations of the RAC with regard to appointment or change of supervisor/co-supervisor.
- b) Consider the report of the examiners and take the decision for the award of degree.
- c) Consider the report of RAC regarding extension of the term of registration of a Ph.D. Scholar beyond five years.

2.4 The standing RAC for the Ph.D. Scholars in each discipline shall be constituted by the Director, FRI/Research Centers concerned.

The **RAC** shall consist of the following:-

- (a) Chairman
- (b) Two experts from outside the division/institute.
- (c) One expert from the division
- (d) One Statistician/Research Methodology Expert
- (e) Supervisor and Co-supervisor -Ex-officio Member
- (f) Member Secretary – Head of Division(in case of FRI)/
Nodal Officer or his nominee (in case of research center.)

The standing RAC shall be constituted for two years. The member secretary may convene the meeting of RAC in consultation with the chairman and the other members as and when necessary.

2.5 The **RAC** shall:

- a) Examine the synopsis received from the applicant for enrollment as Ph.D. Research Scholar and shall hold a synopsis seminar in which all the Forest Officers/ Scientists/RAC/Research Scholars of the concerned Division/Research Center shall participate. The suggestions made in the seminar may be incorporated in the synopsis already submitted by the candidate. The RAC after holding the synopsis seminar shall recommend appropriate topic for registration and approve the synopsis after necessary revision/correction/modification as per

the Ph.D. Ordinance. The recommendation of RAC should come in the Performa as given in Appendix-4;

- b) Recommend co-supervisor, if necessary;
- c) Recommend, if necessary, in consultation with the Supervisor/Co-Supervisor for constitution of an Advisory Committee consisting of the Scientist/Teacher/Forester concerning the field of research of the Research Scholar. The Advisory Committee shall help/guide the Research Scholar in his/her research work in consultation with and overall supervision of the Supervisor;
- d) Examine the application of the Research Scholar for extension of his/her term of registration beyond five years and recommend to the RDC for extension of his/her term of registration for maximum of one year; also examine the progress reports of the research scholars as per synopsis
- e) Recommend short-term basic course in Silviculture/ Forestry/ Forest Management/ Mensuration/ Forest Ecology subjects for those who have no knowledge of these subjects;
- f) To hold pre-thesis submission seminar of a Research Scholar who has completed his/her research work and recommend a panel of eight examiners giving brief bio-data and indicating major areas of research/expertise of the examiners.

While making their recommendations the RAC shall see that the recommendations are made in conformity with the ordinance and such other directives as may be issued from time to time by the Academic Council in regard to matters connected with Ph.D. research.

2 (A) ADMINISTRATIVE COMMITTEE

There shall be a Counseling sub Committee for the purpose of counseling the research scholars and the concerned supervisors including the resolution of grievances if any.

2.(A)1. The Counseling sub Committee shall consist of the following: -

1.	Dean (Academic), FRI University	Chairman
2.	Any two Head of Divisions of FRI/ other research center (to be nominated by the Director, FRI Chairman Academic council)	Member
3.	Registrar, FRI University	Member Secretary

All the cases involving academic/research interests of the research scholar and the supervisor should be addressed to the Director, FRI.

2(A)2. The terms of the reference of the Sub Committee shall be as follows:-

- a) The committee shall look into all the matters that may be referred to it by Chairman, Academic Council.
- b) The Chairman, Academic Council may direct office of the Registrar, FRI University to examine the cases related to academic/research interests of the research scholar and the supervisor and may issue suitable instructions. In exceptional cases, which may require detailed analysis, the Director/Chairman Academic Council may refer such cases to the Counseling Sub Committee for its opinion.
- c) The Sub Committee may study the specific cases and device its own procedure to analyze the issue referred to it and may submit its recommendation to the Director. The Director, FRI/Chairman Academic Council may pass appropriate order on the recommendation of the Counseling Sub Committee.
- d) The Chairman of the Sub Committee may convene the meeting of the Sub Committee as and when necessary.

3. ADMISSION REQUIREMENT

- 3.1. To be eligible for admission to the Doctoral programme, a candidate must:
 - (a) Hold a master's degree or its equivalent from any recognized university/ institute in a subject approved by F.R.I University.
 - (b) Have received grades 55% or above in Post graduate examination.
- 3.2. In case of registration of foreign students as Ph.D. Scholars the Equivalence Committee of the F.R.I. University before their registration shall settle the equivalence of the degree possessed by them.
- 3.3. A candidate who meets the requirements mentioned above may select a field of study out of the following:

Sl. No.	Discipline (Subject of study)	Qualification for admission in doctoral program
1.	Silviculture	Post-graduate degree in Forestry/Agriculture/Botany
2.	Forest Seed Tech.	Post-graduate degree in Forestry/Agriculture/Botany
3.	Forest Genetics	Post-graduate degree in Botany, Agriculture or Forestry with specialization in Genetics
4.	Forest Botany	Post-graduate degree in Botany with specialization in Systematic Botany/ Plant Physiology/ Wood Anatomy/Biodiversity Conservation/Ethno Botany or Post-graduate degree in Agriculture with specialization in Plant Physiology or Post-graduate degree in Forestry
5.	Forest Pathology	Post-graduate degree in Botany, Forestry, Wood Science & Technology or Agriculture with specialization in Plant Pathology/ Microbiology.
6.	Forest Entomology	Post-graduate degree in Forestry or P.G. Degree in Zoology with specialization in Entomology or P.G. Degree in Agriculture with specialization in Entomology
7.	Soil Science	Post-graduate degree in Chemistry, Microbiology Geology, Soil Science or Agriculture (with specialization in Agricultural Chemistry, Soil Science)

8.	Forest Ecology & Environment	Post-graduate degree in Biological/Life Science, Environmental Science or Forestry with Specialization in Ecology or Post Graduate Degree in Marine Biology or Post Graduate Degree in Zoology with specialization in Marine Biology
9.	Forest Management	Post-graduate degree in Mathematics/Statistics/Computer Application/Forestry/Agriculture Forestry
10.	Wood Science & Technology	Post-graduate degree in Physics/Chemistry/Engineering or Botany with specialization in Wood Anatomy or Post Graduate Degree in Wood Science & Technology.
11.	Chemistry of Forest Products	Post-graduate degree in Organic Chemistry/Bio-Chemistry/Agricultural Chemistry, MD in Pharmacology or equivalent in Indian System of Medicine, Post Graduate degree in Pharmacology/Industrial Chemistry
12.	Pulp & Paper Technology	Post-graduate degree in Chemistry, Chemical Engineering or Paper Technology
13.	Forestry Extension	Post-graduate degree in Agriculture Extension / Forestry
14.	Non Wood Forest Products (NWFP)	Post Graduate degree in Botany/Forestry, Organic Chemistry, Agriculture with specialization in cultivation of medicinal plants, MD in Pharmacology or equivalent in Indian System of Medicine
15.	Forest Biotechnology	Post Graduate degree in Biotechnology or Post graduate degree in life sciences with specialization in Biotechnology or Post Graduate degree in Biochemistry/Molecular biology/ Microbiology
16.	Forest Bioinformatics	Post Graduate degree in Bio informatics or Post graduate degree in Forestry/Botany with minimum one year PG Diploma in Bio informatics from a recognized institution or Post Graduate Degree in Computer Science or Post Graduate Degree in Information Technology or Post Graduate Degree in Maths/Physics/Statistics with P.G. Diploma in Computer Science.
17.	Environment Management	Post Graduate degree in Environment Management/ Environmental Science or M.Tech Environmental Engineering or Post Graduate degree in Chemistry with specialization in Environmental Chemistry.
18.	Wildlife Science	Post-graduate degree in Forestry/ Wildlife Science/ Zoology/ Botany/ Environmental Management or Postgraduate degree in any science subjects with recognized Postgraduate Diploma in Wildlife Management..
19.	Forest Geoinformatics	M. Tech in Remote Sensing & GIS or Post Graduate Degree in any science subject with Post Graduate Diploma in Remote Sensing/GIS from IIRS, Dehra Dun or Postgraduate degree in Geoinformatics.
20.	Forest Hydrology	Post Graduate Engineering Degree in Hydrology/ Water Resource Engineering/ Civil Engineering, Post Graduate Degree in Forestry, Environment Management/ Sciences with specialization in GIS/ Remote Sensing/ Watershed Management.

4. **PROCEDURE OF ADMISSION**

- 4.1** The admission to the PhD Programme shall be as per the Ordinance Governing Eligibility Test for admission in Ph.D. Programme
- 4.2** Candidates for the award of degree of Doctor of Philosophy in Forestry may be registered at the beginning of any term i.e. either from 1st August or from 1st

February on basis of the Eligibility list prepared by the FRI University. The eligibility list will be valid for one year.

- 4.3 A Candidate may be admitted as an Internal/External Ph.D. Scholar as per the rules of the FRI University.

The External Research Scholar shall be required to take study leave for a minimum period of 8 months as minimum residential period from the date of commencement of compulsory courses in the first year of registration. During this period the scholar will be expected to clear the compulsory courses and additional courses if any suggested by the Research Advisory Committee (R.A.C.).

- 4.4 A candidate for the Ph.D. degree in Forestry must apply for registration to the Registrar FRI University or through Nodal Officers of the recognized centers of the FRI University on the prescribed form as given in Appendix-I along with the prescribed fee.

- 4.5 The application form shall be accompanied by the documents as may be prescribed in the application form.

- 4.6 The registration letter for the Ph.D. degree will be issued only after receipt of the following fees to the FRI University:

Sl. No.	<u>Fees to be deposited at the time of registration</u>	Fee (in Rs.)
1.	Registration/ Enrolment Fee	10000.00
2.*	Thesis Fee	10000.00
3.	Cultural/ Sports/ Magazine	1000.00
	Total	*21000.00
	+Fee at the beginning of each semester (6 months)/ Year	
4.	Annual fee	5000.00
5.	Laboratory fee <u>to be charged annually for four semesters</u> (to be paid to respective research centers for each semester of six months)	1500.00 (per semester) i.e. Rs. 3000.00 per year
6.	Library fee per year (to be paid to respective research centers)	1000.00
	TOTAL Per year (for first two years)	*+ 9000.00
7.	Caution Money (Refundable)	*+ 2000.00
<u>Yearly fee for remaining period of registration</u>		
	Annual fee	5000.00
	Library fee per year (to be paid to respective research centers)	1000.00
	Laboratory fee <u>to be charged annually for four semesters (i.e. for 2 years)only</u> (to be paid to respective research centers for each semester)	1500.00 (per semester) i.e.Rs. 3000.00 per year
8.	Late fee	500.00
9.	Renewal of registration fee	1000.00

Provided that the External Research Scholar shall be required to pay only the registration fee, thesis fee, Cultural/ magazine fee/sports fee and Annual fee in the FRI University. However, the external research scholars may be charged Library fee, Laboratory fee and Caution Money by the research centers, in case they avail these facilities in the research centers concerned.

- 4.7 A candidate shall ordinarily be permitted to work for Ph.D. Degree in the subject in whom he/she has obtained his/her Master's Degree and/or Post-graduate Diploma (recognized by FRI University/UGC equivalent to Master's Degree.)
- 4.8 A candidate shall pursue research at one of the Research Divisions concerned with his/her subject.

4.9 PROCEDURE FOR REGISTRATION OF FOREIGN CANDIDATES AS PH.D. RESEARCH SCHOLAR

Applications of foreign nationals nominated by the Government of India under scholarship scheme and self-financing foreign nationals will be entertained for registration as an internal Ph.D. Scholar subject to the condition that they should fulfill the following conditions:

- (a) Must hold a master's degree and secured at least 55% marks.
- (b) The applications of scholarship holders (under various schemes) of foreign nationals for admission must be routed through Indian Council for Cultural Relations/Ministry of Human Resource Development (Dept. of Education), Govt. of India, New Delhi or Ministry of Environment and Forests, Govt. of India, New Delhi.
- (c) The foreign students under self-financing scheme should send their application directly to the Institute.
- (d) They must have valid students Visa at least for a period of two years.
- (e) The candidate must have a certificate to be verified by the Ministry/Agencies to the effect that the candidates had been subjected to AIDS test and found negative.
- (f) They should have adequate knowledge of English.
- (g) The Degree/Certificate of the candidates must have been approved by the Association of Indian Universities (A.I.U) or equivalent to the corresponding degrees/certificate of Indian Universities.

- (h) They are required to pay the following fees in U.S. dollar:
- | | | |
|-----|----------------------------|---------------|
| i. | Application fee | US \$ 25 |
| ii. | Registration Fee | US \$ 50 |
| iii | Lab and other Fee | US \$ 750 p.a |
| iv. | Caution money | US \$ 100 |
| v. | Culture, Magazine & Sports | US \$ 25 |
| vi. | Hostel Fee | US\$ 50 p.m. |

4.10 Ordinance Governing Eligibility Test for admission in Ph.D. Programme

4.10.1. The admission to the Ph.D. Programme of the FRI University shall be through eligibility test which shall be organized in all the recognized research centres of the FRI University simultaneously every year.

The student appearing in the final year of the qualifying exam may also be allowed to appear in the eligibility test. However the registration will be subject to other conditions of eligibility and as per clause 3.1 of the Ph.D. ordinance.

4.10.2. The eligibility test will be of 200 marks and 3 hours duration to test the ability of the candidate in the research. The guidelines will be issued separately by the office of the Registrar, FRI University. The exam will be conducted once/twice a year preferably during the month of May/December. The notification and application forms will be made available on website sufficiently in advance.

4.10.3. The candidates who have cleared NET conducted by UGC will be admitted based on the recommendation of Research Advisory Committee. They will have to give a proof of having cleared NET along with their application form. They may not appear for the eligibility test.

4.10.4. There will be no examination for the Foreign/overseas students. Their admission will be based on the existing Clause 4.9 of the PhD ordinance.

4.10.5. Merely qualifying the eligibility test does not mean that the candidate will be registered for Ph.D. Course. The registration in the Ph. D. course shall be subject to the approval of the Research Advisory Committee concerned and the Director FRI University.

4.10.6. The Director may grant admission to exceptional candidates without appearing in eligibility exam. They shall have to meet other eligibility conditions and follow the prescribed procedure provided the candidate may have minimum 10 years professional experience in the field of forestry. However such supernumerary registrations may not exceed 2 in number in a year.

- 4.10.7. There will be no eligibility test for the ICFRE employees or those on deputation to ICFRE.
- 4.10.8. The procedure for eligibility test shall be laid by Registrar FRI University office.

5. SUPERVISOR/ CO-SUPERVISOR

- 5.1** Any scientist/officer working in F.R.I University or its Research Centers may be considered for appointment as Supervisor or Co-supervisor. He/She must be a forester/scientist who possesses a Doctorate degree, published work of high standard and should have atleast 10 years of research experience in case of scientists and 10 years of professional experience in case of forester after award of his/her Ph.D. degree. The Scientists/Foresters having obtained fresh Ph.D. Degree can be considered as co supervisor only after completion of five years from the date of award of Ph.D. Degree. In exceptional cases, the Director may allow a non- Ph.D. Scientist/Forester as Supervisor provided he has minimum 10 years of research experience in the discipline concerned with equivalent published work of very high standard (published in top ranking national and international journals).

Provided that an eminent Scientist not below the rank of Reader or retired as Reader/Scientist from the research organizations other than F.R.I. or its research centers may be appointed as Co-supervisor of a Research Scholar subject to the condition that in such case the research scholar concerned is required to pursue his/her research work mainly in F.R.I. University or its research centers.

- 5.2 No research scholar hereinafter should be registered under a Scientist/forester who is going to retire or whose tenure of deputation is going to expire within 2 years from the date of registration.
- 5.3 For registering of Ph.D. Scholars the maximum number of research scholars under different level of scientists/Forester at any time is as under:

Scientist-F&G or equivalent Forester	6
Scientist-E	4
Scientist-D	3
Scientist-C&B	2

Provided

- That over and above this quota the Director may permit not more than two Research Scholars working under a fellowship awarded by an agency such as UGC, ICAR, CSIR, MoEF, ICFRE or FRI University, under a Supervisor.
- That the name of research scholars, who have submitted the thesis, should not be counted for the purpose of fixing the quota of research scholars under a Supervisor.

5.4 Persons who have registered themselves, as Ph.D. Scholars shall not act as Supervisor or Co-supervisor of any Ph.D. Scholar.

5.5 The change of Supervisor should not be allowed. However, in exceptional circumstances, the Academic Council will consider the change of supervisor on the recommendation of the Research Degree Committee.

6. ENROLLMENT

6.1 Each RAC shall send a copy of the minutes of Synopsis seminar along-with the application of the candidate to the Registrar who shall issue letter of admission to the candidate recommended by the RAC after proper scrutiny and approval of the Director.

6.2 On receipt of the communication regarding the admission, the candidate shall pay the requisite fees to the Registrar latest by 30th September or 31st March for enrollment in that particular term.

6.3 Internal Ph.D. Scholars shall be required to be present in the Institute for prescribed terms as mentioned in the Para 6.8. Their presence shall be duly recorded and maintained in the Division concerned.

6.4 A record of the progress of every Ph.D. Scholar shall be kept by his/her Supervisor. The Supervisor shall forward six monthly progress reports of the candidate in March and September to the Chairman, RAC. The RAC shall consider the progress reports and forward the same with recommendations and comments, if any, to the Registrar.

6.5 **Registration of a Ph.D. Scholar is liable to be cancelled by the Director at any time if:-**

i) Two consecutive six monthly progress reports are not submitted at all or are not satisfactory as per recommendations/comments of RAC.

However, the research scholar is required to submit the six monthly progress reports till the work is presented in the pre-thesis submission seminar and is approved by the committee for submission of thesis.

The initial 4 progress reports may come through Chairman and Member Secretary R.A.C. The rest can come through Head of Division and Supervisor concerned.

ii) The attendance in case of internal Research Scholar should not be less than 75% in any term.

6.6 No internal Ph.D. Scholar shall accept during the period of research any paid assignment apart from Research Fellowships, Research Assistantship etc. unless in the opinion of the RAC such an assignment will not interfere with his/her research work.

- 6.7 A Ph.D. Scholar shall not be permitted to take any other degree course, but may be permitted by the RAC to take part-time Diploma or Certificate course(s) not affecting the scholar's research work adversely.
- 6.8 An internal Research Scholar as mentioned in clause 6.3 is required to pursue research in the Institute/Research Center under the Supervisor on the approved subject for not less than twenty-four months commencing from the date of his registration.
- 6.9 The Research Scholar may not later than eight months from the date of registration, modify the scheme of the research work or nature or scope of the subject, on the recommendation of the Supervisor and RAC with the approval of Director.
- 6.10 A Ph.D. Scholar shall be permitted to submit his thesis not earlier than twenty-four months from the date of his registration.
- 6.11 In case a Research Scholar does not submit his/her thesis within five calendar years from the date of permission granted to him/her unless the term is extended by the Research Degree Committee on the recommendation of the Research Advisory Committee for a period of 1 calendar year, his/her registration shall lapse.

Provided that Research Degree Committee on the specific recommendation of Research Advisory Committee concerned may extend the term of registration of a research scholar for one more year as a very special case .

The recommendations of the R.A.Cs for extension of term of registration must reach this office before expiry of the term of registration.

- 6.12 It shall be made **compulsory for all the Ph.D. Scholars** to pursue the following courses for **100 Hours each** at F.R.I University or its Research Centres.:-
- i) Basic Forestry course as per syllabus vide Appendix-8
 - ii) Computer application course as per syllabus vide Appendix-9
 - iii) Statistical analysis course as per syllabus vide Appendix-10

However, pursuance of short-term courses in Silviculture/Forest Management/ Mensuration/ Forest Ecology subjects by the research Scholars shall be optional unless specifically recommended by the R.A.C concerned for those who may be deficient in knowledge of these subjects in the opinion of the RAC. In such cases the RAC concerned may recommend all or any of the subjects to be pursued and passed by the scholars before the award of Ph.D. Degree.

In all such cases, where research scholar may have pursued these courses as given in item no. (i) (ii) & (iii) above as a part of curriculum in any other course, the research scholar concerned shall be allowed to appear in the exam directly and be exempted to appear in the regular classes. The scholar will have

to pass the exam as per the rules of the FRI University and a certificate to that effect will have to be issued by the research center concerned and submit to the office of the Registrar, FRI University at the time of submission of the thesis.

- 6.13 The performance of the Research Scholar concerned shall be evaluated at the end by the RAC concerned during Pre-thesis Submission Seminar and report may be sent to Registrar for record.

7. SUPPLICATION OF THESIS

- 7.1 On completion of the research work for Ph.D. by the candidate, the Supervisor shall organize, in consultation with the Head of Division under the auspices of the RAC a pre-thesis submission seminar by the candidate to present his/her progress and achievements and to receive suggestions for further improvement of the thesis.
- 7.2 After the pre-thesis submission seminar, the Supervisor shall forward the application of the candidate for supplication of the thesis along-with a certificate about completion of the Seminar and the exact title of the thesis duly approved by the R.A.C.(at the time of synopsis seminar)
- 7.3 A Ph.D. Scholar shall ordinarily supplicate the Ph.D. thesis within six months from the date of his/her pre-thesis seminar or till completion of term of registration whichever is earlier through the Supervisor and the Head of Division. The supervisor shall forward therewith **four hardbound printed copies of the Ph.D. Thesis and 6 copies of summary of the thesis** to the Registrar.
- 7.4 The **thesis shall comply with the following conditions and should contain following documents:**
- i) It must be a piece of research work characterized either by the discovery of facts or by a fresh approach towards the interpretation of facts. In either case, it should evince the candidate's capacity for critical examination and sound judgment.
 - ii) It shall be satisfactory in point of language and presentation of subject matter.
 - iii) The thesis in hard bound form shall be accompanied by:-
 - 1) A declaration from the Ph.D. scholar that the thesis embodies the result of his/her own work and observations and in that respects the investigation appears to advance knowledge in the subject.
 - 2) A certificate from the Supervisor and Co-Supervisor stating:
 - a) That thesis embodies the work of the Ph.D. Scholar himself/herself
 - b) That in the opinion of the Supervisor/(Co-supervisor, if any), the thesis fulfills the requirements of the Ordinance governing award of Ph.D. Degree of F.R.I. University
 - 3) A certificate from RAC to be obtained at the time of pre thesis seminar in the given format at **Appendix -3**.

4) Registration letter.

The documents specified above shall be bound in the beginning of the thesis strictly in the above sequence.

7.5. Format of the thesis

The entire thesis submitted to the FRI University shall be in following format.

(i) The thesis cover page should be printed in the under mentioned format:

Title of the thesis

THESIS
SUBMITTED TO THE
FOREST RESEARCH INSTITUTE UNIVERSITY
DEHRA DUN, UTTARANCHAL
For
THE AWARD OF THE DEGREE OF
DOCTOR OF PHILOSOPHY IN FORESTRY
(Name of Discipline should be printed here)



By

Name of the Research Scholar

Name of the Division/Research Center

Year

(ii) The following should be printed on the side of the thesis:

Name of the scholar

Title of the thesis

Year of submission of the thesis

(iii). The cover should be either green or black in colour. The colour of the letters printed on the cover should be golden and the thesis cover should be laminated.

8. EXAMINATION

- 8.1 When the Ph.D. Scholar has completed his/her pre-thesis seminar, the concerned RAC shall recommend to the Registrar **a panel of at least eight examiners giving brief bio-data and indicating major areas of research/expertise of the examiners.** The scholar shall submit four copies of an abstract of about 600 words of the thesis work along with the thesis. The panel of examiners shall be submitted by the Registrar to the Director, FRI University for appointment of **three examiners**. However, the Director, FRI University may appoint any other expert as examiner beyond the names recommended by the RAC. After appointment of the examiners by the Director FRI, the Registrar shall get in touch with each examiner with a copy of the abstract to secure acceptance of the examiner ship.
- 8.2 An examiner shall ordinarily be required to accept the appointment offered by the F.R.I. University within the time indicated by the Registrar in the appointment letter. If, however, no information is received from an examiner within a reasonable time from the date of issue of the letter of appointment his appointment shall stand cancelled and another examiner shall be appointed.
- 8.3 On receipt of the acceptance of any examiner, the Registrar shall forward the copy of the thesis to him and take all action to get the report of the examiner expeditiously.
- 8.4 The examiner shall be requested to submit their individual reports within two months on the receipt of the thesis.
- 8.5 The examiner shall categorically recommend in the prescribed Performa acceptance or rejection or revision of the thesis and also give their detailed comments and examiners shall state if the thesis complies with the following conditions in case they recommend the award of the degree.
- a) It is a piece of research work characterized either by discovery of facts or by a fresh approach towards interpretation of facts.
 - b) The thesis evinces the Research Scholar's capacity for critical examination and sound judgment.
 - c) It is satisfactorily in point of language and presentation of such matter.
- 8.6 The examiner shall return the copy of the thesis, soon after submission of the report.
- 8.7
- (a) In case all the three examiners accept the thesis the same shall be accepted.
 - (b) In case all the examiners reject the thesis **or** two of them reject the thesis and third accept the thesis **or** two of them rejecting and the third recommending revision such thesis shall be rejected.
 - (c) In case any of the examiners recommends for revision/rejection of the thesis for the second time, the thesis shall be rejected.
- 8.8 If two examiners accept the thesis and the third examiner recommends for revision **or** two recommending revision and third one recommending

acceptance **or** if all the three recommend for revision, in all such conditions the thesis will be returned to the scholar for revision and the research scholar shall have to resubmit the thesis after revision in the light of examiner's observations. **The revised thesis shall be sent to those examiners once again for evaluation who have recommended for revision.**

- 8.9 If two examiners accept the thesis and the third reject the thesis **or** in case one accepts the thesis, one recommends revision and the third reject the thesis in such case the Director, FRI shall appoint the fourth examiner for evaluation of the thesis. The opinion of the fourth examiner shall be final and binding on the scholar.
- 8.10 If the examiners recommend that the candidate be asked to revise his/her thesis the Director shall permit the candidate to resubmit his thesis not earlier than six months and not later than eighteen months, the period being counted from the date of order of the Director granting the permission. In case a candidate is allowed to resubmit his/her thesis he/she shall have to pay a fresh fee of Rs. 250/- at the time of resubmitting his/her thesis but it shall not be necessary for him/her to reproduce any certificate of further attendance at the Institution/Research Center at which he/she had carried on his/her work.
- 8.11 The re-submitted thesis shall be examined as far as possible by the old set of examiners.
- 8.12 As per the above sub clauses if the thesis is accepted then the research scholar shall be called upon to appear for a test before the following Viva-Voce Board:-

- | | |
|--|-------------|
| 1. External examiner
(Nominated by the Director, FRI) | - Chairman. |
| 2. Internal examiner
(Supervisor/Co-supervisor) | - Member |

On satisfaction of the Viva-Voce Board the chairman may write a detailed report in his/her own hand in the prescribed Performa on the viva-voce presentation by the scholar and may recommend him/her for award of Ph.D. Degree by FRI University. Such case shall be submitted to the RDC for consideration of the award of Ph.D. degree. The Board of Management shall award the final degree on passing of grace.

Provided that if a Viva-Voce board is not in a position to conduct the Viva-Voce examination, the Director may look into the special circumstances of the case and may appoint alternative Viva-Voce examiner/examiners.

- 8.13 In case the recommendations of the Viva-Voce examiners differ from that of the thesis examiners or there is a difference of opinion between the Viva-Voce examiners, the Research Scholar may be asked to re-appear at a second Viva-Voce examination within six months. If the Research Scholar fails to satisfy the Viva-Voce examiner a second time, his thesis shall be finally rejected.

8.14 The examiners may seek clarification on the subject matter of the thesis from the Supervisor. The provision will be incorporated in the letter to be sent to the examiners while sending the thesis.

8.15 The thesis as such shall be published only with the permission of the F.R.I. University and such publication, shall state on the title page itself that it was a thesis approved for the award of the Ph.D. Degree of the F.R.I. University.

1. CONCLUSION

9.1 From the date when these Ordinance come into operation all previous Ordinance on the subject shall cease to have effect.

Provided that his revocation shall not affect the previous ordinance so revoked or anything done or suffered under any previous ordinance so revoked or affect any right, privilege, obligation or liability acquired, arrived or incurred under any ordinance so revoked.

9.2 Notwithstanding anything contained in these ordinances, any question, which is not covered by these ordinances, or any difficulty arising out of these ordinances shall be dealt with by the Academic Council.

The following are the established Research Centres of F.R.I. University:

1.	Indian Institute of Forest Management, Nehru Nagar, P.O. 357, Bhopal, M.P.-462 003
2.	Tropical Forest Research Institute, P.O. R.F.R.C., Jabalpur-482 021
3.	Arid Forest Research Institute, P.O. Krishi Manhi, New Pali Road, Jodhpur 342-005
4.	Himalayan Forest Research Institute, Conifer campus, Pathaghati, Shimla – 171 009
5.	Institute of Wood Science & Technology, P.O. Malleswaram, Bangalore- 560 022
6.	Institute of Rain & Moist Deciduous Forest Research, Jorhat, Assam
7.	Institute of Forest Genetics & Tree Breeding, Coimbatore 641 002
8.	Institute of Forest Productivity, Main Road, Hinoo, Ranchi 834 002
9.	Forest Research Institute, P.O. New Forest, DehraDun – 248 006
10.	Kerala Forest Research Institute, Peechi – 680 653, Thrissur Distt., Kerala State

11.	Wildlife Institute of India, P.O. 18, Chandrabani, Dehra Dun – 248 001
12.	Indian Plywood Industries Research & Training Institute, P.O.:2273, Tumkur Road Bangalore-560022
13.	Forest Survey of India, P.O: I.P.E., Kaulagarh Road, Dehra Dun – 248 195
14.	UP Forest Research Institute, Kanpur – 24
15.	Indian Institute of Remote Sensing, (NRSA), 4 th , Kalidas Road, Dehra Dun
16.	G.B. Pant Institute of Himalayan Environment & Development, Kosi- Katarmal, Distt. Almora – 263 643.

***GUIDELINES FOR PREPARING Ph.D. SYNOPSIS**

1. **Cover page** should have title of the proposed work with name of the Research Scholar and Supervisor in a format as depicted below: -

<u>Format :</u>	<u>Example :</u>
(Title of the proposed research plan)	Bamboo – endomycorrhiza: Ecology, growth and macroproliferation.
Synopsis of the proposed research plan	Synopsis of the proposed research plan
Submitted for the degree of	Submitted for the degree of
Doctor of Philosophy in Forestry (Name of Discipline) Of	Doctor of Philosophy in Forestry (Name of Discipline) Of
Forest Research Institute University	Forest Research Institute University
By	By
Name of the Scholar	XYZ
Under the Supervision of	Under the Supervision of
Name and address of Supervisor	XYZ Forest Research Institute, Dehra Dun

** 7 copies of the synopsis are to be submitted to the Member Secretary, Research Advisory Committee by the candidate. The Member Secretary will send one copy to each member of R.A.C. for perusal.*

2. **Second page** should have details of Research Scholars, Supervisor and place of work where Research Scholar intends to conduct studies with signature of Research Scholar and Guide both. **After synopsis seminar, names of R.A.C. members may also be indicated on this page.** These information's be **formatted** as below:-

**** Synopsis of proposed research plan for the degree of Ph.D.
submitted to
F.R.I. University, Dehradun**

Title of research proposal :

Name of the Research Scholar:

Name and Designation of Supervisor:

Name and Designation of Co-Sup:

***Name of Expert Members RAC

Place of work:

Sd/
(Name)
Supervisor

Sd/
(Name)
Research Scholar

***Sd/-
(Name)
Chairman RAC

*** Sd/-
(Name)
Member Secretary. RAC

**** *Synopsis to be revised after the R.A.C. meeting (synopsis seminar) as per the comments/ recommendations of R.A.C.***

***** Names of the R.A.C. members should be incorporated in the revised synopsis only and the same should be signed by the Chairman and Member Secretary also..**

3. **Introduction:** Species/organism/theme/aspect of research should be introduced with background information indicating its importance and relevance with over all objectivity and concept of forestry.
4. **Review of literature:** Review of literature should be comprehensive covering various aspects of the proposed work but it must be precise with recent information. Detailed review at this stage is not required.

5. **Methodology:** Techniques in brief should be given in respect of specific experiments/observations only. Methods of routine nature need not be described.

6. **Proposed plan of work:** This part of the synopsis is very important. Different aspects of the proposed plan of work should be given into separate components/chapters/sub-projects. Each component/sub-project should have detailed titles of various experiments proposed to be performed. Wherever possible area of research be mentioned indicating whether studies would be performed in the laboratory or in some specific field conditions.

7. **Expected Conclusions:** Researcher may indicate the conclusions, which are expected to be drawn from the proposed studies.

8. **References:** References should be listed alphabetically author wise. In the text, the reference should be quoted as Sen-Sarma (1980) or Sen-Sarma and Thakur, (1981) or Sen-Sarma et al. (1982) for single, two and more than two authors, respectively. Papers by the same author in the same year should be distinguished by letters, a, b, c, etc. For references, following pattern should be followed.

FOR RESEARCH PAPERS:

Ahmad, M. 1987. Relative resistance of different clones of *Tectona grandis* to teak defoliator, *Hyblaea puera* Cram. (Lepidoptera: Hyblaeidae) in South India. *Indian Forester*, 113(4): 281-286.

COMPLETE BOOKS:

Beeson, C.F.C. 1941. *The Ecology and Control of the Forest Insects of India and the Neighbouring Countries*. Vasant Press, Dehra Dun, ii + 1007 pp.

FOR A CHAPTER IN EDITED BOOK:

Heather, W.A. and Griffin, D.M. 1984. The potential for epidemic disease, 143-154: In *Eucalyptus for Wood Production*, Hills, W.E. and Brown, A.G. (eds.) CSIRO/Academic Press, Sydney.

CITATION FROM NEWSPAPERS:

Hanumantha Rao, C.H. and Singh Padam, 1986. Fertilizers strategy of diffusion. *The Economics Times (Bombay)*, Jan. 29, 25(327): I-II (Suppl.).

THESES AND DISSERTATIONS:

Mehra, M.S. 1984. Litterfall and nutrient return in certain forest ecosystems of Kumaun Himalaya, Ph.D. thesis, Kumaun University, Nainital : 274 pp.

FOR ANNUAL REPORT:

Annual report, 1989-90. Department of Agricultural Research and Education, Ministry of Agriculture, Govt. of India, New Delhi 67-70

IN CASE OF PROCEEDING/CONFERENCE:

Khan, M. 1987. NGOs and Agroforestry. In *Professional Education I Agroforestry*, 209-215: Easter Zulbert, E. (ed.) *Proceedings of an International Workshop*, 5-10 December, 1982, ICIPE Training Centre, Dudville, Nairobi, Kenya.

IN CASE OF BULLETINS/RECORDS:

Byant, M.S. 1951. bibliographic style, USDA. Bib. Bull. 6:30 pp.

Or

Author, year. Title Indian For. Rec. (N.S.), (Ent.) 33(5): 1-71

APPENDIX -3

Performa of the minutes of meeting of RAC for Synopsis Seminar

- i) Name of Candidate:
- ii) Date of meeting:
- iii) Institute's name:
- iv) Division's Name:
- v) Chairman's Name:
- vi) Expert member's names:
 - (1)
 - (2)
 - (3)
 - (4)
- vii) Supervisor's name:
- viii) Co-Supervisor's name:
- ix) Head of Division (Member Secretary):
- x) **Suggestions/comments made by the RAC:**
(Please attach the details duly signed by all the members)
- xi) Topic recommended by R.A.C.:
- xii) Name of Discipline for which registration is recommended:
(Which will be recorded in the Degree certificate as per clause 3.3 of the Ph.D. Ordinance. The decision of the office of the FRI University shall be final)
- xiii) Courses recommended:
(As per clause 2.5 & 6.12 of the Ph.D. ordinance)
- xiv) Recommendation of RAC whether to be registered as PhD Scholar:

Signatures of the Members of the RAC

(The proceedings should be neatly typed)

Format of Progress Report

1. Name of the scholar :
2. Registration Number :
3. Name of Discipline & Topic of Research :
4. Name of Supervisor :
5. Name of Co Supervisor :
6. Name of Research Center/ Institute :
7. Date of meeting of R.A.C.
8. Progress report I/II/III/IV :
9. Period of Progress report :

(Detailed progress report should be attached compulsorily)

Remarks if any of the supervisor:

Remarks of Expert Members of R.A.C.:

Signature of the Supervisor and members of the R.A.C. at the last page of the report

Performa of the minutes of meeting of RAC for extension of term

- xv) Name of Ph.D Scholar :
- xvi) Registration Number & date :
- xvii) Date of meeting:
- xviii) Topic :
- xix) Institute's name:
- xx) Discipline
(as per clause 3.3 of the Ph.D. ordinance)
- xxi) Chairman's Name:

- xxii) Expert member's names:
 - (1)
 - (2)
 - (3)
 - (4)
- xxiii) Supervisor's name:
- xxiv) Co-Supervisor's name:
- xxv) Head of Division (Member Secretary):
- xxvi) Recommendation of RAC reg. Extension giving specific reason:
(the RAC should clearly state the reason for grant of extension and the duration of extension required upto a maximum period of one year from the due date)

Signatures of the Members of the RAC

Performa of the minutes of meeting of RAC for Pre-thesis submission seminar

- (i) Name of Ph.D. Scholar :
- (ii) Registration Number & date:
- (iii) Date of meeting:
- (iv) Topic:
- (v) Institute's name:
- (vi) Discipline
(as per clause 3.3 of the Ph.D. ordinance)
- (vii) Chairman's Name:
- (viii) Expert member's names:
 - (1)
 - (2)
 - (3)
 - (4)
- (ix) Supervisor's name:
- (x) Co-Supervisor's name:
- (xi) Head of Division (Member Secretary):
- (xii) Suggestions (in detail must be given)/Recommendation of RAC:

Signatures of the Members of the RAC

**FOREST RESEARCH INSTITUTE UNIVERSITY
DEHRA DUN**

This is to certify that Mr./Ms./Mrs.
.....enrolment no..... carried out
research work under Dr..... of (Name of the Center)
..... . The topic of the research
registered with FRI University was
..... The scholar presented his/her work in the
pre-thesis submission seminar held on and the RAC found the
work to be satisfactory and approves the work to be presented in the form of
thesis for evaluation by examiners for “Award of Ph.D. Degree” by FRI
University.

Supervisor

Head of Division

Expert Member
Member

Expert Member

Expert

Chairman RAC

Syllabus for Basic Forestry Course

1. Overview of Forestry in India

History of management and development of system of management of forest in recent years. Historical evolution of forest policy; Tangible/Intangible benefits, forestry resources.

Lecture session – 2

2. Forest Ecology

Basic principles and concept of forest ecology, Major abiotic and biotic components, food webs, ecological pyramids and energy flow, ecological successions, forest community concepts; Forest types in India, Conservation of forest ecosystems.

Lecture session – 5

3. Systematic Forest Botany and Ethnobotany

Importance of Systematic botany in forestry; concept of species, genus; dendrological approach on classification of forest species; herbarium, arboretum; Ethno botany of forest flora of economic importance; plant nomenclature; Identification of species.

Lecture session – 5

4. Forest Biotechnology

Aims and objectives of Tissue Culture for genetic improvement through clonal propagation, production of in vitro variability, transgenics, somaclonal variation, genetic fusion of cells.

Lecture session – 6

5. Soil Science & Soil Conservation

Forests Soils, classification, factors affecting soil formation; physical, chemical and biological properties. Soil reaction - soil pH and its relation to nutrient availability.

Soil conservation - definition, causes for erosion; types - wind and water erosion; conservation and management of eroded soils/areas, wind breaks, shelter belts; Role of forests in conserving soils.

Lecture session – 5

6. Forest Hydrology & Watershed Management

Introduction, Hydrological cycle, Rainfall-runoff process, Interception, forest & water, run-off, water holding capacity of soils, free water, field capacity, capillary water, hygroscopic water, ground water.

Watershed Management – approach and concepts of watershed; watershed management, its objectives;

Lecture session – 4

7. Silvicultural Practices

Definition of silvics and silviculture, Study of locality factors like climatic, edaphic, Forest regeneration, natural and artificial regeneration of forests, (plantation forests) and mixed regeneration; methods of propagation, grafting techniques; site factors; nursery and planting techniques-nursery beds, polybags and maintenance, water

budgeting, grading and hardening of seedlings, pruning and lopping. Thinning- thinning of irregular corps, increments felling, improvement felling.

Silvicultural system - definition, classification and detailed study of the following systems: Clear felling system; uniform system; the group system; coppice with standard system;

Lecture session – 5

8. Forest Management, Forest Mensuration and Remote Sensing

Forest Management - Objective and principles; techniques; management of forest plantations.

Forest Mensuration and Remote Sensing: Introduction - definition, objectives and scope. Measurement of single tree - object, place of measurement, Methods of measuring - diameter, girth, height, crown and volume of trees; form-factor; volume estimation of stand, current annual increment; Forest cover monitoring through remote sensing; Geographic Information Systems for management and modeling.

Lecture session – 5

9. Forest Protection and Forest Economics

Agencies causing forest damage viz. man, fire, cattle, wildlife, insects and pathogens nature of their damages, cause, prevention, remedial measures and benefits. General forest protection against fire, equipment and methods, controlled use of fire. Grazing regulations; effect of wild animals on forest regeneration.

Forest economics: – fundamental principles, cost-benefit analyses; estimation of demand and supply; Socio-economic analyses of forest productivity and attitudes; valuation of forest goods and service. Basic knowledge of forest pathology and forest entomology – definition, scope and damage.

Lecture session – 6

10. Wood Technology

Anatomical structure of wood, defects and abnormalities of wood, timber identification - general principles. Different types of Wood seasoning and preservation; Pulp-paper and rayon; Wood substitution.

Lecture session – 4

11. Non-Wood Forest Products

i. NWFP – Definition, Importance, Diversity / Types, their distribution, Role in rural livelihood and industry, present utilization and future scope

Lecture session – 3

ii. Introduction about natural products chemistry; General procedures for isolation of extractives, and other secondary metabolites from wood and NWFP; Value addition chemical from forest plants.

Lecture session – 4

12. Biodiversity and Environmental Conservation:

Forest Biodiversity, its protection, components and principles of conservation, Climate Change, Clean development Mechanism, Carbon Trading, Pollution types, global warming, green house effects, ozone layer depletion, Forest and environment impact assessment and control measures. National conservation strategies. I.F.A. Overview on national strategies and international conventions related to forest conservation and management (CBD, UNFCCC, NBA, CITES etc.)

Lecture session – 6

13. Forest Genetics and Tree Improvement

Forest Genetics and its applications. Concept of tree improvement, methods and techniques. Variation and its use, provenance trials. Quality seed production through seed production area and seed orchards. Establishment and management of seed orchards. Genetic testing through progeny tests. Selection and breeding for resistance to diseases, insects, and adverse environment; the genetic base, forest genetic resources and gene conservation in situ and ex-situ. Essentials of seed testing, seed quality evaluation, seed dormancy, seed storage, seed classification and seed certification.

Lecture session – 6

14. Extension Forestry

Extension Education - meaning, definition, objectives, principles, and characteristics. Extension programmes of ICFRE. Major elements involved in forest extension

Lecture session – 2

15. Agroforestry

Agroforestry - scope and necessity; Agro forestry systems under different agro-ecological zones

Lecture session – 2

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Syllabus for Computer application Course

Course Schedule	
Fundamentals	Fundamentals (Theory), Fundamentals (Discussion / Practical)
Windows XP	Introduction / Desktop / Start menu, Windows XP (Task bar / Control Panel / Search Command), Windows Explorer – Files / Folders / Shortcuts Windows XP Workshop, System Tools / Add Remove / System Restore, Open Discussion / Practical Test, Internet / Email, About virus and its protection (Open Discussion / Practical Test)
MS Word	Introducing – Word Application Window / Toolbars / Menu bars / Horizontal ruler, The Status Bar / Creating a WORD document / To start a new paragraph / Saving a document, Moving and Scrolling through a document / Selecting Text & Graphics / Making selection using mouse / Correcting & Deleting, Moving & Copying Text and Graphics / Formatting Text Characters / Inserting Symbols, Formatting paragraphs / Page setup / Inserting page numbers, Previewing a document before printing / Printing a document / Auto correct, working with tables / Working with images, Mail merge, Open Discussion/ Practical Test
MS Excel	Starting Excel / The Excel screen elements, Creating workbook / Worksheet / Entering Data, Moving the active cell pointer / Editing data, Working with date / time, Formatting data, cells, rows and columns, Previewing / Printing the worksheets, Working with formulas, Working with functions, Working with charts, Open Discussion/ Practical Test
MS Power Point	Creating basis presentation using the auto-content wizard / Power point environment / Creating a presentation using a template / saving a document for the first time, Inserting a new slide / Editing the layout template / Inserting text / Editing Text, Using a blank presentation / Creating a slide master, Inserting a chart / Creating tables / Organizational charts, The drawing tool bar, Animating text and objects on a slide, Updating a presentation / Opening a presentation / Printing a presentation/ Printing slides as needed / Running a presentation, Open Discussion/ Practical Test
Adobe Page Maker	Page Maker's Introduction/ Palettes/ Creating & Opening Publications/ Publication from Templates/ Naming & Saving Publications/ Closing Publications/ Printing Publications/ Page Maker's Introduction/ Creating Text objects/ Text frames & blocks/ Text flow/ Jump lines/ Formatting text/ Guides/Drawing objects & Graphics/Grouping & Ungrouping/ Adding colours/Cropping

	Graphics/ Arranging text & graphics/ Non- printing objects/ Layers/ Format characters/ Control character spacing/ Format paragraphs
Adobe Photoshop	Basic file types/Photoshop's introduction/ Selection techniques/ Other tools/ Create layers/ Modify layers/ Using type layers/ Add layer effects/ Models /Image modes/ Image canvas sizes

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Syllabus for Statistical Data Analysis and Research Methodology

1. Basic Statistics (Compulsory)

Graphical data analysis, Central tendency and dispersion, Skewness and Kurtosis, Correlation and Regression. Concept of probability and probability distributions, important distributions – Binomial, Poisson and Normal.

2. Estimation and testing of hypotheses (Compulsory)

Estimating means and variances, Errors in testing a hypothesis, t, F, z and chi-square tests, Non-parametric tests and their uses, Analysis of variance (One way and two way models)

3. Basic designs of experiments (Compulsory)

Principles of designing experiments, Completely Randomized Design, Randomized block design, Latin square design, Factorial experiments, Confounding.

4. Advance design of experiments (Elective) (Directed towards field experiments and complex lab experiments in chemistry, tissue culture, etc.)

Row- column designs, Lattice designs, Balanced incomplete block designs, Partially balanced incomplete block designs, Designs for obtaining optimal solutions, Response surfaces, Orthogonal Arrays.

5. Basic sampling techniques (Compulsory)

Sample versus complete enumeration, Properties of a sample, simple random sampling, stratified random sampling, systematic sampling, Point (variable plot) sampling.

6. Advance sampling techniques (Elective) (Directed towards ecological and environmental studies)

Two-stage and multi-stage sampling, Double sampling plots.

7. Multivariate analysis (Compulsory)

Multivariate analysis of variance, Factor analysis, Principal components, Analysis, Cluster analysis, Multiple regression

8. Analysis of time series (Elective)

Time series, decomposition of time series into various components, Moving averages, ARIMA and Box-Jenkins model, Auto-correlation and regression, Correlogram and periodogram.

9. Statistical quality control (Elective) (Directed towards industrial applications of wood science)

Concepts of SQC, Product & process control, Acceptance sampling plans, Dodge and Roaming sampling plans, Control charts, Single and Double sampling plans, sequential sampling plans, Operating characteristics, Sequential probability ratio test.

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