



SMU SIKKIM
MANIPAL
UNIVERSITY

Established under Govt. of Sikkim, Act 9 of 1995, recognized under 2(f) of the UGC Act, 1956

REGULATIONS FOR RESEARCH PROGRAMME LEADING TO AWARD OF PHD DEGREE

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Contents

| | |
|---|----|
| 1. Introduction | 1 |
| 2. Designation of the Degree | 5 |
| 3. Eligibility for Admission | 5 |
| 4. Types of Candidates for Research | 6 |
| 4.1. Full-Time Research Scholars: | 6 |
| 4.2. Part-Time Research Scholars: | 6 |
| 4.2.1. Part-Time Internal Scholars: | 6 |
| 4.2.2. Part-Time External Scholars:..... | 7 |
| 5. Registration for the Ph.D. Programme: | 7 |
| 5.1. Ph.D. Entrance Examination | 7 |
| 5.2 Course Work and Its Evaluation | 8 |
| 5.3 Research Programme Utilizing Facilities Outside SMU | 9 |
| 5.4 Research Scholars Under Research Grants | 10 |
| 5.5 Change of Research Title..... | 10 |
| 5.6 Fees..... | 10 |
| 5.7 Cancellation of Registration | 11 |
| 5.8 Eligibility Criteria for Supervisors and Co-Supervisors | 12 |
| 6 Research Committees | 13 |
| 6.1 Department Level Committees | 13 |
| 6.2 Institute Level Committee | 14 |
| 6.3 University Level Committee (URC) | 14 |
| 6.4 Department – Research Progress Committee (D-RPC) | 15 |
| 7 Progress of Research Work | 15 |
| 8 Duration of the Course | 16 |
| 9 Pre Submission of Thesis at Department Level | 16 |
| 10 Thesis Submission and Evaluation at Institute Level | 17 |
| 11. Open Defense of the Thesis/Viva-Voce Examination | 20 |
| 12. Award of the Degree | 21 |
| 13. Conclusion | 21 |
| Fees Structure for PhD Programme | 23 |
| FORMAT FOR RESEARCH PROPOSAL | 24 |

| | |
|---|-----------|
| FORWARDING NOTE FOR SYNOPSIS OF PhD THESIS..... | 27 |
| FORMAT FOR SUBMISSION OF PRE -SYNOPSIS /SYNOPSIS | 28 |
| Format for Submission of Thesis | 31 |
| 1. Thesis and Project Report Arrangement..... | 31 |
| 2. Layout..... | 33 |
| 3. Style and Form | 34 |
| Important Instructions..... | 52 |
| Application Form..... | 53 |

SIKKIM MANIPAL UNIVERSITY
Regulations for Research Programme Leading to Award of
Ph.D. Degree

1. Introduction

SIKKIM MANIPAL UNIVERSITY (SMU) has established itself as one of the prominent Universities in the entire North – East region of the country in its academic and research pursuit. SMU started offering Ph.D. programme in 2001. SMU follows the minimum guidelines for Ph.D. programmes prescribed by University Grants Commission (UGC) prescribed time to time and has adopted best practices of Ph.D. from leading universities and IITs to produce quality Ph.D. Presently, SMU hosts Ph.D. programmes in varied fields covering medical, clinical, technology, sciences, humanities and social sciences.

All procedures and modalities pertaining to SMU Ph.D. programme has been documented as **“SMU Regulations for Research Programme Leading to Award of Ph.D. Degree - 2016”** and is approved by the University Research Committee (URC) and the Academic Senate. These regulations will be effective from 03 September 2016.

Research Programme at the University will be controlled by the Vice Chancellor through the following committees:

- a) University Research Committee.
- b) Research Protocol Evaluation Committee (RPEC) at each Department (D-RPEC) /Constituent College (I-RPEC).
- c) A Department Research Progress Committee (D-RPC) for each research candidate.
- d) A Board for Examination for Ph.D. (Defense Committee) for each candidate.

This University will usually conduct Ph.D. entrance examination once a year.

A summary of the registration process, research work and award of Ph.D. degree is presented in the table below and the details follow thereafter.

**Summary of the Process of Registration, Research Work
and Submission & Approval of Thesis for
Award of Doctor of Philosophy**

Before Registration

- Respond to University notification given in website /newspaper regarding Ph.D. entrance examination, number of seats available etc.,
- Submission of Application to Registrar, SMU/ Head of Institute.
- Clear Ph.D. entrance examination.
- Interview cum / Presentation of Protocol to Department; D-RPEC (screening of candidates based on number of seats).
- Modification of Protocol as per D-RPEC recommendations.
- Presentation of Protocol to Institute; I-RPEC.
- Modification of Protocol as per I-RPEC recommendations.
- Presentation of Protocol for IEC approval (applicable to Medical & Biological research).
- Submissions of I-RPEC recommendations along with IEC recommendation (applicable to Medical and Biological Research) to the Registrar, SMU for registration.

After Confirmation of Registration

- Completion of course work within one year from the date of registration.
- Ph.D. Research Work at designated Department/Institute/Approved Research Centre.
- Present Progress Seminar to Department – Research Progress Committee (D-RPC) once every semester (every six months). *Missing of two consecutive progress presentation during the entire period of research by the candidate will lead to termination of the registration.*
- Recommendation by D-RPC regarding continuation, mid-course correction or discontinuation depending on progress and quality of work after every six monthly progress presentation.

- In case the D-RPC at any stage, during the research, work feels that the candidate is not making sufficient progress or is not likely to complete his Ph.D. for any reason, the D-RPC, in consultation with the Supervisor, may recommend discontinuation of research work and cancellation of registration of the candidate.
- Candidate must publish adequate research papers in peer reviewed journals with a minimum of two publications with at least one paper (mandatory) in SCI/SSCI journal and the other in SCOPUS for Engineering, Humanities & Management scholars and minimum of 2 publications with at least one publication(mandatory) in PubMed/ Index Medicos, and one in Index Copernicus/SCOPUS for medical scholars.

After Completion of Research Work

- After completion of sufficient research work and specified minimum period after registration, if satisfied, D-RPC recommends writing of Pre Submission of Thesis by the candidate.
- Presentation of Pre Submission of Thesis to D-RPEC.
- D-RPEC may recommend further work if not satisfied or may recommend pre submission presentation to I-RPEC, if satisfied. Recommendation of I-RPEC will also be sent to Registrar.
- On approval by I-RPEC, the candidate will write the thesis and submit six spiral bound copies duly signed by the Supervisor, to Registrar, SMU within six months from the convening date of I-RPEC. A short report summarizing the contribution and the outcome of the research needs to be submitted one month before the thesis submission.

After Submission of Thesis at SMU

- Registrar sends the research summary to three reviewers approved by Vice Chancellor, for their consent to review the thesis of the candidate. One of the reviewers will usually be from a foreign university.
- On receiving consent of the reviewers, Registrar sends the thesis to the reviewers for review, requesting them to review the thesis and send their comments, in the prescribed format, within 45 days. *Polite reminders will be sent to the reviewers every*

15 days after expiry of 45 days till they send the reviews. In case a reviewer fails to send the review within six months, Vice Chancellor may approve another reviewer and ask the Registrar to send the thesis for review.

- On receipt of reviews from two reviewers (one Indian & one Foreign), and if both the reviewers have recommended the thesis for award of Ph.D., the Vice Chancellor will ask the Controller of Examinations to organize Defense of the thesis. The Committee for Defense will comprise members of I-RPEC, University Research Committee and minimum one external examiner who will normally be one of the reviewers.
- In case of non-recommendation or recommendation for additional work/major modifications to the thesis, Vice Chancellor will advise the candidate and the Supervisor to do further work/modifications as the case may be, in consultation with the University Research Committee (URC), and ask the candidate to resubmit the thesis after complying with the instructions.
- In case the reviews suggest cancellation of registration of the candidate for poor quality research work or unacceptable practices such as plagiarisation, Vice Chancellor may, in consultation with University Research Committee (URC) and after giving due chance to the candidate to present his/her case, order cancellation of registration of the candidate.

On successful Defense of Thesis

- On successfully defending the thesis and recommendation of the Defense Committee, the candidate will be eligible for award of Degree of Doctor of Philosophy (Ph.D.) on the day of Defense. On receiving the recommendation of the Defense Committee, and a No Dues Certificate regarding clearance of all dues to the University, Registrar will issue a provisional certificate to the effect that the candidate has successfully defended his thesis and has been declared eligible for the award of Ph.D. Degree. The provisional certificate will also state that the certificate has been issued in accordance with the provisions of UGC Regulations for Award of M.Phil. /Ph.D. – 2016. The academic Senate will ratify the Ph.D. Degree.
- The candidate will be awarded the Ph.D. Degree during the next convocation.

2. Designation of the Degree

The Ph.D. degree shall be designated as Doctor of Philosophy of Sikkim Manipal University.

3. Eligibility for Admission

A candidate seeking admission to the Ph.D. Programme of SMU should:

- a) Have a Master's degree of this University or its equivalent of another recognized University or Institute with a minimum of 55% marks. The degree should be relevant to the department to which he/she applied for PhD. In case of candidates holding a qualifying degree from Foreign Universities, registration for the Ph.D. will be confirmed after determination of equivalence by the relevant University body.
- b) A relaxation of 5% of marks, from 55% to 50%, or an equivalent relaxation of grade, may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-Abled and other categories of candidates as per the direction of the UGC from time to time, or for those who had obtained their Master's degree prior to 19th September, 1991. The eligibility marks of 55% (or an equivalent grade in a point scale wherever grading system is followed) and the relaxation of 5% to the categories mentioned above are permissible based only on the qualifying marks without including the grace mark procedures.
- c) In exceptional cases, a candidate with B.Tech./B.E./M.B.B.S degree having high first class with relevant experience commensurate to his proposed research and experience equivalent to a post graduate degree in the relevant field may be considered for registration on the special recommendation of the University Research Committee (URC). Such candidates will be required to complete higher number of credits (24 to 36 credits) as course work compared to 10 to 12 credits for those with postgraduate qualifications.
- d) Clearing of entrance test is only one of the pre requisite for admission.
- e) Should be recommended by the Department / Institute Research Protocol Evaluation Committee (D/I-RPEC) based on presentation of proposed Research Protocol and number of seats available.

- f) Foreign students will be required to produce clearance from the Government of India/relevant authorities, for being considered eligible and are holding research visa.
- g) Number of Ph.D. registrations in the University at any given time will not be more than eight times the number of registered supervisors in the University. The vacancy of the research scholars will be worked out and notified through advertisement by the University.
- h) The eligibility criteria prescribed in this section are the absolute minimum.

4. Types of Candidates for Research

4.1. Full-Time Research Scholars:

Scholars admitted in this category shall not be a registered scholar in any other academic program in India or abroad. The unemployed scholars shall be eligible for financial assistance in the form of *Teaching Assistantship* or *Research Assistantship* as per norms of the University, or Scholarship or Fellowship as per norms of the funding agency, *e.g.*, UGC, CSIR, DBT, NBHM and DST-INSPIRE. An employee of any organization can also join as full-time research scholar provided he has been sanctioned minimum two years study leave by his parent organization. Such candidate will not be eligible for teaching/ research assistantship.

4.2. Part-Time Research Scholars:

Scholars admitted in this category shall be a full-time employee of a recognized Institute, University or Organization. The scholar shall not be eligible for any financial support, and needs to get her/his application forwarded by her/his employer. The scholar shall complete the minimum course and residential requirements at SMU. She/he can undertake research at a location other than the University or its constituent units. These scholars are further categorized as:

4.2.1. Part-Time Internal Scholars:

Applicable to working faculty members in any of the constituent colleges/departments of SMU.

4.2.2. Part-Time External Scholars:

Who will register with the University should complete the mandatory residential and credit requirement completion within one year. They may then be permitted to continue their research work at their place of work, if approved, as a research institute by the University. They will make a presentation to the Department – Research Progress Committee (D-RPC) at Constituent Institute(s) through which they have registered, on the progress of their research work once every six months.

5. Registration for the Ph.D. Programme:

5.1. Ph.D. Entrance Examination

- 5.1.1 Applications will be submitted in prescribed format along with the required documents and shall state the subject or inter-disciplinary field in which the candidate desires to pursue his research work and the University Department / Constituent Institute where the research work will be carried out.
- 5.1.2 An entrance test shall have qualifying marks as 50%. The Syllabus of the Entrance Test shall consist of 50% of research methodology and 50% shall be subject specific.
- 5.1.3 Post the publication of entrance result, successful candidates will be called for interview/presentation of their proposed research work before Department-Research Protocol Evaluation Committee (D-RPEC).
- 5.1.4 The above candidates will submit six copies of the Ph.D. protocol (Approach Paper) covering the broad areas of interest, motivation for research in the selected area brief display of knowledge gained and work done in the area, statement of research problem, objectives and methodology of the proposed research. The Protocol shall ordinarily not exceed 5000 words.
- 5.1.5 Department Research Protocol Evaluation Committee (D-RPEC) will conduct interview/presentation based on availability of seats to consider the following aspects, viz, whether:
 - 5.1.5.1 The candidate possesses the competence for the proposed research.

5.1.5.2 The research work can be suitably undertaken at the institution/college

5.1.5.3 The proposed area of the research can contribute to new/additional knowledge.

The selected candidates may be directed to modify their proposal by D-RPEC and recommended for final presentation for registration before Institute Research Protocol Evaluation Committee (I-RPEC). In consultation with the proposed supervisors, the D-RPEC also suggests the credit requirements /course work to be undertaken by the candidates. Institute to issue temporary admission number. Candidate who were not considered may repeat next entrance examination and face the selection process again.

5.1.6 Institute Research Protocol Evaluation Committee (I-RPEC) approves the provisional confirmation of registration of candidates after satisfactory research protocol presentation. IRPEC also approves the credit requirements and ratifies / suggests modification in the course work.

5.1.7 I-RPEC will forward the details of candidates along with IEC recommendation (applicable to Medical and Biological Research) to be registered for Ph.D. as per format with curriculum vitae of supervisors (in case he/she is not registered with SMU).

5.1.8 University will issue registration number after completion of necessary formalities by the candidates.

5.2 Course Work and Its Evaluation

5.2.1 On registration for Ph.D., all candidates will be required to undertake course work as part of the programme. The credits requirement and duration of course work will be as under:

5.2.1.1 Candidates with post graduate degree: 10 to 12 credits as specified by the D – RPEC/ I-RPEC.

5.2.1.2 Candidates with under graduate degree: 24 to 36 credits as specified by the D – RPEC/I-RPEC. *Date of registration for these candidates will be the date on which they complete the course work credit requirement.*

5.2.1.3 Research Methodology will be the compulsory credit course for all candidates.

- 5.2.1.4 The other subjects to be undertaken by the candidate to satisfy the course work requirement will be decided by the D – RPEC/ I-RPEC in consultation with the Research Supervisor(s) / Co-Supervisor(s). The course work may include courses and seminars (*seminar should not more than one*). The course work syllabi must be duly approved by respective Board of Studies (BoS).
- 5.2.2 All candidates will be required to complete the specified number of credits for Ph.D. within one year from the date of registration.
- 5.2.3 Part-Time candidates shall produce the No Objection Certificate (NOC) from the parent institute / organization for their residential requirement to complete credit course at SMU and its constituent institutes.
- 5.2.4 Candidates must register for course work examination in the Examination Section and post payment of requisite fee, the hall ticket shall be issued to them.
- 5.2.5 Evaluation of course work shall be done by the D – RPC and the supervisor(s) concerned. Marks / grades so obtained to be duly forwarded to the Examination Section of respective institute for the issuance of course completion certificate.
- 5.2.6 The candidates with post graduate qualification should complete their course work of 10 -12 credits within one year of registration. They should score a minimum GPA of 6.00 (or 60% marks in aggregate where percentage system is used) to make them eligible to continue their research work. Candidates with under graduate qualification must complete 24 - 36 credits of course work within first two years of registration. They should score a minimum GPA of 6.00 (or 60% marks in aggregate where percentage system is used) to make them eligible to continue their research work.
- 5.3 **Research Programme Utilizing Facilities Outside SMU**
- 5.3.1 The Programme shall be carried out in the University Department or in a constituent institute or in a Research Institutes recognized by the University for the purpose. If the research programme requires utilization of facilities outside the University, the candidate may avail of such facilities on recommendation of the supervisor and approval of the University Research Committee (URC).

5.3.2 For candidates carrying out research work in other universities/research organizations, in addition to Supervisor(s), there will be Co – Supervisor(s) from other universities/research organizations, approved by the University, who will supervise the candidate’s research work in that organization.

5.4 Research Scholars Under Research Grants

Whenever University faculty members have research grants, with provision for selecting the research scholars, the faculty members holding that grant will select the candidates who have passed UGC-CSIR(JRF)/GATE/SLET/NET or M.Phil qualified after evaluating the suitability of the candidates.

In case such candidates are not available then test and interview will be held under the arrangements of the University as in the normal cases. Rest of the procedure will be as outlined in this regulation.

5.5 Change of Research Title

5.5.1 The title of the research problem may be modified, if necessary, by the candidate on recommendation of Supervisor and approval of the University Research Committee (URC). However, such modification will not be permitted after approval of the pre submission report by D – RPEC.

5.5.2 Change of title of research topic may be permitted, provided the D – RPEC, I - RPEC and the Supervisor of the concerned candidate recommends the same. *Such changes shall be generally allowed within one year of the registration; but under no circumstances it will be allowed after approval of Pre Submission presentation by the D - RPEC. However, a minor change of title may be permitted any time during the tenure of research.*

5.6 Fees

5.6.1 The candidates will pay the following fees:

5.6.1.1 Non-refundable Registration fee along with the application.

5.6.1.2 Annual fees including laboratory fees for the first year will be paid on the date of registration and subsequently in the same month as that of registration every year

till submission of the thesis. *Laboratory fees may not be paid by the candidates whose research work does not involve experimental work involving use of laboratory facilities.* The Supervisor will intimate the same to the Finance Section through the Heads of the respective institutes for the waiver of laboratory fees.

5.6.1.3 Examination fee at the time of appearing for course work examination.

5.6.1.4 Examination fee during submission of thesis. The student will obtain no dues certificate and clearances before payment of examination fee.

5.6.2 During every Ph.D. progress presentation, candidates must enclose the fee payment details of the current year along with the Ph.D. progress report.

NOTE: The quantum of fees will be decided by the University from time to time.

5.7 Cancellation of Registration

5.7.1 Registration may be cancelled on the recommendation of the D- RPC, based on the lack of progress, or if requested by the Supervisor and after giving due opportunity to the candidate for defending his/her case. The candidate on his part will be allowed to withdraw if he/she so desires. *Such a candidate will not get any benefit of earlier registration if he/she joins for Ph.D. again.*

5.7.2 Registration may be cancelled for candidates missing more than two consecutive progress presentations during the entire period of research.

5.7.3 Registration may be cancelled if the candidate fails to submit the research protocol / thesis within the maximum stipulated period.

| | |
|--|---|
| Submission of modified research protocol to Office concerned | Within one month of convening of I-RPEC |
| Submission of thesis to the Office concerned. | Within six months of convening of Pre Submission Presentation |

5.7.4 *Recommendations of D-RPC on para 5.7.2 and 5.7.3 above for considerations is subject to approval of Chairman, I-RPEC further to be ratified by Chairman, URC.*

5.8 Eligibility Criteria for Supervisors and Co-Supervisors

5.8.1 The Supervisor should be a full-time faculty member on the payroll of SMU and have a Ph.D. from a recognized University/Institute and should possess preferably two years post-doctoral experience. For Medical Allied Health Sciences, 5 years teaching experience after Post Graduation/Ph.D. from a recognized University/College.

Post-Doctoral Publications (Desirable):

| | |
|---|----------------|
| Professors | 5 Publications |
| Associate Professor / Assistant Professor | 2 Publications |

University Research Committee (URC) *may relax the post-doctoral publications in the field where there is limited publications work available.*

5.8.2 Preferably the co-supervisor should possess Ph.D.. However co-supervisor may also be eligible with degree from a recognized University/Institute or post graduate with adequate experience/academic work comparable to Ph.D. For Medical Allied Health Sciences 3 years teaching experience after Post Graduation/Ph.D. from a recognized University/College.

5.8.3 Each candidate will have a research supervisor and may have one or more co-supervisors, especially for research problems of inter-disciplinary nature. Only those candidates who meet the laid down criteria for Ph.D. supervisors and are registered with the University as Supervisors will be allowed to guide Ph.D. work. In special cases, on recommendation of R-PEC, eminent scholars working in other universities/research organizations may apply for registration as co-supervisors. However, such co-supervisors need to submit a No Objection Certificate from their employers.

5.8.4 The Academic Senate will also approve the appointment of Supervisor / Co-Supervisor while approving the research proposals.

5.8.5 The criteria for appointment of Supervisors laid down in 5.8.1 and 5.8.2 above may be relaxed by the Academic Senate in exceptional cases.

- 5.8.6 Updated lists of Supervisors and Co-Supervisors will be approved by the Academic Senate once every year and the list to be displayed in University / Institute website.
- 5.8.7 Approved supervisors shall normally not register more than two candidates in one academic year. Also the total number of Ph.D. candidates registered with a supervisor at any point of time is as shown in table below.

| | |
|---------------------|------------------------------------|
| Professor | Not more than 8 scholars at a time |
| Associate Professor | Not more than 6 scholars at a time |
| Assistant Professor | Not more than 4 scholars at a time |

- 5.8.8 The Supervisor and Co-Supervisor(s) shall not be closely related to the candidate.
- 5.8.9 In the absence of the supervisor for a prolonged period of time (more than one year), the Vice Chancellor may appoint another person as supervisor with the recommendation of the I-RPEC / URC.

6 Research Committees

6.1 Department Level Committees

- 6.1.1 Department – Research Protocol Evaluation Committee (D-RPEC): This is the research committee at the Department level where the candidates present his / her research protocol. *This committee is common for all prospective Ph.D. candidates of the concerned department.* The **Head** of the Department will be the Chairman / Chairperson of the D-RPEC. Other members of D-RPEC include a minimum of five senior faculty members of the Department, two external members from other Department, Coordinator, Research / Dean (R&D) as permanent member. The proposed Supervisor / Co-Supervisor(s) will also attend the D-RPEC meeting.
- 6.1.2 D-RPEC may or provisionally confirm the selection of the candidate for Ph.D. programme post satisfactory presentation/interview. This committee may also recommend modifications in the proposed protocol.
- 6.1.3 Chairman / Chairperson, D-RPEC forwards the details of the candidates along with the recommended research protocol to Office of the Research & Development of the respective institutes.

6.1.4 The same committee assesses the pre submission of thesis of the candidate recommended by the Department Research Progress Committee (DRPC).

6.2 Institute Level Committee

6.2.1 Institute – Research Protocol Evaluation Committee (I-RPEC): This is the committee where the candidate presents his / her final proposed research protocol. Its constitution is Head of the Institute as Chairman / Chairperson, I – RPEC, Research Coordinator / Dean (R&D) as Member Secretary, five senior faculty members of the Institute, Deputy Controller of Examination and Chairman / Chairperson D-RPEC. Supervisor(s) / Co-Supervisor(s) of the candidates and an eminent external expert (optional) will be invitees.

6.2.2 I – RPEC provisionally approves the confirmation of registration of candidate after satisfactory research protocol presentation. It also ratifies the credit requirements and the associated course work. This committee may also seek modification / reject the research protocol. *Candidate must submit the modified research protocol duly approved by the Supervisor and Chairman / Chairperson, D-RPEC within one month of convening of I – RPEC.*

6.2.3 I – RPEC further recommends the registration of candidate for ratification by the University Research Committee (URC).

6.2.4 External expert may be invited during I-RPEC meetings (at the time of research protocol presentation and also at the time of pre submission of thesis by the candidates).

6.3 University Level Committee (URC)

6.3.1 The Programme shall be monitored by the Academic Senate with the help of the **University Research Committee (URC)** headed by the Vice Chancellor. The Registrar, SMU will be the Member Secretary of URC.

6.3.2 URC will ratify the registration of scholars, approval of supervisor /co-supervisor, decide cancellation / extension of registration and make policies for Ph.D. regulations from time to time.

6.4 Department – Research Progress Committee (D-RPC)

- 6.4.1 This committee assesses the six monthly progress of each candidate after registration. The committee is **candidate specific**. It comprises of Head of the Department as Chairman / Chairperson, minimum five senior faculty of the Department as members, one external expert (candidate specific) from other Department, Coordinator, Research / Dean (R&D) as permanent member while the concerned supervisor will be the convener of D-RPC.
- 6.4.2 This committee may recommend the continuation or otherwise of the registration in respect of that research scholar. At the end of each semester the research scholar will submit a progress report in the specified format for evaluation by the D-RPC. The candidate will also make a presentation to the D-RPC after submitting the progress report.
- 6.4.3 Missing of two consecutive progress presentation to D-RPC during the entire research period by the candidate will lead to cancellation of registration.
- 6.4.4 With sufficient progress and meeting of required criteria, D-RPC recommends pre submission of Ph.D. by the candidate.

7 Progress of Research Work

- 7.1 The candidates with post graduate qualification should complete their course work of 10 to 12 credits within one year of registration. They should score a min GPA of 6.00 (or 60% marks in aggregate where percentage system is used) to make them eligible to continue their research work. Candidates with under graduate qualification (refer Para 3 c) must complete 24 to 36 credits of course work within first two years of registration. They should score a min GPA of 6.00 (or 60% marks in aggregate where percentage system is used) to make them eligible to continue their research work.
- 7.2 The RPC will write a progress report after presentation of the progress seminar by the candidate every six months and submit it to Registrar, SMU.
- 7.3 Candidate should submit the progress reports every six months i.e., at the end of each semester in the specified format. The RPC will assess this progress report and recommend continuation or otherwise of research work.

7.4 The candidate will communicate adequate number of research publications to indexed international/national journals and international/national conferences .A minimum of two research publications out of which at least one should be in a SCI/SSCI journal and the other in SCOPUS for Engineering, Humanities & Management scholars. A minimum of two publications out of which one publication (mandatory) in PubMed /Index Medicos, and the other in SCOPUS/Index Copernicus for Medical scholars will be required before writing the thesis.

8 Duration of the Course

8.1 The duration of the course will be from the time of registration to submission of thesis.

8.2 The minimum period for completion of Ph.D. work and submission of thesis for full- and part-time candidates will be three years. The maximum period for completion of Ph.D. work and submission of thesis for both full-time and part-time candidates will be six years.

8.3 However, in exceptional circumstances, under the recommendations of the I - RPEC, post ratification by the URC, extension of one year may be permitted. If the thesis is not submitted within this stipulated period PhD registration of the concerned candidate will be cancelled.

8.4 A full-time candidate may convert his status from full-time to part-time after completion of two years with the approval of the University on recommendation of the Supervisor and I-RPEC.

8.5 Women and Person with disability (more than 40% disability) to be given relaxation of two years for Ph.D. in the maximum duration.

8.6 In addition, women candidates may be provided Maternity Leave / Child Care Leave once in the entire duration of Ph.D. for upto 240 days.

9 Pre Submission of Thesis at Department Level

9.1 After completion of sufficient research work and specified minimum period after registration, *if satisfied*, D-RPC will recommend for pre submission of research work by the candidate.

- 9.2 The candidate will write and submit six copies of spiral bound pre submission report in prescribed format to the Chairman / Chairperson, D-RPEC duly signed by the Supervisor and Co - Supervisor(s). Convener, D-RPEC will send one copy of pre submission report to each member of D - RPEC.
- 9.3 After allowing one to two weeks time for the D - RPEC members to go through and evaluate the report, Convener D-RPEC will convene the D-RPEC and ask the candidate to present the pre submission presentation to the D-RPEC. This presentation will be open to all faculty members and students of the Department.
- 9.4 After the presentation, D-RPEC may recommend further work, *if not satisfied* or may recommend pre submission presentation to I – RPEC, *if satisfied*.

10 Thesis Submission and Evaluation at Institute Level

- 10.1 After allowing one to two weeks' time for the I - RPEC members to evaluate the pre submission report, Convener / Dean (R&D), I-RPEC will convene the I-RPEC and direct the candidate for pre submission presentation. This presentation will be open to all faculty members, research scholars and students of the Department. Eminent external expert may also be involved wherever necessary. After the presentation, I-RPEC may recommend further work, *if not satisfied* or may recommend writing of thesis, *if satisfied*.
- 10.2 Detailed recommendation of I - RPEC along with other necessary documents, six hard copies and a soft copy of thesis will be sent to Registrar, SMU (within six months of convening of I-RPEC) by Convener, I – RPEC while a brief summary of the research work (5 to 10 pages)will be sent one month before the submission of thesis.
- 10.3 The colour to be used in Ph.D. thesis cover should be Maroon and Gold colour is to be used for lettering on the same. One soft copy of the thesis will also be submitted. The candidate may also submit in support of the thesis the contents of any work which may have been previously published by him/her, but the candidate shall not submit any work for which a degree or distinction has been earlier conferred on the candidate by this or any other university. The candidate will not, however, be

precluded from incorporating any such work in a thesis covering a wider field, provided a clear statement of the work so incorporated is given.

- 10.4 Along with the thesis a plagiarism verification certificate duly signed by the scholar and the supervisors as per the format enclosed is to be submitted.
- 10.5 Thesis will be submitted within six years but not earlier than three years from the date of registration of the candidate.
- 10.6 Candidate shall submit six spiral bound thesis initially.
- 10.7 Chairman / Chairperson, D - RPEC (in consultation with all members of D-RPEC) will submit a panel of six to ten experts who are acknowledged leaders in the field of study undertaken by the candidate to Chairman / Chairperson, I-RPEC. Thereafter, Chairman / Chairperson, I – RPEC forwards the panel of experts to the Vice Chancellor who may select two or three experts from the list for reviewing the thesis of the candidate. The experts who have been referred in the thesis for their work in the area of research may also form the basis for selection of the reviewers by the Vice Chancellor. *It shall be ensured that the reviewers are not known to the Supervisor or the Candidate so as to get unbiased adjudication of the thesis.* The names of the external reviewers will be kept confidential and shall not be communicated to the supervisor and the candidate until the reports from the examiners are received. One of the reviewer will preferable from outside the country.
- 10.8 Registrar will send the brief summary of research work duly recommended by I-RPEC to two/three reviewers selected by Vice Chancellor, for their consent to review the thesis of the candidate.
- 10.9 On receiving consent of the reviewers, Registrar will send the thesis to the reviewers requesting them to review the thesis and send their comments, in the prescribed format, within 45 days. *Polite reminders will be sent to the reviewers every 15 days after expiry of 45 days till they send the reviews. In case a reviewer fails to send the review within six months, Vice Chancellor may identify another reviewer and ask the Registrar to send the thesis for review.*
- 10.10 The reviewers shall submit a detailed report on the thesis. Their recommendations for acceptance of the thesis shall accompany a precise certificate that the candidate's

work is of a standard suitable for awarding the degree. When a thesis is unanimously and unconditionally recommended for the degree by all examiners, the candidate will be eligible for appearing at the Viva-Voce (Defense) to defend his / her thesis. At the Viva-Voce the candidate shall respond to the suggestions made by the examiners, if any, in the thesis.

- 10.11* With incorporation of modifications suggested by reviewer(s), candidate shall submit six copies of hard bound thesis.
- 10.12* If both external examiners reject the thesis, it will stand rejected and shall not be referred to any other examiner. The URC will then decide on whether the candidature of the scholar is to be cancelled or he/she is to be allowed to work on a revised topic. In case the scholar is allowed to continue his work on a revised topic, the evaluation of thesis will be done afresh.
- 10.13* In case one reviewer approves the thesis for award of Ph.D. and the other is of the opinion that the thesis is not up to the standard and is therefore rejected giving precise reasons for such rejection, Vice Chancellor will then select another reviewer and ask the Registrar to send the thesis for review by this reviewer. In case this new reviewer approves the thesis, it will be considered as approved. In case the reviewer rejects the thesis, the case will be decided as in 10.13 above.
- 10.14* If one the reviewers feels that the thesis can be accepted after a revision, he shall state the points on which revision is needed. If there is any ambiguity or conditionality in the reports of the examiners, the Vice Chancellor may consider the appointment of the third reviewer. In case this new reviewer approves the thesis, it will be considered as approved.
- 10.15* If one or more examiners recommend re-submission of the thesis after modifications, it shall be done within a maximum period of six months from the date on which the candidate is so informed by the University or within maximum period of registration, whichever is later.
- 10.16* If the report from any one of the external examiners is not received within six months, the Vice Chancellor will appoint a new examiner from amongst the approved panel of examiners and a copy of the thesis will be sent to the new examiner for review.

11. Open Defense of the Thesis/Viva-Voce Examination

- 11.1. After the reviewers have approved the thesis, a public defense of the thesis and Viva-Voce will be held by a board of examiners appointed for the purpose. Copies of reports of the reviews of the thesis shall be sent to the all members of the board of examiners conducting the Defense/Viva-Voce and also to the candidate prior to the Defense. Wide publicity will be given to the date, time and venue of Defense so that all interested faculty members and students may attend the Defense/Viva Voce Examination.
- 11.2. The board of examiners for the viva voce/defense shall consist of supervisors, Co-supervisor(s), one external examiner, one internal examiner from the RPC and one or two members from the RPEC concerned and the University Research Committee. The external examiner will generally be one of the reviewers of the thesis of the candidate.
- 11.3. The topic, date and the time of defense of thesis shall be announced by the university well in advance so that the faculty members and others interested in the topic of the thesis can be present during defense. Those attending the public defense, who are not members of board of examiners, can also participate by asking relevant questions. The board of examiners shall take into consideration the views and criticism, if any, by the faculty members and others participating in the public defense of the thesis. However only the members of the board of examiners shall decide the result of the examination.
- 11.4. The examiners of the Viva-Voce/Defense shall jointly submit a report to the Registrar on the performance of the candidate at the Defense, clearly indicating whether the candidate deserves to be admitted to the degree. If the candidate fails to satisfy the examiners at the Viva-Voce/Defense, the candidate shall be allowed by the Vice-Chancellor to Defend his thesis again after a period of three months from the date of first Defense.

Results

The candidate shall be declared eligible for the award of the degree of Doctor of Philosophy, on the recommendation of the board of examiners, after the Defense.

12. Award of the Degree

- 12.1. The Vice-Chancellor, after considering the reports on the thesis and Defense, shall recommend to the Senate the award of Degree to the candidate.
- 12.2. The candidate shall be awarded the Degree at the next convocation of the University.
- 12.3. A provisional certificate will be issued to the candidate by Registrar on successful completion of Defense. The certificate will also include words to the effect that the certificate has been issued in accordance with the provisions of UGC Regulations for Award of MPhil/Ph.D. – 2016.
- 12.4. A Ph.D. degree certificate under the seal of the University in the specified format and signed by the Vice-Chancellor, will be given to each successful candidate at the next annual convocation of the University.
- 12.5. Copies of the thesis accepted for the Degree of Doctor of Philosophy, with necessary corrections or modifications, if there be any, shall be retained in the University, College and Departmental libraries.
- 12.6. Registrar SMU will submit a soft copy of the thesis to the UGC within 30 days of successful Defense of the thesis by the candidate, for hosting the same on INFLIBNET.

13. Conclusion

The Degree of Doctor of Philosophy (Ph.D.) shall be awarded to a candidate on the basis of original research work of merit incorporated in a thesis, recommended by the board of examiners and successfully defended by the candidate during the Viva-Voce (Defense of the thesis).

The thesis shall demonstrate that the candidate has technical mastery of the chosen field of investigation and is capable of doing scholarly work. The result of research embodied in the thesis shall be a contribution to existing knowledge either by a discovery of some new facts or by a discovery of some new relation between facts

already known, or by a critical survey of facts leading to some new interpretation. The thesis will be written in English.

Fees Structure for PhD Programme

Schedule of Fee

| Sl. No | Category | Registration Fee | Annual Fee |
|--------|--------------------------|------------------|-------------|
| 1. | SMU Employees | Rs 10,000/- | Rs 20,000/- |
| 2. | Other / General Category | Rs 15,000/- | Rs 25,000/- |
| 3. | NRI / Foreign | USD 500/- | USD 1500/- |

Note:

1. Registration fee is onetime (nonrefundable) payable at the time of registration.
2. Course work examination fee of Rs 1000/- per paper.
3. In addition to the above fees, the amount of Rs.10, 000/- as the examination Fee must be remitted at the time of thesis submission.

FORMAT FOR RESEARCH PROPOSAL

1. Title/Cover page as per Annexure –I
2. Certificate from Guide /Coguide as per Annexure –II
3. Contents
4. Introduction: To include brief description of the research area selected, its significance and motivation for research in the selected area.
5. Brief review of the Literature
6. Problem definition and Scope of Research : Limitations and Delimitations
7. Research Posers /Hypothesis
8. Methodology/Design (Methods & Procedures)
 - ii. Statement of the Research Problem
 - iv. Approach (Experimental or Research survey)
 - vi. Sampling technique, size and selection
 - vii. Data collection & collation methods
 - viii. Analysis and Interpretation of data. (Specify the procedures & technique you will use)
 - ix. Anticipated results:
(Based on the related and previously conducted research in the area, what do you predict that the result of your expectations, surveys etc. will yield in terms of data and its implications to academic, industry and other organisation.
9. Year wise plan of work
10. References
11. One page bio-data of the researcher

Annexure -I

Sample Copy

**DESIGN AND IMPLEMENTATION OF EFFICIENT INFORMATION
EXTRACTION TECHNIQUES**

Research Protocol

Submitted by

R Pradhan

Under the Guidance of

Prof (Dr)M K Ghose

**Department of Computer Science and Engineering
Sikkim Manipal Institute of Technology**



SMU SIKKIM
MANIPAL
UNIVERSITY

Established under Govt. of Sikkim, Act 9 of 1995, recognized under 2(f) of the UGC Act, 1956

MONTH YEAR

Annexure -II

Particulars of Supervisor /Co-Supervisor for PhD Registration Scheme

- (1) Name of Proposed Supervisor /Co-Supervisor :
- (2) Academic Qualification :
- (3) Membership of Professional Societies of Supervisor /Co-Supervisor :
- (4) Designation of Supervisor /Co-Supervisor :

Certificate of Guide/ Co-Guide

This is to state that Mr/Ms. _____ has been selected for PhD programme in the Department of _____ under the full time/part time PhD Programme of SMU, I agree to be his/ her Supervisor /Co-Supervisor and shall extend all possible facilities to enable him/her to carry out his/her research programme towards the submission of thesis.

Date

Signature of Supervisor /Co-Supervisor

FORWARDING NOTE FOR SYNOPSIS OF PhD THESIS

| | | | |
|------|--|---|----------------------|
| 1 | NAME OF SCHOLAR | | |
| 2 | ROLL NO. | DEPARTMENT | |
| 3 | REGISTRATION DATE | | |
| 4 | TYPE OF REGISTRATION (put "√" where applicable) | EXTERNAL / SMU EMPLOYEE | PART TIME /FULL TIME |
| 5 | TITLE OF THESIS | | |
| 6 | COURSES PRESCRIBED & COMPLETED: (Continue on reverse if necessary) | | |
| S.NO | COURSE .NO | COURSE TITLE | GRADE |
| a) | | | |
| b) | | | |
| 7 | RESIDENTIAL PERIOD COMPLETED.(Ext. Research scholars) | | |
| 8 | PROGRESS REPORT SEMINARS (Date) | REMARKS OF RPC | |
| DATE | | | |
| a) | | | |
| b) | | | |
| 9 | Details of Publications | Minimum 2(two) publications in peer reviewed international journals * | |
| a) | | | |
| b) | | | |
| c) | | | |
| 10 | <p>CERTIFICATE BY GUIDE:</p> <p>The Pre Synopsis Report has been seen by me. The scholar is likely to submit the thesis within one month from date.</p> <p>DATE SIGNATURE OF THE GUIDE</p> | | |
| 11 | REMARKS OF THE RPC | | FORWARDED. |
| | DATE: | | |

For Engg/Hum/Mgt. minimum of 2 publications with atleast one paper in SCI/SSCI & other in SCOPUS.

For Medical minimum of 2 publications with atleast one paper in PubMed/Index Medicos other in Index Copernicus /SCOPUS.

FORMAT FOR SUBMISSION OF PRE -SYNOPSIS /SYNOPSIS
(Approx. 20 pages)

1. Title/Cover page as per University format. (Annexure -I)
2. Certificate as per University format. (Annexure - II)
3. Introduction (Background, Description/Definition, Research propositions, Motivation for research, Organisation of thesis to highlight chapters of the thesis)
4. Literature survey **(Short)**

(Including summary of each of past works, **the research gap/limitation of past works** and proposed improvements)
5. Objectives (Limitations & Delimitations, research posers, propositions and research hypotheses)
6. Methodology/Experimental setup (flow char may be given)
7. Significant Contributions
8. References **(Short)**
9. Appendices/Annexures **(if required)**
10. List of Publications from Research

Annexure -I

SYNOPSIS OF

**STUDY ON THE PROCESS PARAMETERS OF NON-TRADITIONAL MACHINING
TECHNIQUES FOR THE DEVELOPMENT OF AN EXPERT SYSTEM**

A THESIS

MANISH KUMAR ROY

DEPARTMENT OF MECHANICAL ENGINEERING.
SIKKIM MANIPAL INSTITUTE OF TECHNOLOGY

to be submitted

In fulfillment of the requirements of the degree of

DOCTOR OF PHILOSOPHY

to the



SMU SIKKIM
MANIPAL
UNIVERSITY

Established under Govt. of Sikkim, Act 9 of 1995, recognized under 2(f) of the UGC Act, 1956

September 2016

Annexure -II

CERTIFICATE

This is to certify that the thesis titled **“TITLE OF YOUR THESIS”** being submitted by **“NAME OF THE RESEARCH SCHOLAR”** to the Sikkim Manipal University, for the award of degree of Doctor of Philosophy is a bonafide record of original research work carried out by him. He has worked under my/our guidance and supervision and has fulfilled the requirement for the submission of this thesis, which has reached the required standard.

The results contained in this thesis have not been submitted, in part or full, to any other university or Institute for the award of any degree or diploma.

Supervisor (s)

Format for Submission of Thesis

1. Thesis and Project Report Arrangement

Assemble the thesis/project report in this order:

1. Title/Cover page as per University format. (Annexure –I)
2. Inside Cover Page
Front side: Same as cover page
Reverse Side: Copyright on left side of reverse inside cover page
© Sikkim Manipal University, Sikkim- 20.....
All rights reserved.
3. Dedication
This should not exceed one page
4. Certificate
should be exactly as shown in (Annexure –II)
5. Acknowledgement(optional)
should not exceed two pages (Annexure –III)
6. Plagiarism Verification Certificate
(Annexure –IV)
7. Abstract
a concise summary of the essential information of the work being presented, namely scope of study, purpose and results. The reference-free single spaced abstract should not exceed two pages (Annexure – V)
8. Table of contents
includes all the subsections of each chapter and the list of appendices and annexures (if applicable) and page numbers (Annexure – VI)
9. List of figures
figure numbers to be represented by chapter

concerned. For example if there are three figures in chapter 2, they will be numbered sequentially as 2.1, 2.2 and 2.3.

| | |
|--|--|
| 10. List of Tables | Similar to numbering of figure as explained above (Annexure – VII). |
| 11. List of Appendices | |
| 12. Abbreviations Page | lists all the abbreviations used in the text alongside their fully written unabbreviated form in alphabetical order (Annexure – VIII). |
| 13. Notations | The research scholar must explain the meaning of special symbols and notation used in the thesis, Define English, Greek, & Miscellaneous Symbol separately (Annexure – IX) |
| 14. Chapters | Thesis text; Introduction, Literature survey, methodology, conclusion. The layout is described in the next section (Annexure – X). |
| 15. Appendices | |
| 16. References | (Annexure – XI) |
| 17. List of Papers Submitted on the Basis of this Thesis | (Annexure – XII) |
| 18. Brief Bio-data of Researcher | One page |

2. Layout

The following presents a framework for a thesis. The information is offered as a general guideline. Students should always consult their advisor for additional guidelines. In particular, the layout of project reports can be different depending on the type and scope of the project. Note that each chapter should start on a new page.

2.1 *Introduction*: background; statement of the problem; definition of terms; purpose of the study; theoretical basis; contributions of the study; organization of the remainder of the study (chapter number, title and in short what it deals with).

2.2 - *Literature Review*: chronological, categorical or related theoretical viewpoints related to topic.

2.3 - *Proposed Solution/Methodology*: research design or approach (quantitative, qualitative or algorithmic); experimental detail or methodology, population and / or sample; collection and tabulation of data; and data analysis procedures.

2.4 - *Solution Validation, Analysis of the Data, Results, and Discussion*: presentation and discussion of the findings, including limitations.

2.5 - *Conclusions, Recommendations*: summarizes the entire research effort; addresses the initial purpose of the study (stated in the introduction); stresses the importance of the work accomplished; leaves a final impression on the reader. It can also include suggestions for further work.

2.6 - *Bibliography/References*: references should acknowledge any work done by someone other than the author. The reference should also include work performed by the author if presented or published at an earlier date. References should adopt one of the standard international styles; the American Psychological Association style for references and citation is recommended

2.7 - *Appendices*: material too detailed or lengthy for inclusion in the body of the study (e.g. questionnaires, maps). Appendices may also contain information that might clarify the thesis but is routine in nature or indirectly related to the thesis. Raw data and examples of calculation could be incorporated.

3. Style and Form

3.1 Paper: Use A4 (210 mm X 297 mm) bond unruled paper (90 gsm) for all copies submitted. Use both side of the page for all printed/typed matter.

3.2 Printing: A high-quality laser printer should be used for the final copy.

3.3 Headings: In disciplines where section numbering is normally used, the following guidelines apply: **((Annexure - VIII)**

3.3.1 Chapter number: Use only Arabic numerals should be centered on the top of the page using Times New Roman 14, bold and lower case with 'C' capital eg., **Chapter 1 (Annexure VIII).**

3.3.2 Chapter Heading: Times New Roman 14, bold and all capital.

3.3.3 Section Heading: Use only Arabic numerals, Times New Roman 12, bold and lower case with leading capitals, e g., only first letter in each word to be capital.

3.3.4 Subsection Heading: Use only Arabic numerals, Times New Roman 12, bold and lower case with leading capitals, e g., only first letter in each word to be capital. The style of Section Heading and Subsection Heading some way may be different e.g. one may be italic.

3.4 Text Font: Acceptable fonts generated by word processing programs restricted to: Times New Roman 12. Bold and italics should not be used excessively in the text. Furthermore, colored text should not be used.

3.4.1 Special Text: Italics/ Superscript/ Subscript/Special Symbols etc., as per necessity. Special text may include footnotes, endnotes, physical or chemical symbols, mathematical, notations, etc., whenever these are required.

3.4.2 Justification: The text should be fully justified. Hyphenation should be avoided as far as possible. Text corresponding to be bullets, and listings should be indented. Quotation from other research work must be indented on the left and right, if they

are longer than two lines. Shorter quotation can be included as a part of the regular text. Quotation may be in *Italic font*.

3.4.3 References: Single spacing for each entry and double spacing between entries or 1.5 spacing uniformly.

3.5 Spacing: Double spacing is required for the text. Only footnotes, long quotations, bibliography entries (double space between entries or 1.5 spacing throughout), table captions, and similar special material may be single spaced.

All paragraphs in the thesis should be left justified completely from the first line to the last line.

3.6 Margins: Left 1.25"; top 1.00", bottom 0.67", and right, 1.25". Please note that the bottom of page number should be 17.0 mm above the bottom edge of the numbered pages.

3.7 Page Numbering: Every page in the Thesis, except the Thesis title page, must be accounted for. The page numbering starting from acknowledgement and till the beginning of the introductory Chapter, should be printed in small Times New Roman number i.e. i, ii, iii,.....

The page number of all the first page of the each chapter should not be printed (but must be accounted for). All page numbers from the second page of each chapter should be printed using Arabic numerals i.e. 1, 2, 3,

All printed page numbers should be located at the bottom centre of the page, 17 mm (2/3") from the bottom edge, using normal print.

3.8 Tables and Figures: Figures and tables should be inserted at the appropriate place in the text. Figures must have numbers and captions under the figures. Tables have their titles and numbers above. All figures should be drawn in black ink with sharp lines and adequate contrast between different plots if more than one plot is present in the same graph. Figures and tables should follow immediately after they are referred to for the

first time in the text. Splitting of paragraphs, for including tables/figures on a page should be avoided. The last line of the title of the any table should be 10 mm to 15 mm above the top-most horizontal line of the table, whereas in figures the first line of the tittle for figures, graphs, drawing and photo should be between 10 mm to 15 mm below the bottom and they should be centered with respect to the table/ figure. The title must be in the same font as the regular text and should be single spaced. The title format is given below:

Table example:

Table<blank> <Chapter number> <serial number> <left indent> <table title>.

Example of a small table which is sought to be placed within the text:

| |
|---|
| The content of the table will be within the surrounding double line (which indicates the top-most, left-most, right-most, and bottom-most boundaries of the table.) |
|---|

Figures Example:

Fig.<blank> <Chapter number> <serial number> <left indent> <figure title>.

Wherever a table/figure exceeds one page present the full title of the table/figure on the first page and in the following pages provided the table number and state “(contd.)” after it.

Wherever explanatory notes are used for clarification any information presented inside the table, print them after leaving **single space** immediately below the table.

All the tables/figures in landscape format must be placed such that their top portions are near binding of the thesis and their bottom portions near the outer edge.

When there are many plots in a single graph or figure, the lettering, labelling or numbering of each plot for its for its identification should be of a size such that even after size reduction in the thesis, the identification should be clearly legible.

3.9 Drawings: Drawing which is larger than A4 size are not encouraged. Any material which cannot be typed or computer generated should be drawn with permanent black

ink in neat and heavy lines. Photographs of drawings are acceptable. Xerox reproductions of drawings are acceptable if they are of high contrast. Drawing should be numbered and referred to as a figure. Drawing titles should be similar to those provided for figures.

3.10 Photographs: Use colour photographs only if necessary. Remember that the thesis may have to be photocopied. In case colour photographs are used, all copies of the thesis must contain only colour photos. Photos should be printed on glossy paper, and should be mounted with glue. Do not use rubber cement or tape. High-clarity Xerox copies of photographs are also acceptable. However, high-quality scanned e-images can also be inserted into the thesis text. Each photo should be numbered and referred to as a figure. Photos titles should be similar to those provided for figures.

3.11 Footnotes: In disciplines where footnotes are normally used, they should appear at the bottom of the same page as their reference. Footnotes should be numbered in Arabic numerals. The footnote reference is superscripted and the explanation at the bottom of the page begins with the footnote reference number. Footnotes should have a smaller font size than the text (e.g. 10 pt).

3.12 CDs and DVDs: identify with title, name of student, and date.

3.13 Computer Software: Describe in separate section in prefatory pages (e.g., list of figures and tables). If applicable, state requirements for the use of the software (e.g., hardware, screen resolution type) and any other information necessary for proper viewing of the software.

3.14 Oversized Material: Oversize foldout pages may be included, though ample margins for binding must be included. Leave oversize page unfolded. The bindery will fold and insert them. All pages must appropriately numbered if found in the text.

4. Sample Pages

The following sample pages are appended to show how these guidelines can be implemented.

Annexure -I

(Sample Copy)

**STUDY ON THE PROCESS PARAMETERS OF NON-TRADITIONAL MACHINING
TECHNIQUES FOR THE DEVELOPMENT OF AN EXPERT SYSTEM**

by

MANISH KUMAR ROY

DEPARTMENT OF MECHANICAL ENGINEERING.
SIKKIM MANIPAL INSTITUTE OF TECHNOLOGY

submitted

In fulfillment of the requirements of the degree of

DOCTOR OF PHILOSOPHY

to the



SMU SIKKIM
MANIPAL
UNIVERSITY

Established under Govt. of Sikkim, Act 9 of 1995, recognized under 2(f) of the UGC Act, 1956

April 2016

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Annexure -II

(The certificate must be on the respective Institute's Letter Head)

CERTIFICATE

This is to certify that the thesis titled "**TITLE OF YOUR THESIS**" being submitted by "**NAME OF THE RESEARCH SCHOLAR**" (**Registration No.**) to the Sikkim Manipal University, for the award of degree of Doctor of Philosophy is a bonafide record of original research work carried out by him/her. He/she has worked under my/our guidance and supervision and has fulfilled the requirement for the submission of this thesis, which has reached the required standard.

The results contained in this thesis have not been submitted, in part or full, to any other university or Institute for the award of any degree or diploma.

Supervisor

Co-Supervisor

Date:

Place:

(Annexure -III)

ACKNOWLEDGMENT

I would like to express my sincere gratitude and appreciation to my supervisor , for guiding me throughout all my research technically and methodologically.

I would like to express my sincere gratitude and thanks to my co-supervisor for guiding me with his patience and sound intelligence.

I would like to express my sincere gratitude , for constant encouragement and motivation.

I would also like to thank Sikkim Manipal University and the members of Research Protocol Evaluation Committee (RPEC), Sikkim Manipal Institute of Technology / Sikkim Manipal Institute of Medical Science, for allowing me to carry out research work.

Name with Signature

[Reg. No. 20081008]

Department of

(Annexure - IV)

PLAGIARISM VERIFICATION CERTIFICATE

1. Title of the Thesis:

2. Total Pages:

3. Name of the Scholar:

4. Department:

5. Name of the Supervisor:

6. Exclusion for Plagiarism check (e.g: Index, Bibliography, Literature Survey, etc.,)

a.

b.

c.

7. Software used:

8. Similarity index:

Date:

Checked by:

Signature of Scholar

Signature of Supervisor

(Annexure - V)

ABSTRACT

Keywords: River Morphology, RS and GIS, Depth Elevation Model (DEM), Strahler's stream order, Artificial Neural Network (ANN), Bayesian, Shape-from-Shading (SFS), Rainfall runoff.

The Information Extraction System (IES) plays a vital role in extracting and processing the morphometric parameters from Reference maps and Satellite data in studying the morphological changes of the rivers using Remote Sensing and Geographical Information System (RS and GIS) techniques. It includes the selection, retrieval and storage of information in a GIS database from Reference maps and Satellite imageries for further processing and analysis for arriving at useful conclusions. The parameters taken into consideration in the present study are stream orders, drainage patterns, contour lines, Depth Elevation Models (DEM) and rainfall runoff.....

(Annexure – VI)

TABLE OF CONTENTS

| | |
|-----------------------|-------|
| Abstract | i |
| Acknowledgment | iii |
| Table of Contents | v |
| List of Figures | x |
| List of Tables | xv |
| List of Abbreviations | xvi |
| List of Symbols | xviii |
| List of Appendix | xix |

Chapter 1

1. Introduction

| | | |
|-------|---|----|
| 1.1 | River Morphology | 1 |
| 1.2 | Remote Sensing and Geographic Information System (RS and GIS) | 5 |
| 1.3 | Information Extraction System (IES) for River Morphology | 8 |
| 1.4 | Proposed Solution Strategy | 11 |
| 1.4.1 | Drainage Pattern Extraction and Stream Order Initialization | 12 |
| 1.4.2 | Contour Pattern Extraction and Tracing | 12 |
| 1.4.3 | Depth Elevation Model (DEM) Extraction | 13 |
| 1.4.4 | Land cover/ Land use Classification | 13 |
| 1.4.5 | Rainfall-Runoff Modelling | 14 |
| 1.5 | Thesis Contribution | 14 |

Annexure – VII)

LIST OF TABLES

Chapter 5

Contour Extraction and Tracing 62

Table 5.1: Database generated for the result obtained. 75

Chapter 7

Land Cover/Land Use Classification 100

Table 7.1: Confusion matrix for Back-Propagation Neural Network Classifier. 117

Table 7.2: Confusion matrix for Bayesian Classification Algorithm 117

Table 7.3: Confusion matrix for Hybrid Classification 118

Chapter 8

Rainfall Runoff Modelling 120

Table 8.1: Definition of Hydrologic Soil Groups 124

Table 8.2: Land Use Categories and Associated Curve Numbers 125

Table 8.3: Spatial distribution of the land use/ land covers in Teesta Basin, in and around Singtam 131

Table 8.4: Weighted average runoff curve number 132

(Annexure – VIII)

LIST OF ABBREVIATIONS

| | |
|-------------|---|
| ALSM | Airborne Laser Swath Mapping |
| AMC | Antecedent Moisture Condition |
| ANN | Artificial Neural Networks |
| AOI | Area of Interest |
| BP | Back Propagation |
| CMA | Cumulative Moving Average |
| CN | Curve Number |
| DEM | Digital Elevation Model / Depth Elevation Model |
| DFS | Depth First Search |
| DTD | Digital Terrain Data |
| DTM | Digital Terrain Model |
| EC | Evolutionary Computation |
| EMR | Electro Magnetic Radiation |
| GA | Genetic Algorithm |
| GCP | Ground Control Points |
| GGVF | Generalized Gradient Vector Flow |
| GIS | Geographic Information System |
| GVF | Gradient Vector Flow |
| HBV | Hydrologiska Byråns Vattenbalansavdelning |
| HMT | Hit-or-Miss Transformation |
| HSV | Hue-Saturation-Value |

(Annexure – IX)

Notation

| | |
|---------------|------------------------------|
| η | Angle in degree |
| φ | Average gradient direction |
| \in | Belongs to |
| $O (.)$ | Big-Oh Notation |
| \setminus | Difference operator |
| δ | Dilation operator |
| ∂ | Directional field |
| ε | Erosion operator |
| \cap | Intersection (AND) operation |
| μ | Lagrangian Multiplier |
| σ_s | Light source slant |
| τ_s | Light source tilt |
| \subseteq | Subset |
| ϕ | Surface Slant |
| θ | Surface tilt |
| Θ | Thickening operator |
| \ominus | Thinning operator |
| \cup | Union (OR) operation |

(Annexure - X)

Chapter 1

1. CHAPTER HEADING

1.1. Section Heading

1.1.1. Subsection Heading

Chapter 2

2. CHAPTER HEADING

2.1. Section Heading

2.1.1. Subsection Heading

:

:

:

Chapter 9

Summary and Conclusion

9.1 Summary

9.2 Limitations and Scope for further studies

(Annexure - XI)

Bibliography or References:

The following format may be used for the Bibliography / References:

The American Psychological Association style for references and citation:

Author, A. A., & Author, B. B. (Year of publication). Title of article. *Title of Journal*, volume number, page range.

For Book

Sl. No Author (s). (Year). Book, Publisher, Pages (PP).

For Journal / Proceedings

Sl. No Author (s). (Year). Paper, Journal, Vol. No, Pages (PP).

Citing References in Text/Thesis

Cite the work of those individuals whose ideas, theories, or findings have directly influenced your work, even if you are paraphrasing or describing someone else's idea.

To avoid plagiarism, take careful notes as you research to keep track of all sources and collect the information you need to cite them properly.

The following steps illustrate how to format citations in text:

1. APA style uses the author-date citation system. This system allows readers to find the sources cited in text in the reference list where each source is listed alphabetically.
2. To insert a citation in text, include the author's surname and year of publication. For a direct quotation include the page number or specific location of the phrase or sentences in the original work.

REFERENCES

1. Abbott, M. B., Bathurst, J. C., Cunge, J. A., O'Connell, P. E. and Rasmussen, J.(1986). An Introduction to the European Hydrological System - Système Hydrologique Européen "SHE". 1: History and Philosophy of a Physically-based Distributed Modelling System. *Journal of Hydrology*, Vol. 87, No. 1/2, pp. 45-59.
2. Amin, T. and Kasturi, R. (1987). Map Data Processing: Recognition of Lines and Symbols, *Optical Engineering*, Vol. 26, No. 4, pp. 354-358.
3. Andrews, R. G. (1954). The Use of Relative Infiltration Indices in Computing Runoff. Unpublished Report. U.S. Soil Conservation Service, Forth Worth, Texas, pp. 348-350.
4. Ardiansyah, P. O. and Yokoy, R. (2002). DEM Generation Method from Contour Lines Based on the Steepest Slope Segment Chain and a Monotone Interpolation Function, *ISPRS Journal of Photogrammetry and Remote Sensing*, Vol. 57, No. 1-2, pp. 86-101.

(Annexure - XII)

APPENDIX -I

List of papers communicated/accepted/published/presented

APPENDIX -II

Copies of acknowledgment/acceptance letter in case the papers are communicated/accepted

APPENDIX -IV

Any other data, material used during the research to be put as an appendix

Important Instructions

1. Checklist during submission of applications for PhD

- a) Duly filled application with copies of marks/grade sheets.
- b) Attach attested copies of certificates, mark sheets etc.
- c) A candidate presently working in an organization (including those on projects) must provide a “No Objection certificate” from the employer (if applicable)
- d) SC/ST/OBC/Disability Certificate (if applicable)
- e) Date of Birth (DOB) certificate or High School (Class Ten) Certificate with DOB (Required for all candidates).
- f) With the downloaded form attach DD of Rs. 1000/-. (Application form + PhD Entrance exam fee). The fee can be paid through DD payable to Sikkim Manipal University at Gangtok.

2. Checklist during PhD progress presentation

- a) Filled PhD progress report in prescribed format
- b) PPT print out
- c) Detailed PhD progress report (optional)

3. Checklist during PhD Pre Submission presentation

- a) Six copies of spiral bound pre submission report in prescribed format
- b) PPT print out
- c) Course work completion certificate

Mailing Address for Applications:

A) For programmes at SMIT

Director
Sikkim Manipal Institute of Technology
Majitar Rangpo,
East Sikkim,
PIN-737136

B) For programmes at SMIMS

Dean
Sikkim Manipal Institute of Medical Sciences
5th Mile Tadong, Gangtok
East Sikkim,
PIN-737102

C) Registrar Academics

Sikkim Manipal University
5th Mile Tadong, Gangtok
East Sikkim, PIN-737102

Application Form