GUIDELINES FOR DOCTORAL STUDENTS IN CHEMICAL ENGINEERING

GRADUATE STUDIES COMMITTEE

MAY 2014

Chemical Engineering Department
University of Puerto Rico at Mayaguez

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PREFACE

The most important departmental guidelines and policies related to the Doctoral Program in Chemical Engineering of the University of Puerto Rico (UPR), Mayagüez, PR, are presented in this handbook.[1] In addition, the UPRM's Office of Graduate Studies provides general information concerning institutional policies (http://grad.uprm.edu). The Graduate Program Coordinator, the President of the Graduate Studies Committee, and the secretary assigned to the Graduate Program are valuable sources of information and support for graduate students. Finally, academic policy for graduate students within the Department is the responsibility of the Graduate Studies Committee and its implementation lies on the Graduate Program Coordinator and the Department Chairman. For campus-wide policies, students may contact the Office of Graduate Studies.

Graduate Studies Committee[2]

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[1] The guidelines presented herein have been prepared in accordance with Certification 09-09 of the UPRM academic senate and the "Proposal to Establish a Doctoral Degree Program in Chemical Engineering at the UPRM". The Graduate Studies Committee gratefully acknowledges the assistance of the graduate program of the Massachusetts Institute of Technology for their assistance in preparing these guidelines.

[2] The Graduate Studies Committee would like to acknowledge the work of Dr. Carlos Rinaldi, former committee member and chairman, for the development of these guidelines. Dr. Rinaldi's initiative developed the very first draft of these guidelines, among many other significant contributions to our program.

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PART 1. ACADEMIC REGULATIONS

A. REQUIREMENTS

The Doctor of Philosophy degree in Chemical Engineering at the UPRM requires an intense program of study and research. As such, the Department requires a minimum of 58 credits to complete the degree, which are divided as follows: 12 credits in chemical engineering core subjects; 1 credit in doctoral seminar, 18 credits in doctoral dissertation, 18 credits in subjects in the specialization area, and 9 credits in subjects outside the specialization area. A maximum of 9 credits in advanced undergraduate elective courses is allowed, which **should be approved within the first 30 credits** of coursework. At least 60% of all courses must be approved at the UPRM.

The discipline of Chemical Engineering covers many diverse areas and, therefore, the Department provides graduate-level subjects to cover those of most relevance. The philosophy of the Department is to encourage students to develop an in-depth understanding of the fundamental concepts of Chemical Engineering and, at the same time, broaden their perspective by sampling other, more specialized subjects. To this end, the following **four subjects** have been designated as **core**: (i) Mathematical Methods in Chemical Engineering (InQu 6001); (ii) Reactor Design (InQu 6005); (iii) Advanced Transport Phenomena (InQu 6016); and (iv) Advanced Thermodynamics (InQu 6019). It is expected that doctoral students will complete these four core subjects within the first two years of their tenure at the UPRM. The list of core subjects will be periodically reviewed to accommodate modern developments in the discipline.

In addition to these core courses, doctoral students must enroll each semester in Doctoral Seminar (InQu 8099) and, upon approval of the Doctoral Qualifying Examination (see section 1.F., in Doctoral Dissertation (InQu 8999). Under special circumstances, a student may be allowed not to enroll in InQu 8099 if he/she is enrolled in a similar course elsewhere. A maximum of 18 credits of Doctoral Dissertation (InQu 8999) may be applied to the fulfillment of doctoral credit requirements (see below).

To ensure the student's academic and professional development, the Department requires a minimum of 18 credits (typically six courses) in subjects in the specialization area and a minimum of 9 credits (typically three courses) in subjects outside the specialization area, which

should be related to the student's dissertation research. These courses should be selected by the student in consultation with his/her dissertation advisor.

A Plan of Study Form must be submitted to the Office of Graduate Studies after being approved by the dissertation committee and the Graduate Program Coordinator, by the stipulated deadlines during the student's second semester of enrollment. A copy of such form must be sent to the Office of Graduate Studies. New students are also expected to fill the Survey for New Students located in the departmental website within the first semester of study.

Students with deficiencies in courses are expected to complete them satisfactorily during their first year of study.

For the successful completion of a PhD program the candidate is expected to have an approved peer-reviewed publication at the time of the dissertation defense.

B. Expected Grades in Departmental Courses

UPRM's regulations require all graduate students to maintain a graduate GPA of 3.0 or higher. A student is placed on probation if his/her GPA drops below 3.0 or receives a non-satisfactory grade (NS) in dissertation research. The student is suspended from the graduate program if he/she is placed on probation three times. Chemical engineering doctoral students are expected to receive a grade of "B" or higher in any course taken to satisfy a departmental requirement. Failure to fulfill this expectation may result in denial of subsequent financial support. Withdrawing courses ("W") is strongly discouraged; such action should be taken after consultation with the dissertation advisor and the graduate program coordinator.

C. Validation And Accreditation of Courses Taken Prior to Joining the UPRM's PhD Program

Students who have received a BS, MS, or ME degree from the UPRM within five years of the time of admission into the PhD program may qualify for validation of up to 24 credits towards the PhD degree. A maximum of 9 credits in advanced undergraduate elective courses and graduate courses taken at UPRM can be validated even if the credits were used for completion of a BS degree.

Students who have approved graduate courses from another recognized institution offering programs comparable to those of the College of Engineering at UPRM, or students

transferring from such a program, may qualify for validation of up to 21 credits towards the PhD degree. Core courses approved at other institutions will not be approved nor elective graduate courses taken at other institutions if the credits were used for completion of a BS degree. Courses approved more than ten years prior to enrollment, at UPRM or elsewhere, will not be approved. Three criteria will be used by the Graduate Studies Committee to approve courses: (a) if the course taken elsewhere is considered equivalent to a UPRM course, then the couse can be validated; (b) if a course is not equivalent to any course offered at UPRM, but its contents are deemed to be of an appropriate level and relevance to chemical engineering, then the course can be accredited. (c) courses will not be approved if the requirement of 60% course residence is not fulfilled.

Written requests for approvals of courses taken prior to enrollment in the PhD program must be submitted to the Graduate Program Coordinator within the first two semesters of enrollment in the program. The request must include the following: (i) petition letter from the student with approval of the dissertation advisor, (ii) course syllabus signed by the course professor, department chair, or higher authority at the institution where the course was taken, (iii) official transcript showing the grade obtained in the course, and (iv) UPRM equivalent course code and title, if applicable. The Graduate Studies Committee will make final decisions on the basis of academic performance and course contents. A grade of A is required in advanced undergraduate elective courses (5000-level), whereas a grade of B or higher is required in graduate coursework (6000-level or higher). Dissertation credits approved at other universities will not be validated. Courses approved during a suspension period will not be validated. In keeping with residency requirements applicable at the UPRM, no less than 60% of all the credits of the PhD program must be approved at the UPRM.

D. SELECTION OF DISSERTATION ADVISOR(S)

Each graduate student is associated with a research advisor who plays an important role in the student's academic and research programs. First-year doctoral students are required to go through the process described herein. To help in this process, the Graduate Program Coordinator's Office has prepared a form that will be given to all first-year students. Every new student is required to meet with at least five Chemical Engineering faculty members to discuss possible research topics; each faculty member should sign the form. Then, each student has to

select three research projects by the date specified in the form, and prioritize them according to the instructions in the form. **Failure to comply with this requirement in a timely manner may result in loss of institutional funding**. Students and potential advisors are reminded that the dissertation advisor is ultimately responsible for securing funds to support the graduate student during his/her tenure at the UPRM, hence this should be an important point during discussions of potential dissertation topics. The Director of the Department, in consultation with the Graduate Studies Committee, will make every effort to grant each student one of his/her choices within funding and space limitations. Students will be notified of their dissertation advisor(s) assignments by the end of their first semester. **Students and potential advisors cannot reach agreements without the consent of the Graduate Studies Committee and the Department Director**.

Prior to registration (Fall and Spring semesters), the student's course selection must first be approved by the dissertation advisor before the Graduate Program Coordinator authorizes registration. Advisor approval should also be obtained for any subsequent courses add/drop actions during the term (no additional authorization by the Graduate Program Coordinator is required).

Occasionally, a research project does not proceed according to the expectations of the student, the research advisor(s), or both. Early recognition of the possibility of switching the research topic and/or dissertation advisor(s) is an important factor in successfully managing this situation. Any student contemplating a change of dissertation advisor(s) should contact the Graduate Program Coordinator for consultation and assistance. Students must be aware that in most cases a change in dissertation advisor, after the oral examination has been approved, will not be granted. However, in the improbable case that such change is approved, the student must present a new doctoral proposal subjected to the conditions given by the Graduate Program Coordinator in consultation with the Office of Graduate Studies.

E. DISSERTATION COMMITTEE (STUDENT'S COMMITTEE)

Once a dissertation advisor has been assigned to the student, the two will work together to choose a dissertation committee with the necessary skills and background to assist the student in developing his/her dissertation research. The committee should consist of 4-6 members, at least half of which must be from the Department of Chemical Engineering at

UPRM. Any committee member external to the UPR system should have an adjunct appointment in the Department according to university regulations. The selection of the committee members must then be informed to the Graduate Program Coordinator and included in the student's plan of study.

F. DOCTORAL QUALIFYING EXAMINATION

Purpose and General Information

The purpose of the doctoral qualifying examination (QE) is to assess at an early stage if he/she possesses the necessary intellectual skills and knowledge to earn the degree of doctor of philosophy in Chemical Engineering. **The assessment is made based on the Schedules** shown in the Table below. **Schedule 1 corresponds to the case where a student takes a written comprehensive exam (WCE) for the first time.** In this case, the evaluation of the QE takes into consideration **only** the results of the WCE and the student's core coursework performance. **Schedule 2 corresponds to the case where a student takes a WCE for a second and final time.** In this case, the evaluation of the QE takes into consideration the results of the WCE, the student's core coursework performance, and the results of a feedback questionnaire to be completed by the student's advisor.

The WCE is prepared and evaluated by faculty members and overseen by the QE Coordinator, who is a member of the Graduate Studies Committee. It is offered twice every year as scheduled by the QE Coordinator. Students admitted to the program without any coursework deficiencies must take the QE within the first year of studies. If a student fails the WCE the first time (i.e., Schedule 1), the student must retake it the next time they are offered (i.e., Schedule 2). Failure to take the WCE within the required timeline period will be considered as a failed attempt, except in the case of extenuating circumstances.

Grading of the WCE is double-blind, where the student does not know the evaluator's identity and vice versa. **Subject examinations are closed-book.** A handout containing standard formulas of the topics examined will be provided. The handout may include more formulas than are actually needed to complete the solution of each problem. No other material will be allowed during the exam unless provided by the examination proctor. Calculators are allowed. Examinee questions will not be answered during the examination. Well-written and organized solutions are expected from each examinee.

Schedule 1		**Schedule 2**	
Part 1 - WCE (Core Undergraduate Topics) (weight on QE score: **50%**)		Part 1 - WCE (Core Undergraduate Topics) (weight on QE score: **33.333%)**	
Total score based on a problem's pass or fail score. A pass is equivalent to 1 point; a fail is equivalent 0 points.		Total score based on a problem's pass or fail score. A pass is equivalent to 1 point; a fail is equivalent 0 points.	
Areas Evaluated	# of Problems or Max. Points	Areas Evaluated	# of Problems or Max. Points
Momentum Transport	1	Momentum Transport	1
Energy Transport	1	Energy Transport	1
Mass Transfer and Separations	1	Mass Transfer and Separations	1
Chemical Kinetics and Reactor Design	1	Chemical Kinetics and Reactor Design	1
Thermodynamics	1	Thermodynamics	1
Total	5	Total	5
Part 2 - GPA Based on Graduate Program Core Courses (weight on QE score: **50%**)		Part 2 - GPA Based on Graduate Program Core Courses (weight on QE score: **33.333%)**	
A minimum GPA of 3.00 based on core courses is required.		A minimum GPA of 3.00 based on core courses is required.	
Courses:	# Credits	Courses:	# Credits
InQu 6001 -Mathematical Methods in Chem. Eng.	3	InQu 6001 -Mathematical Methods in Chem. Eng.	3
InQu 6005 - Reactor Design	3	InQu 6005 - Reactor Design	3
InQu 6016 - Adv. Transport Phenomena	3	InQu 6016 - Adv. Transport Phenomena	3
InQu 6019 - Adv. Thermodynamics	3	InQu 6019 - Adv. Thermodynamics	3
Total	12	Total	12
		Part 3 - Advisor's Feedback (weight on QE score: **33.333%)**	
		Survey focusing on the student potential for successful completion of doctoral level research work. Based on 5-point scale system.	

Assessment of the QE Grades

The result of the QE is determined as follows:

1. Each WCE topic/problem evaluator submits a written assessment of the student's performance in the examination, including the evaluator's opinion regarding the

student's in-depth understanding of the fundamentals of chemical engineering in the specific area tested. The evaluator recommends the approval or failure of the student in the specific area or areas graded.

2. The QE Coordinator will tabulate the results of the individual WCEs without identifying individual student's identities and present them along with the corresponding graduate core-courses GPA to the Graduate Studies Committee. During Schedule 1, only the results of the WCE and the student's graduate core-courses GPA will be evaluated. If the student failed the QE the first time, the Graduate Studies Committee will consider Schedule 2 for the QE evaluation, which includes the student advisor's answers to a survey. A consensus vote will be made by the committee during any of the Schedules to decide on each candidate passing or failing the QE.
3. **Those students that receive a QE total score of 89.5% or higher during Schedule 1 will approve the exam in an outstanding fashion.** Students that receive a QE total score between 79.5 and 89.4% will pass the QE while those with a score between 69.5 and 79.4% will be recommended to either transfer to the MS program or retake the WCE under Schedule 2. Students that receive a QE score of less than 69.5 will be required to retake the WCE under Schedule 2.
4. During Schedule 2, students that receive a QE total score between 79.5 and 100% will pass the QE while those with a score between 69.5 and 79.4% will be recommended to transfer to the MS program. **Students that receive a QE score of less than 69.5 during Schedule 2 will fail the exam and will not be given a third opportunity to retake the WCE.**
5. The Graduate Studies Committee will inform the Graduate Program Coordinator of the results of the QE, who will in turn inform the students and the Office of Graduate Studies no later than two weeks after the QE evaluation.

A student who has passed the QE will be allowed to register in InQu 8999 – Doctoral Dissertation. This student is henceforth regarded as a doctoral degree candidate in the Department of Chemical Engineering at UPRM. According to UPRM regulations, a second WCE failure will result in the student's dismissal from the UPRM PhD program. After a one

year suspension, the student may apply for a second and final admission to the same program or to another UPRM graduate program.

G. DISSERTATION PROPOSAL

The Department requires doctoral candidates to prepare, submit, and defend a written Dissertation Proposal **before registering for doctoral dissertation for a fourth time**. This constitutes an absolute maximum and students are strongly encouraged to prepare and submit their Dissertation Proposal within one year of passing the qualifying examination. The Dissertation Proposal consists of a written exposition of the planned research followed by an oral presentation. The purpose of the Dissertation Proposal is to obtain important feedback early on in the development of the dissertation research. Since the Dissertation Proposal counts as the Preliminary Examination in the Chemical Engineering Doctoral Program, it also provides the opportunity to evaluate the student's overall progress. The written portion must be submitted to the student's dissertation committee and to the Graduate Program Coordinator at least **four weeks prior** to the oral presentation. Failure to complete the Dissertation Proposal and the oral presentation within the above-mentioned deadline will constitute unsatisfactory progress toward the doctoral degree (which may be recorded as such if the student is currently enrolled in InQu 8999 – Doctoral Dissertation), and can result in denial of institutional funding.

Scheduling meetings with faculty can be difficult at certain times during the academic year. It is therefore **strongly recommended** that students do not leave the oral presentation of the Dissertation Proposal to the very end of the allowable period (i.e., too close to the deadline specified above). It is the student's responsibility to schedule a room and any audiovisual equipment that he/she may need for his/her presentation. It is also the student's responsibility to provide the dissertation advisor(s) with a Report of Dissertation Proposal Presentation Form, which can be obtained in the Doctoral Program Coordinator's Office.

Although the exact format of the Dissertation Proposal is determined by the student and his/her research advisor(s), students are encouraged to follow the guidelines provided by the Office of Graduate Studies (http://grad.uprm.edu/normastesis.htm). The following outline can be used as a guide:

I. **Cover Page.** Provides the dissertation title, name(s) of the student, the dissertation advisor(s), and members of the student's dissertation committee, and date of submission.

II. **Goal and Specific Aims.** Clearly states the overall goal and specific tasks to be accomplished (not to exceed one page).

III. **Background and Rationale.** Presents a rationale for conducting the proposed studies. Reviews all key publications in the chosen field, and shows their relation to the proposed studies. This section should be used by the proponent to highlight the scientific contribution of his/her project to the field of Chemical Engineering.

IV. **Project Plan and Methodology.** Discusses the planned research with particular emphasis on expected difficulties and challenges. Indicates how the experimental and/or theoretical results will serve to meet the proposed objectives. Multiple strategies to accomplish the main tasks should be indicated.

V. **Safety.** Notes any safety issues related to the use of chemicals, biohazards, and laboratory procedures that are part of the planned research, if applicable.

VI. **Time Schedule.** Delineates the expected schedule for completion of the Dissertation' main milestones.

VII. **Literature Citations.** Lists all references following the style of any major journal in the field of Chemical Engineering.

VIII. **Appendices.** This section is optional.

Dissertation Proposals, including literature citations, figures, tables, and appendices **should not exceed 40 pages**. Brevity and clarity of presentation will be appreciated by the dissertation committee. The Dissertation Proposal is a statement of the intended plans for the research program and not a summary of the student's past or current accomplishments.

The oral presentation of the Dissertation Proposal should be conducted as follows:

1. General Dispositions

a. The oral presentation of the Dissertation Proposal will be held during the regular academic period, will be open only to the members of the academic community, and will be publicly and broadly announced through the Graduate Program

Coordinator's Office to the Department and the UPRM community **at least two weeks prior to the oral presentation**. The student is responsible for arranging the time and date with all members of the dissertation committee.

b. The student's dissertation committee, presided by the dissertation advisor, will evaluate the oral presentation.

c. The dissertation advisor is responsible for advising the student on all details regarding the written and oral portions of the Dissertation Proposal.

2. Oral Presentation

a. Open Forum (open to the academic community):

i. The dissertation advisor will introduce the student to the audience and ask him/her to provide a biographical sketch.

ii. The dissertation advisor will provide the student's dissertation committee with copies of the student's academic record.

iii. The student will present a clear and concise exposition of his/her Dissertation Proposal (30 minutes is suggested).

iv. Having concluded the oral presentation, a question-and-answer period open to the audience will follow (30 minutes maximum is suggested).

b. Closed Forum (only members of the student's dissertation committee and the student may be present):

i. A second question-and-answer period will be held (30-60 minutes is suggested). Questions during this period should focus on the proposed research presented and/or on general chemical engineering aspects applicable to the proposed research.

ii. The student's dissertation committee will deliberate privately and confidentially on the results of the Dissertation Proposal. Approval of the Dissertation Proposal requires a majority vote by the student's dissertation committee.

iii. The dissertation advisor will inform the student of the results at the conclusion of the closed forum deliberations.

iv. If successful, the student, in consultation with the dissertation advisor, will present a report summarizing the suggestions and/or corrections made to the Dissertation Proposal. This report must be submitted to the Graduate Program Coordinator, no later than two weeks after the oral presentation, who will inform the Office of Graduate Studies.

v. If the student fails, he/she may try a second attempt no later than one semester after the first. A second failure will result in dismissal from the doctoral program. During this semester, the student may be allowed to enroll in InQu 8999. A letter from the Graduate Program Coordinator to the Office of Graduate Studies should be issued on this regard.

After the dissertation proposal has been approved, and only then, the student may submit his/her proposal to the Office of Graduate Studies to fulfill their requirements. Then, the Director of Graduate Studies will appoint his/her Representative to the student's dissertation committee.

H. DISSERTATION COMMITTEE MEETINGS

Purpose and Types of Dissertation Committee Meetings

In the PhD program, the Department of Chemical Engineering requires **at least one student's dissertation committee meeting in each two-semester period following the presentation of the Dissertation Proposal**, and more frequent meetings are encouraged whenever significant input from the committee is required. Each dissertation committee meeting should focus on the student's education and research progress, with emphasis on achievements and problems encountered. These meetings are opportunities for the student to receive advice and counsel from the members of his/her Committee. As a student progresses in his/her research, however, these meetings should focus on the eventual completion of the student's doctoral dissertation. As such, three types of student dissertation committee meetings have been defined and described below.

1. Regular Dissertation Committee Meeting

The first student dissertation committee meeting following the approval of the Dissertation Proposal, referred to as the **Regular Dissertation Committee Meeting,** should be scheduled by

the student **within two semesters** of the approval of the Dissertation Proposal. This meeting is an opportunity for the student to discuss his/her progress on the proposed research, as well as to discuss with the committee the feasibility of the intended research.

2. Plan-to-Finish Dissertation Committee Meeting

Within two semesters of the regular Dissertation committee meeting, the next dissertation committee meeting, referred to as the **Plan-to-Finish Dissertation Committee Meeting**, should be scheduled by the student. At this meeting, the **dissertation** committee should evaluate a **Plan-to-Finish Oral Report** presented by the student. The Plan-to-Finish Oral Report should be a concise summary reevaluating the research plan proposed by the student in the original Dissertation Proposal, including discussing and justifying any needed modifications to the original research plan. The report should also discuss the remaining tasks (experiments, computations, analysis, literature review, and writing) that are needed to bring the doctoral dissertation project to a successful completion. A realistic timeline for the completion of these tasks should also be included. The Plan-to-Finish Oral Report should not constrain the intellectual inquiry of students and dissertation advisor(s). On the contrary, it is subjected to revision if significant opportunities or setbacks arise in the course of the remaining dissertation research.

3. Dissertation Student Committee Meeting

Within two semesters of the Plan-to-Finish student dissertation committee meeting, the student should schedule the Final Dissertation Committee Meeting. For this meeting, the student should prepare a **Final Progress Oral Report** summarizing the main results obtained in the doctoral research and justifying why they are sufficient for completion of the doctoral dissertation. At the final student dissertation committee meeting, the committee should agree that the work carried out by the student, as reflected in the Final Progress Oral Report, constitutes a high-quality research study suitable for presentation to the faculty in the **Final Dissertation Defense** (see section 1.I.). A suggested timeline for completion of the doctoral program, including student's dissertation committee meetings, is presented in Figure 1.

Format of Student's Committee Meetings

For a Progress Report to be most useful, in addition to summarizing the progress made by the student since the last committee meeting, it should clearly state the problems and challenges encountered by the student in his/her research, including unsuccessful attempts made to resolve

them and a discussion of future approaches to be tried. When appropriate, supporting data and completed manuscripts may also be presented during the Progress Report.

Student committee meetings should be attended by the student's committee and by invited guests deemed appropriate by the student's dissertation advisor.

The student's committee meetings **should not exceed 90 minutes**, with up to 45 minutes for the student's presentation and 45 minutes for discussions. Following the student's committee meeting, **in consultation** with the dissertation advisor(s), the student should prepare a detailed summary of the dissertation committee's evaluation of his/her research to date, as well as indicate any real or potential problems identified.

I. FINAL DISSERTATION DEFENSE

Following the satisfactory completion of the Final Dissertation Committee Meeting, and no earlier than four semesters after defending the Dissertation Proposal successfully, doctoral candidates should commence the Dissertation Defense process, which will be as follows:

1. An Application for Oral Examination and one copy of the final dissertation must be submitted to the UPRM Office of Graduate Studies by the date indicated in the official Academic Calendar and at least one month prior to the proposed defense date. In order for your application to be accepted by the UPRM Office of Graduate Studies you must have applied for graduation, have an approved plan of study and proposal, be registered in InQu 8999 – Doctoral Dissertation and have fulfilled all requirements of the program. The Office of Graduate studies will appoint an Office of Graduate Studies representative that will be member of your Examining Committee in addition to your dissertation committee members.
2. It is the student's responsibility to coordinate with the Examining Committee members a date, time, and place for the defense. The student should preferably get a written confirmation of the place reservation.
3. It is the student's responsibility to request a grade for the Graduate Studies Seminar at least two weeks prior to the last day of classes of their last semester in the program. See the Graduate Seminar Syllabus for more details.
4. At least one month prior to the proposed defense date the student must provide a copy of

the final version of the dissertation to the members of the Dissertation Committee: (a) the dissertation advisor(s), and (b) every dissertation committee member. It is customary for the Office of Graduate Studies to provide the copy of the dissertation to their representative but it is the student's responsibility to corroborate. During the next two weeks, the Examining Committee will review, comment upon, and suggest changes to the dissertation.

5. **Two weeks** before the oral dissertation defense, the student should turn in to the Graduate Program Coordinator's Office copies of the Technical Summary. The Technical Summary is a text-only document no longer than two pages describing the scope and significance of the doctoral dissertation. The primary audience is the Chemical Engineering faculty, who will be interested in a concise description of the dissertation research and its most significant findings. The Technical Summary should explain the impact of the Doctoral Dissertation on the Chemical Engineering profession and on the advancement of scientific knowledge in the field.
6. Upon receipt of the Technical Summary, the Graduate Program Coordinator's Office will distribute it to the entire Departmental faculty, along with an announcement designed to generate faculty attendance at the final dissertation defense.
7. On the day of the oral dissertation defense, the student should turn in the following materials to the Graduate Program Coordinator's Office:
    - One copy of the Dissertation Abstract.
    - Chemical Engineering Department Departure Form.
    - One copy of the Dissertation Title Page (unsigned).
    - Filled UPRM INQU Doctorate Exit Survey (located at inqu.uprm.edu)
    - Forwarding Address Form.
    - Filled Survey of Earned Doctorates Form.

The Graduate Program Coordinator's Office will forward the last two items to the Office of Graduate Studies.

8. The dissertation advisor will preside over the Dissertation Defense and will introduce the candidate to the audience. The student should make plans to speak for no more than 45 minutes. The dissertation advisor will also be in charge of the open and closed question-

and-answer sessions that follow the candidate's presentation and the final confidential deliberations by the Examining Committee. The dissertation presentation and open question-and-answer session are open to the public, but will be followed by a closed session between the candidate and the Examining Committee. Additional questions may be asked during the closed session, but the total time for the Dissertation Defense will not exceed 4 hours.

9. After the closed session with the candidate, the Examining Committee will deliberate on the approval/non-approval of the Dissertation Defense, with a majority vote required for approval. The result of the Dissertation Defense will be notified immediately to the candidate by the dissertation advisor. In the case of non-approval, the Examining Committee will make recommendations for a second Dissertation Defense whose result will be final.
10. Once the Dissertation Defense is successfully completed, the student must assemble the final version of the dissertation document within the timeline stipulated by the Examining Committee and the constraints set forth by the Office of Graduate Studies. All dissertation materials must be submitted to the Office of Graduate Studies in pdf-format.

J. UNSATISFACTORY PROGRESS

Students judged to be making unsatisfactory progress toward their degree objectives will be so notified in writing by the dissertation advisor(s), the Graduate Program Coordinator, or the Office of Graduate Studies. If sufficient improvement is not made by the end of the following semester, financial support may be cancelled.

Unsatisfactory progress includes not meeting any of the requirements set forth herein, not making sufficient progress in developing a research project leading to the degree of Doctor of Philosophy in Chemical Engineering, inadequate performance in coursework, failure to attend departmental research seminars, failure to have timely dissertation committee meetings, etc. The student will be notified why unsatisfactory progress has been assessed and will be given guidelines to improve his/her performance.

Timeline for Completion of Doctoral Program

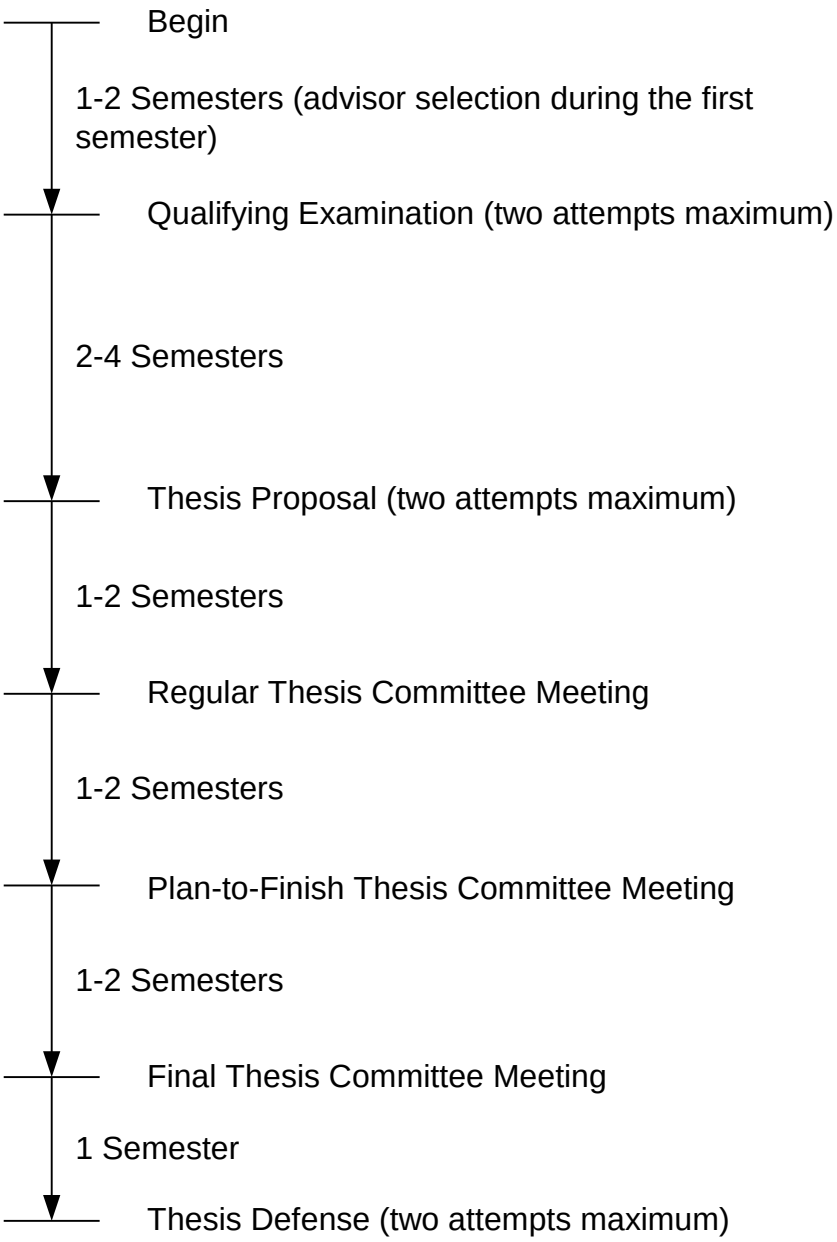

Figure 1. Suggested timeline to complete the PhD program

PART 2. FINANCIAL SUPPORT

Graduate students may provide their own financial support or receive financial assistance in the form of fellowships, research assistantships, or teaching assistantships.

A. FELLOWSHIPS

Fellowships come from the UPRM or from external sources. Examples of external fellowships include: NSF, DOD, NIH, NASA, GEM, Hertz, Kodak, Lucent, Ford Foundation, Sloan Foundation, Merck, and Whitaker Foundation Fellowships. Information about external fellowships is maintained in a binder in the Graduate Program Coordinator's Office. UPRM's Office of Graduate Studies may have a more complete listing of outside fellowships. Internal fellowships are typically limited to first- and second-year doctoral students. Funds for such awards are usually provided by gifts from alumni or donations from industry. Fellowships are awarded on the basis of academic merit, and a high level of performance in coursework and research activities is expected of each recipient.

Recipient of Departmental Fellowships are under no obligation, either real or implied, to the donor of the fellowship, other than to complete his/her program of study and research diligently. Recipients of external fellowships should check with the appropriate coordinating official to determine any existing obligations regarding their fellowships.

The recipient of an institutional or departmental fellowship is allowed two weeks vacation per calendar year, which should be taken in consultation with the dissertation advisor. Additional vacation time is allowed only by permission of the dissertation advisor(s).

B. RESEARCH ASSISTANTSHIPS

Research Assistants (RAs) are supported from research contracts or grants, and are supervised by faculty members of the Department. In this case, the Principal Investigator (PI) has a responsibility to the funding organization to conduct research in specific areas covered by the grant. In most cases, an appointment as a RA coincides with the selection of a research topic and a dissertation advisor(s). This means that the selected or assigned dissertation advisor is the PI or a co-PI of the grant funding the student.

In a few cases, students may be assigned as research assistants to a project where there is an agreement between the student and the dissertation advisor(s) that the work will not be used as

part of the dissertation. A typical time commitment to this type of research project would be 18 hours per week.

In the case of RAs, an arrangement is made with the dissertation advisor(s) to provide project funds for tuition and/or stipend. The dissertation advisor(s) will inform the Graduate Program Coordinator's Office each semester of the availability of such funds, so that appointments can be processed. When paid on a 12-month basis, a RA is allowed two weeks vacation per calendar year, which should be taken in consultation with the dissertation advisor. Additional vacation time is allowed only by permission of the dissertation advisor(s).

C. TEACHING ASSISTANTSHIPS

Teaching Assistants (TAs) play a central role in the Department's educational program. Service as a TA, which requires working closely with one or more faculty members, is an important and beneficial aspect of the graduate school experience. Each TA is assigned to a specific undergraduate or graduate course. While the exact duties of the TA vary depending on the course and the instructor's teaching methodology, typical duties may include the following:

- Developing and grading problem assignments
- Grading reports and examinations
- Holding regular office hours (6 per week) for individual students and group sessions
- Leading recitation sections and tutorials
- Planning, designing, and supervising laboratory experiments
- Proctoring examinations
- Preparing a course solution book to be archived in the Department
- Attend the classes of the course they are TAing
- Attend orientation and training workshops organized by the Department or by the University

TA assignments are generally made at least one month before the beginning of a semester. In some instances, however, enrollment-driven last-minute TA assignments are necessary. Not all students may be selected for TA appointments. Upon assignment as a TA, the student will be provided with a list of detailed responsibilities, including information on the preparation of a course solution book, by the course instructor(s).

TAs are expected to be available for the **complete academic period** of their assignment. A student working as a full-time TA (6 credit-hours) is expected to devote 15 hours per week to TA duties. Some courses with limited enrollment require only a fractional TA effort, and in those cases, partial TA appointments are made. TAs' stipends are set by the institution and announced each term by the Office of Graduate Studies.

D. GRADUATE GRADERS

A limited number of positions known as graduate graders may be available to assist in the teaching of some high-enrollment undergraduate courses. Graders are involved in grading homework assignments, photocopying handouts, and preparing audiovisual materials for class. Graders should not be responsible for any activity involving direct contact with students. Graders' stipends are set by the institution and announced each term by the Office of Graduate Studies.

E. CONSULTATION OR OUTSIDE JOBS

The financial aid provided by the Department for fellowships, RAs, or TAs usually carries a restriction that the student must devote full-time effort to the activities for which he/she is receiving support. Students receiving any research or teaching assistantship through the institution (UPRM) cannot have inside or outside jobs. For any other type of institutional support, the students should consult with their dissertation advisor(s) and ask the Graduate Program Coordinator before undertaking any compensated activity, and obtain an approval form from the Director of Graduate Studies.

PART 3. ADMINISTRATIVE ASPECTS

A. KEYS

New students will receive their office assignments during the first few weeks of their first semester (Fall or Spring). Once students have been assigned a dissertation advisor, he/she will instruct them on securing an office and/or a laboratory key. The Department Director's Secretary will contact the student when the key form is complete. At that time, the student should pick up the signed key request form from the Department Office, and bring it to the Property Office between 10:00 AM and 2:00 PM to request his/her keys. Under no circumstances are students to be given keys to faculty offices or departmental facilities such as the mailroom, conference room, classrooms, or auditorium.

B. MACHINE SHOP FACILITIES

A Departmental Machine Shop is available for usage by students and faculty in Chemical Engineering. The machinist will perform the desired work once a work order is filled out and submitted to the department officers.

C. LABORATORY SAFETY

The Department has established policies and procedures to make students and employees aware of their responsibilities for safe practices in the laboratory and elsewhere. Although our office work and research activities are diverse, the following requirements apply in all cases:

1. We are all mutually responsible for our own safety and the safety of those who work with us, for us, or around us.
2. The responsibility for the safe conduct of an experiment, or for the safe utilization of laboratory space, rests with the person running the experiment or utilizing the laboratory space at any given time.
3. To the extent that the execution of an experiment is supervised by someone who is not performing the experiment, that supervisor shall satisfy himself/herself that the person who is performing the experiment is both aware and able to follow safe laboratory procedures.

Presentations on laboratory safety should be given by the Departmental Safety Coordinator for one hour during the first session of the Graduate Seminar (InQu 6029/8099) each semester. All graduate students are required to attend this presentation and to sign the attendance log before they begin their laboratory work. The safety seminar format varies; it can be a lecture by the Departmental Safety Coordinator, an invited lecture, or a written examination on the Department of Chemical Engineering Chemical Hygiene Plan.

The importance of lab safety cannot be overemphasized. More specific information on safety-related policies and procedures is available from the Departmental Safety Committee.

D. COMPLETION OF STUDIES

Each student, upon completion of his/her graduate program, must submit the following materials to the Doctoral Program Coordinator's Office:

1. Forwarding Address Form.
2. Departmental Departure Form - This form requires various approvals, including those of the student's dissertation advisor(s) and the Associate Director for Administrative Affairs to ensure that the laboratory and/or office space is left neat and clean, and that no unapproved chemical samples are left behind. In addition, all keys must be returned prior to leaving the UPRM (proper documentation from the Property Office is required).
3. Recruiting Questionnaire. This is useful to the Doctoral Program Coordinator's Office in collecting data about what Chemical Engineering students do after graduating from the UPRM.

The cover page of the dissertation must be signed by the Dissertation Examining Committee prior to being submitted to the Doctoral Program Coordinator's Office. The title pages and one copy of the dissertation will then be delivered by the Doctoral Program Coordinator to the Department Director for final approval and signature. The two copies of the doctoral dissertation, along with all other forms, must be turned in to the Doctoral Program Coordinator's Office within the time allotted in the Final Dissertation Defense, but no later than the last day of class or the date established by the Office of Graduate Studies for the semester in which the defense is held.