

Department of Chemical Engineering
New Mexico State University



Information Guide for Ch E Graduate Students
2008-2009 (Spring Edition)

Revised January 27, 2009

Printed January 27, 2009

All graduate students are responsible for knowing
the information contained within this document.
Save your copy for future reference

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Introduction

Welcome to the Department of Chemical Engineering at New Mexico State University!

This department offers both Masters of Science and Doctor of Philosophy degrees in Chemical Engineering. Education and training consist of two parts for both degrees: formal course work and an independent research investigation culminating in the preparation of a master's thesis or a doctoral dissertation. Each part is integral to the successful completion of the degree work. We look for and expect great things from you as you progress from the role of student to that of a colleague in Chemical Engineering.

While graduate studies should be and usually are associated with great intellectual stimulation and excitement, they are also associated with some stress as various hurdles are cleared. The intent of this *Information Guide* is to provide you with information that will minimize this stress and help you to pursue your graduate studies smoothly. This guide provides an overview of our requirements and expectations. Additional information about the department can be found at the departmental website, <http://chemeng.nmsu.edu>.

Contacts

Telephone area code for all number listed below (575).

Ch E Personnel Email addresses may be found online in the NMSU Phonebook.

<i>Administrative Division</i>	<i>Mail Stop</i>	<i>Phone</i>	<i>Fax</i>
Graduate School	MSC 3G	646-2736	646-7721
Engineering College	MSC 3449	646-2911	
Chemical Engineering	MSC 3805	646-1214	646-7706

<i>Ch E Personnel</i>	<i>Position</i>	<i>Office Phone</i>
Andersen, Paul	Associate Professor	646-8153
Bailey, Janice	Department Secretary	646-1214
Deng, Shuguang	Associate Professor	646-4346
Edwards, Keith	College Instructor	646-1214
Ghassemi, Abbas	Professor	646-1719
Johnson, Charles	Professor	646-1214
Long, Richard	Associate Department Head	646-2503
Mitchell, Martha	Department Head, Professor	646-2093
Munson-Mcgee, Stuart	Professor	646-6439
Rockstraw, David	Professor	646-7705
Wootton, Derrik	Departmental Tech	646-4809

Code of Ethics, College of Engineering, New Mexico State University

The NMSU College of Engineering adopts the Code of Ethics of the National Society of Professional Engineers with regard to the professional practice of its engineering faculty. The College of Engineering faculty will adhere to the canons of the NSPE Code of Ethics except that they will also adhere to the code of ethics established by New Mexico State University and the following ethics standards established by the College of Engineering.

Teaching

- Faculty will show no favoritism or bias in their interaction with students. Faculty will make a good faith effort to equitably give assignments, grades, time, etc. to students without regard to race, color, sex, creed, or handicap.
- Faculty shall strictly maintain a professional relationship with students and will not involve themselves with students in any manner that would appear unseemly. This standard is not a restriction on random social contact such as at banquets, university functions, or other similar activities.
- Faculty will not accept gratuities or any other compensation from individuals or organization to exert undue influence on or extend preferential treatment to students.
- Faculty shall carry out their teaching duties in a professional manner that includes respect for students and student rights. As such, faculty shall make a good faith effort to clearly define course objectives and then adhere to these objectives, to establish reasonable office hours and be available during these hours, and be expeditious and consistent in classroom operations.
- Faculty shall make a good faith effort to concisely and clearly advise their students, correctly guiding them through their college years and beyond.
- Faculty shall make a good faith effort to instill in their students correct engineering practices giving them an appreciation for ethics and safety in this practice.
- Faculty shall make a good faith effort to keep to the forefront of knowledge in their particular field and strive to transfer this knowledge to the classroom.

Research

- Faculty shall not be a part of intellectual dishonesty by misrepresentation of research results or deliberate application of incorrect research procedures as to bias results. Intellectual dishonesty also includes taking credit for another's research or claiming another's idea or invention as your own.
- Faculty must give due recognition to graduate students, co-workers, and others who have made a significant technical contribution to their research efforts when the results of this research are reported or published. Graduate students and others who contribute to the intellectual preparation of a research paper shall be listed as a co-author on the paper.
- Faculty shall not abuse the graduate research assistant program. Graduate students must be given a realistic chance to obtain an advanced degree in a timely fashion or not be utilized on a project.
- Faculty shall hire the best qualified individuals, when possible, avoiding nepotism and favoritism in their employment practices.
- Faculty shall not tamper with or in any way interfere with the research of others and instill in their assistants this standard of conduct. Special emphasis is given to tampering or interference by means of a computer such as the introduction of a computer virus.

Service

- Faculty shall not engage in unfair competition in their consultant practices. Unfair competition could involve the use of publicly funded university equipment or facilities to support private consultant activities without payment of suitable fees.

General Information

Incoming Graduate Student Curriculum Advisor

Dr. David A. Rockstraw, P.E. is the *Incoming Graduate Student Curriculum Advisor* for the department. In this capacity, Dr. Rockstraw serves to advise incoming graduate students, as well as chair the Graduate Studies Committee.

Admission

All students are admitted to the Chemical Engineering Graduate Program on a competitive basis, with preference given to Ph.D. level students. Previous course records and GPA standings, GRE scores, letter of interest from the applicant, and letters of reference (plus TOEFL scores for foreign applicants) weigh heavily in the selection process. Requests for transfer of major to Chemical Engineering by students already accepted to the NMSU Graduate School under a different major will be considered after a review of the student's rationale for the transfer request, current academic standing, source of financial support, and consent of current advisor.

Foreign Student Requirements

In addition to attending the NMSU Graduate School Orientation Program for new students and/or the International Teaching Assistants Training Course, new foreign students must satisfy NMSU requirements for English language competency. This may entail enrollment in one or more speaking and writing courses.

Grievances

Any graduate or prospective graduate student who believes that she/he has been unjustly treated within the academic process may proceed as far as necessary in the following steps to resolve their grievance. In general, there are three levels at which a grievance can be addressed: a course instructor or advisor, a department head, or the dean of the Graduate School. If the initial grievance is with an instructor or advisor, the process begins at level 1. If the initial grievance is with a departmental committee, the process begins at level 3. In all instances, the process must begin at the lowest possible level. Contact the Graduate School for details.

Keys

Keys will be issued for Jett Hall 183 (Chemical Engineering Graduate Student Office), computer facilities and outside doors of Jett Hall. A \$20 key deposit is required which will be refunded when all the keys are returned. See the departmental secretary in Jett Hall 259. Additional keys (for laboratories, etc.) can be obtained at the request of the student's advisor (see departmental secretary for appropriate form). The wings in Jett Hall that house the Chemical Engineering Computer Laboratories are protected by key code locks. The combination is available from the secretaries in the department office. Do not provide this combination to any unauthorized persons. Report any suspicious activity.

Office Space

We will make every effort possible to assign office space to you during your first semester. See the secretary in the department office (JH 259). Office space is assigned on the basis of seniority. You may also be assigned office space by your advisor. Report changes of office space, office phone number or e-mail address to the secretary in the department office. Students are expected to keep the graduate student office space clean.

Graduate Student Organization

The Graduate Students in Chemical Engineering Organization (GSO) was formed to address concerns and needs of the graduate students in Chemical Engineering. The GSO is part of a larger organization known as the Graduate Student Council (GSC). The GSC provides an opportunity for representatives from all the graduate organizations on campus to meet and address issues that directly affect graduate students. The chemical engineering GSO is always looking for ways to improve the quality of education and the quality of life for chemical engineering graduate students. Monthly meetings are held.

Additional, detailed information concerning the Graduate Student Council (GSC) and Graduate Student Organizations (GSOs), Free Escort Service (sponsored by ASNMSU to provide safe escort for students who travel on campus at night), child daycare, Student Legal Aid Program, typist for theses and dissertation, notary publics, and other services may be found in the Graduate Student Handbook, published by the Graduate School Dean's Office. The handbook is online at <http://gradschool.nmsu.edu/gradcat.html>.

Career Services

Career Services offers a convenient, reliable service to aid in a career search. Their website is <http://careerservices.nmsu.edu/>. Career Services is located at 224 Garcia Annex. The telephone number is (575) 646-1631. Useful services available include advising, organization of workshops, recruiting, and the maintenance of current and relevant job search reference materials.

Students may establish a placement file online through the Student Employment Service (SES) Ventana. The file is a repository for supporting employment documents (resumes, transcripts, recommendation letters). Having an active placement file allows participation in on-campus interviews with numerous employers from business, industry, government and nonprofit organizations.

Fall and Spring Career Fairs

Career fairs are held each Fall and Spring, with representation from major organizations from New Mexico and other states. The dates for these are usually announced at the start of each semester and will be posted on the department bulletin board. In addition, special career fairs are held by individual programs, such as the Society for Hispanic Engineers and WERC, a Consortium for Environmental Education and Technology Development. Event dates can be found on the Career Services website.

Mail and Notices

Graduate student mailboxes are located in the departmental office, 259 Jett Hall. See the departmental secretary to have a box assigned. The department address is Department of Chemical Engineering, MSC 3805, New Mexico State University, P.O. Box 30001, Las Cruces, NM, 88003-8001. Each student should check their mailbox at least once a week. These mailboxes should not be used for personal mail.

Tuition and Fees

Students are responsible for paying all tuition and fees. A description of fees can be found in the current Schedule of Classes. You are required to pay tuition and fees according to the payment plan. Noncompliance will result in additional fees and DISENROLLMENT from classes in which you have enrolled. The schedules are set by the university and faculty cannot assist you in case of noncompliance.

Health Coverage and Hospitalization Insurance

For university regulations pertaining to health service and hospitalization charges for students please see the current Schedule of Classes.

Registration and Student Identification Card

As a graduate student, your college is the Graduate School (Educational Services Building, 646-2736). It is through the Graduate School that you will be admitted or readmitted. You will register through the Graduate School. You may also register over the internet. See <http://www.nmsu.edu/ONLINE/> for more details.

New students register for the first time in person at the Graduate School. You must first seek advisement in Chemical Engineering, pick up a registration document from the Office of the Registrar, then make a down payment at the Business Office. After a receipt is obtained, the student may go to Auxiliary Services in Corbett Center for an ID card. A student ID is needed to buy a parking sticker, enter the bookstore during the first two weeks of a semester, use the library or computer labs, or access other University services.

Libraries

Branson Library, located on the NMSU campus, contains books and periodicals related to the science and engineering departments. You will need a student identification card to borrow books from the library. For regular library hours for both Branson Library and Zuhl, call 646-4749 or access the website: <http://lib.nmsu.edu/aboutlib/libhours.html> .

The Department also maintains the Shires Reading Room, located in Jett Hall 263, containing many resources of use to chemical engineers, including texts, manuals, catalogs and periodicals. The hours are 8:00 am-5:00 pm, Monday-Friday. Books must be used *in the library* and may not be checked out so that the resources are available at all times, to all students.

Bookstore

The campus bookstore is located in the Corbett Center. Course catalogs, textbooks, computers, computer supplies, and general school supplies are available for sale at this location. See the current Schedule of Classes for bookstore hours.

E-mail (my.nmsu.edu)

The first step toward establishing your NMSU email identity is activating your myNMSU Account. This one-time process provides access to not only email, but many NMSU services such as WebCT, web.nmsu.edu, and the myNMSU portal.

E-mail addresses and passwords are assigned to individuals and are not to be shared. You are encouraged to select an obscure password and change it frequently. Access to and use of e-mail is a privilege and should be treated as such. Computer services, including e-mail, may not be used for illegal or unauthorized purposes, including: harassment; destruction of or damage to equipment, software, or data belonging to others; or the disruption or unauthorized monitoring of electronic communications. Using e-mail to participate in illegal acts may be subject to prosecution by state and federal authorities. Use of e-mail for private business purposes unrelated to the university is not allowed.

Computers

PCs for your use with coursework-related activities are available without charge on the first floor of Jett Hall. A research cluster is located in JH 268, intended for research-related activities. JH 268 also contains Sun computers for use with research and educational purposes. You must set up an account to use these PCs or the Suns (separate accounts) by filling out forms available in the Chemical Engineering Departmental office, Jett Hall 259. To use a university UNIX account see e-mail section above.

Security

Do not leave your office unattended and unlocked. Do not prop open the outside doors or leave them unlocked after normal working hours. Such actions may lead to a loss of key privileges. You are encouraged to ask politely for the identity and purpose of any stranger you encounter in the building after regular office or evening class hours.

Copier and Facsimile machine

A copy machine is located in Jett Hall 259. As a chemical engineering student, you may ask the department secretaries to make copies for you. Personal copies have a fee schedule available in the office. If the copies are for research purposes, tell the departmental secretary the budget number to which the copies should be charged.

Our FAX number is (575) 646-7706. If you wish to send a FAX, submit your request to the departmental secretary. A fee schedule is available in the office for personal facsimiles sent within the continental United States. For international facsimiles, you will be charged when the bill arrives. If you need to send a FAX for business purposes, tell the departmental secretary what budget number to which to charge the expense.

Parking

If you have a car, motorcycle, or moped that you will be parking on campus, you must register your vehicle with the Parking Division of the NMSU Police Department, 725 College Drive (NE corner of College Dr. & Union Ave). You must have your vehicle registration and your student ID with you. You will have to fill out an application and pay a fee to obtain a sticker. See <http://www.nmsuparking.com/> for more information.

Bicycles should be registered with the Police Department, located on the west end of campus, not the Parking Division. If you have questions about parking, call the Parking Division at 646-1839.

Phones

On-Campus When dialing from an NMSU phone, you can call or FAX anywhere by dialing the last five digits of the phone number.

Off-Campus (local calls) To dial off-campus dial 8 (for an outside line) and the phone number you want to call.

Long Distance If you need to make long-distance phone calls for research purposes, for example, to call companies to order laboratory equipment or supplies, there is a phone with long-distance capability in Jett Hall 259 for that purpose. You must fill out the phone log (located in a red binder near the phone) for every call you make.

Vacation

The university provides no formal vacation for graduate fellows, teaching assistants, or research assistants. The department tradition is that a graduate student is not removed from the payroll if, with the concurrence of the advisor, the student does not take more than **two weeks** of what could be construed as vacation leave per year.

If a graduate student does not take a vacation in one year, then the following year the student will not be removed from the payroll if, with the concurrence of the advisor, the student takes up to four weeks of what could be construed as vacation leave.

Financial Support

Teaching Assistantship/Research Assistant Eligibility

All students must satisfy the following coursework requirements:

- remove any and all undergrad course deficiencies, earning a grade of B or better,
- be enrolled as a full-time student (a minimum of 9 credits numbered 450 or above during Fall or Spring and 6 credits over the course of the two summer sessions),
- earn a grade of B or better in all Ch E graduate courses attempted at NMSU, and
- have a cumulative NMSU graduate GPA of at least 3.0.

Additionally, foreign national students must have passed either the spoken English proficiency exam or the English for TA's course.

In terms of their research, **MS candidates** must also meet the following requirements:

- by the end of one semester have selected and be working on a research project,
- been working toward their degree less than 4 regular semesters and one summer.

Ph.D. candidates must meet the following after beginning the Ph.D. program at NMSU:

- by the end of one semester have selected and be working on a research project,
- by the end of 18 months have taken the qualifying exam,
- by the end of 30 months have taken the comprehensive exam,
- been working toward their degree less than 8 regular semesters and 3 summers.

All teaching assistants in the Chemical Engineering Department will be evaluated at both the midterm and end of each semester. Evaluation forms to be used by the faculty are included on the pages that follow. Students whose performance as a teaching assistant is substandard risk losing funding in subsequent semesters.

Financial Aid contact information

For financial aid information you may also wish to contact the Financial Aid Office:

Student Financial Aid
New Mexico State University
Box 30001, Dept. 5100
Las Cruces, NM 88003

(575) 646-4105

<http://fa.nmsu.edu/>

finaid@nmsu.edu

Mid-semester Ch E TA evaluation form

Course: _____

Date: _____

Name of TA: _____

Name of instructor: _____

Evaluate the performance of the TA on a scale of 0 - 4 (0: unacceptable, 4: excellent)

Responsiveness (answers email, responds to requests): _____

Timelines (adheres to deadlines): _____

Quality of work: _____

Overall assessment: _____

Use the remaining space to outline areas of improvement.

End of semester Ch E TA evaluation form

Course: _____

Date: _____

Name of TA: _____

Name of instructor: _____

Evaluate the performance of the TA on a scale of 0 - 4 (0: unacceptable, 4: excellent)

Responsiveness (answers email, responds to requests): _____

Timelines (adheres to deadlines): _____

Quality of work: _____

Overall assessment: _____

Do you recommend the TA for continued funding (Y/N)? _____

Do you want to have this TA work
with you next semester (Y/N)? _____

Comments

Other Degree Requisites

Advisor and Thesis Topic Selection

It is the responsibility of the student to select a thesis advisor during the first semester. To assist in this process, the faculty will first give brief presentations during the orientation that will occur before the end of the first week of the fall semester, identifying areas of research as well as specific topics. Each student must then meet with each of the members of the graduate faculty, exploring research opportunities to the extent appropriate. A rank-ordered preference for three thesis or dissertation topics and the corresponding advisors must be submitted to the *New Graduate Student Advisor* (the preferences must include at least two advisor choices). Upon confirmation by the chosen advisor that the advisor is willing and able to accept the student (generally based on compatibility and available financial support) the advising responsibilities shift from the *New Graduate Student Advisor* to the new thesis advisor.

Chemical Engineering Seminar

Attendance - All graduate students must attend the graduate seminar, Ch E 590/690, each semester. Students may register for the course a maximum of 8 times. Attendance will be taken each week and only 2 unapproved absences per semester are allowed.

Presentation - All Master's candidates are required to give at least two presentations at the graduate seminar, PhD students three presentations, before completing their degrees.

Residency Requirements

Master's Degree- The residence requirements are intended to ensure that the candidate has ample opportunity for close association with other scholars in the intellectual environment of the university. A candidate for a master's degree must be enrolled on the campus of New Mexico State University for a minimum of two regular semesters; or one semester and two six-week summer sessions, or four six-week summer sessions.

Doctoral Degree - Requirements for the Ph. D. ordinarily cannot be met in less than three years following the bachelor's degree, during which time the student must devote all working time to study and research. Graduate credit earned at other approved institutions may be counted toward requirements for the higher degree if accepted by the major department and the graduate dean. The minimum residence requirement for the doctoral degree shall include at least two regular semesters at NMSU, exclusive of summers, following completion of the first 30 credits of graduate work, provided the student is admitted to a doctoral program. During these two semesters, the student must be engaged full-time in academic pursuits on campus and must complete at least 9 credits of graduate course work each semester. Students will be considered to be engaged full-time in academic pursuits on campus if they hold appointments as graduate assistants, fellows, or trainees and complete 9 credits of coursework during a given semester. Employment other than as a graduate assistant must be found by the graduate dean to be compatible with residence as here defined. The research and writing connected with the dissertation is understood to require at least one year of full-time work.

Criteria for Milestones and Examinations for the Degree of *Master of Science*

The goals of the Master's program are three-fold:

- increase the student's understanding of chemical engineering fundamentals
- deepen the student's knowledge within a specialized area of chemical engineering
- broaden the student's knowledge in basic science and engineering.

These goals are achieved by a combination of required courses, elective courses, and independent thesis research. The required courses are in thermodynamics, transport phenomena, reaction kinetics and advanced engineering analysis. Elective courses come both from within the department and the university, often by the departments of Chemistry and Biochemistry, Experimental Statistics, Mathematics and Physics.

Minimum Grades and Credit Hours

Each undergraduate deficiency course must be passed with a minimum grade of B. An overall grade point average of 3.0 (minimum) must be maintained. Six credits of thesis or 6 credits of Ch E 598 are required for completion of an M.S. program. The thesis may be pursued in absentia at various industrial sites by special arrangement.

Course Requirements: M.S.

Courses Ch E 501, Ch E 506, Ch E 513, Ch E 516 and Ch E 542 constitute a core program that all MS candidates are required to pass with a minimum grade of B. M.S. students are also required to take 9 graduate elective course credits, six of which must come from the *Analysis and Experimental Tools* list, 2 credits of Ch E 590 seminar as outlined in the flowchart, and 6 thesis credits.

Students may select from the *Tools Electives* listed below, as necessary to fulfill the criteria specified for the degree in the graduate catalog; however, students are not bound by these lists. A student may, with the support of their research advisor, provide written appeal to the department head for approval of a course that does not appear on these lists. The document should be submitted electronically and must include the student's name, the research advisor's name, the justification for the request and a complete course description (department, course number, course title, and catalog description). The request will be approved or denied by the faculty at the next faculty meeting.

Experimental Tools Elective Courses

BCHEM 494	Techniques for Genetic Engineering
BIOL 506	Biological Transmission and Scanning Electron Microscopy
BIOL 591	Principles of Confocal Microscopy
BIOL 592	Microscopy Practicum
CHEM 471	Instrumental Methods of Analysis
CHEM 472	Analytical Methods for Toxic Organics and Metal Ions in the Environment
CHEM 521	Chemical Instrumentation
CHEM 526	Advanced Analytical Chemistry
CHEM 528	Electroanalytical Techniques
CHEM 529	Spectrochemical Analysis
CHEM 539	Spectroscopy
CHEM 606	Physical Methods in Inorganic Chemistry

Experimental Tools Elective Courses (continued)

GEOL 562	Analytical Geochemistry
PHYS 535	Experimental Spectroscopy
E ST 505	Statistical Inference I
E ST 506	Statistical Inference II

Analysis Tools Elective Courses

MATH 517	Complex Variables
MATH 518	Fourier Series and Boundary Value Problems
MATH 519	Calculus of Variations and Optimal Control
MATH 525	Advanced Linear Algebra
MATH 531	Ordinary Differential Equations
MATH 532	Partial Differential Equations
CS 467	C Programming
CS 475	Artificial Intelligence I
CS 487	Java Programming
PHYS 495	Mathematical Physics I
PHYS 496	Mathematical Physics II
E ST 503	SAS Basics
E ST 504	Statistical Software Applications

Thesis Requirements and Deadlines

An M.S. student must choose their advisor and thesis topic by the end of the first semester of enrollment. The M.S. Ch.E. supervision committee must be formed by the end of the first semester of enrollment (see form: Committee for Final Examination, Masters and Ed. Specialist). The committee must consist of the thesis advisor, one other faculty member from the Department of Chemical Engineering and a Dean's representative (a faculty member from another department). All members of the committee must be members of the graduate faculty at New Mexico State University. An application to candidacy, which formally summarizes the student's program of studies must be filed immediately after the student has completed 12 credits of graduate work in residence.

The thesis work *must* be presented in a graduate seminar. The Graduate School has **rigorous** requirements for the thesis format that must be followed. Print out and carefully follow the Guidelines for Preparing a Thesis or Dissertation, <http://gradschool.nmsu.edu/Guidelines/>.

A thesis may include chapters based on published or in-press journal articles generated from the thesis research.

Time Limit

The graduate program leading to the master's degree must be completed within seven years (or eight successive summers). Any course work more than seven years old at the time of the final examination will not be included in the program. Neither graduate credit nor grade-point average will be affected by courses taken seven or more years prior to admission or readmission to a master's program, provided the student has not been enrolled in a graduate school during that period.

Final Examination: M.S.

Be aware of the deadlines for final exams, etc. for graduation as published by the Graduate School. The final examination consists of a 30 to 45-minute seminar summarizing the thesis research for the committee. The seminar is followed by a rigorous oral defense of the thesis. The defense of the thesis may lead to additional questions in regard to the student's disciplinary knowledge base, but this is not a requisite of the exam. The Graduate School form to schedule this exam must be filed at least 10 working days in advance. Not later than seven (7) working days before the date of the final examination, the student must personally deliver a **final** copy of the thesis to each member of the examining committee.

Information from the Graduate School indicates that once a thesis is completed, the candidate should check with the editor at the Graduate School prior to the final typing of the document. This editor should ONLY be counted on to check that the dissertation meets format requirements (e.g. page numbering, margins, table and figure numbering, etc.). It is the candidate's responsibility to ensure that all format, stylistic, and grammatical rules are followed. A particular style, e.g. from the ACS style guide, must be followed consistently throughout the document.

Upon successful completion of the final exam, the department head should sign the Graduate School clearance card. The student should submit three (3) unbound copies (on 25% white cotton bond, 20-lb. paper) signed by the advisor that will be presented to the Graduate School Dean for signature. Before the advisor's signature can be obtained all obligations to the Department must be met (owed money must be paid and all keys must be returned). At this time, the following paperwork must be submitted to the Graduate School: binding slip (sent to chair of committee by Graduate School) and binding fee receipt (issued by the Business office to the student after the student pays for binding). The 3 copies of the thesis (with an abstract of not more than 350 words), the receipt for binding fees, and the signed binding slip will be deposited with the librarian in accordance with the schedule published by the Graduate School.

Any candidate failing the final exam may (1) upon recommendation of the advisor and the approval of the graduate dean, be granted a second examination after a lapse of at least one semester (or 16 weeks) or (2) be excluded from further candidacy for the degree. Failure in the second exam disqualifies a candidate from obtaining the degree.

Certification that thesis has been accepted and final examination has been passed must be filed with the Graduate School no later than one week before the conferring of the degree.

Required Forms (<http://gradschool.nmsu.edu/forms-index.html>)

A number of forms are required by the Graduate School, including: Application for Admission to Candidacy; Application for Degree (obtained from Office of the Registrar; \$30 filing fee, \$25 late fee); Application of Committee for Final Examination; Binding Fee Slip (\$30 required fee payable at the Business Office); and receipt for binding fee (issued by the Business Office).

Master of Science Degree Plan Checklist

Also see administrative checklist at <http://gradschool.nmsu.edu/Catalog/mastcheck.html>.

☞ Before or at Start of First Semester

- sign “Form 200” for receiving financial support through teaching (TA) or research (RA) assistantship (if applicable)
- attend NMSU Graduate School Orientation Program for new students
- attend Chemical Engineering Orientation
- register for courses after consulting with the New Graduate Student Advisor
- receive teaching assignment (for TAs)

☞ First Semester

- initiate formal course work
- attend the graduate seminar
- choose an advisor and thesis topic (if not already identified)
- with your advisor, form a master’s committee

☞ Second Semester

- continue course work and attendance at graduate seminar
- conduct independent research work

☞ Third Semester

- following completion of 12 graduate credits, file “Application for Admission to Candidacy for Master’s Degree” form with committee approval
- complete course work
- attend graduate seminar (present one seminar during semester)
- conduct independent research work

☞ Fourth Semester

- complete research and write thesis
- attend graduate seminar (present one seminar during semester)
- file “Application for Diploma”
- defend thesis; paperwork due in Grad School 10 working days in advance

NMSU Ch E M. S. Degree course flow diagram (08/09 catalog)

Coursework (24 cr)				Seminar (2 cr)	Research (6 cr)	Req'd Examinations	total credits = 32
Ch E 501 3 cr Intermediate Thermodynamics Fa	Ch E 516 3 cr Numerical Analysis Fa	Grad Elective 3 cr Experimental & Analysis Tools † Fa Sp	Ch E 590 1 cr Graduate Seminar Fa Sp				Year 1 - Fall 10 credit hours
Ch E 506 3 cr Intermediate Transport Phenomena Sp	Ch E 542 3 cr Intermediate Reactor Analysis and Design Sp	Ch E 513 3 cr Intermediate Engr. Data Analysis Fa	Graduate Seminar Attendance				Year 1 - Spring 9 credit hours
† see the Chemical Engineering Graduate Student Handbook for a list of courses that fulfill these requirements.					Ch E 599 3 cr Master's Thesis Fa Sp Su		Summer 1 - Fall 3 credit hours
	Grad Elective 3 cr Ch E Graduate Elective Fa Sp	Grad Elective 3 cr Experimental & Analysis Tools † Fa Sp	Ch E 590 1 cr Graduate Seminar Fa Sp	Ch E 599 3 cr Master's Thesis Fa Sp Su	Final Oral Exam defense of Master's thesis		Year 2 - Fall 10 credit hours

Criteria for Milestones and Examinations for the Degree of *Doctor of Philosophy*

The goals of the Doctoral program are to develop the candidate's: expertise within a field of chemical engineering; breadth in advanced engineering topics; ability to conduct independent research; and aptitude for identifying significant research issues.

For satisfactory completion of the Doctoral program, the candidate must demonstrate that their work is creative, novel and innovative. The Doctoral candidate is not formally admitted to candidacy until after passing both a qualifying examination and a comprehensive exam. The first exam, usually taken after the first year at NMSU, covers graduate-level understanding of the fundamentals of chemical engineering practice, including thermodynamics, transport phenomena, reaction kinetics and engineering mathematics. The comprehensive examination, usually taken 9 to 12 months after the qualifying exam, focuses on the candidate's proposed research: its scope, objectives and justification. During this time the required course work is also being completed with courses selected with the approval of the candidate's advisor.

Once the qualifying exam has been passed, the candidates focus on their research. The projects are tailored to the interests of the students such that the scope of the research satisfies both the requirements for the degree (specifically, originality and a combination of theoretical and experimental work) and the requirements of the funding source. Frequently the candidate is able to significantly influence the direction of the research based on knowledge gained while preparing for the comprehensive exam.

Students admitted to the M.S. program who successfully complete the required core Ch E Graduate courses with a 4.0 grade point average, with a signed recommendation from their defense committee, may request consideration to transfer to the Ph. D. program.

Course Requirements: Ph.D.

Students with a B.S. or M.S. in Ch E are required to take a minimum of 36 course credits and 18 dissertation credits; with specific requirements determined the advisor (additional work may be determined to be necessary). The 36 course credits must include at least 15 credits of the M.S. core curriculum, 9 credits of Ch E graduate elective courses, and 9 credits of Tools courses with at least one from each of the *Experimental Tools* and *Analysis Tools* categories. Up to 18 course credits from an M.S. degree (excluding seminars, special research programs, thesis, and similar topics) with the approval of the departmental faculty may be used to satisfy course requirements.

Individualized programs of study will be developed for students whose previous degree is in a discipline other than Chemical Engineering.

Qualifying Examination

Ph. D. candidates are expected to take the qualifying examination within one year of entering the Ph. D. program. The purpose of the qualifying examination is to determine the adequacy of a student for Ph. D. work. This written examination will be based on understanding of Masters level coursework and concepts. The examination will be offered once a year. The exam timing is selected to accommodate a maximum of students wishing to sit. Results are known to students within 2 weeks of the examination.

Upon successful completion of the qualifying examination, the student must submit the form “Program of Study and Committee for Doctoral Students” to the Graduate School. A student is admitted to the doctoral program after successful completion of the qualifying examination. The committee must consist of the student’s advisor, two other members of the faculty in Chemical Engineering and a Dean’s representative, a faculty member in another department at NMSU. All committee members must be members of the graduate faculty at NMSU. It is the candidate’s responsibility to check with the Graduate School as to the status of all potential committee members.

Comprehensive Examination

The comprehensive examination is taken 9 to 12 months after the qualifying exam. This exam focuses on a candidate’s proposed research: scope, objectives, and justification. This exam consists of two parts: a written dissertation proposal and an oral examination.

Dissertation Proposal (Written Examination)

The dissertation proposal will be developed in conjunction with the student’s major advisor and committee members, but should include significant independent analysis and planning by the student. It will include a thorough and critical review of the relevant literature, a statement of goals and specific objectives, an extensive outline of the experimental plan for accomplishing the stated objectives including some details of the procedures and approaches to be used and a complete list of references. The experimental plan should include a timetable for completion, including milestones for gauging progress. The proposal will be used as a guide for the dissertation research, with significant changes in content to be approved by the student’s committee. The final version should follow the formatting requirements of the dissertation as required by the Graduate School. Committee review and approval of the proposal is intended to assure that the scope and nature of the research represents a significant and novel contribution to the field of chemical engineering, meritorious of a dissertation when completed.

The proposal must be rewritten as frequently as deemed necessary to meet the satisfaction of the major advisor and the committee with respect to the content, readability, and clarity in the use of the English language. The dissertation proposal must be submitted to **all** committee members **ten business days** before the planned date of the oral examination. Defense of the proposal must precede defense of the dissertation by nine calendar months.

Oral Examination

The oral portion of the comprehensive examination will include a 30 to 45-minute presentation of the dissertation proposal. This presentation will be followed by a rigorous defense of the proposal. At the end of the oral portion of the exam, a single vote is cast by each committee member regarding the student’s performance on the written and oral portion of the comprehensive. The vote is: pass, fail, or adjourn. Two or more votes for adjourn will require the oral portion of the exam to be rescheduled within 15 working days (3 weeks); the committee may also require a rewrite of the written portion of the exam. Two or more votes for fail will require the committee to determine whether the student is disqualified from the comprehensive exam for the lapse of one semester, or disqualified from the Ph. D. degree program.

After successful completion of the comprehensive examination, a student must continue to register for at least 3 credits in dissertation or graduate course work each regular semester until the dissertation has been approved by the Graduate School. A student who fails to abide by this regulation will be considered withdrawn from the university, and in order to resume studies must formally apply for readmission and satisfy the requirements in effect at the time of reapplication.

Dissertation Requirements and Deadlines

A Ph. D. student must choose an advisor and thesis topic by the end of the first semester of enrollment. The Ph. D. supervision committee must be formed by the end of the second semester of enrollment (see form: Committee for Doctoral Examination). The committee consists of the advisor, two other Ch E faculty members, and a Dean's representative (a faculty member from a department outside of Chemical Engineering). All committee members must be members of the graduate faculty at NMSU.

Dissertation work must be presented in the graduate seminar. The Graduate School has rigorous requirements for the dissertation format which must be followed. These guidelines must be followed, and can be found at <http://gradschool.nmsu.edu/Guidelines/>.

Productive Ph. D. candidates frequently have already published or have in press journal articles resulting from the dissertation research, and these articles often have more than one author. In this event, the articles should include a footnote indicating that the research was performed in part for the dissertation. On the other hand, the dissertation has only one author. When the student is the senior author on an article, it may be included as a chapter in the dissertation provided that the student was in fact the primary researcher and drafted (authored) the article. When the student is the junior author on an article, or was not the primary researcher, or did not draft the article, the article may not be a chapter in the dissertation unless: (1) the student extracts the portion of work on which he/she was the primary researcher and redrafts (authors) the text; or (2) the student made significant contributions to the entire work reported and redrafts (authors) the entire text. There may be other special situations not covered here that will require a recommendation from the student's committee and approval of the department head. If such articles are used in the dissertation as chapters, the acknowledgments section should clearly identify that work presented which was not the student's own. When chapters are used, the dissertation must include a general introduction for the whole body of work and a general discussion that interrelates the entire body of work as a coherent whole.

Time Limit

If more than five years have elapsed since the date of the comprehensive examination, the candidate will be required to take another comprehensive examination before admission to the final examination.

Final Examination: Ph. D.

Be aware of the deadlines for final exams, etc. for graduation as published by the Graduate School. The final examination consists of a 45 to 60-minute seminar summarizing the dissertation research for the committee. The seminar is followed by a rigorous oral defense of the dissertation. The defense of the dissertation may lead to

additional questions in regard to the student's disciplinary knowledge base, but this is not a requisite of the exam. The Graduate School form to schedule this exam must be filed at least 10 working days in advance. Not later than seven (7) working days before the date of the final examination, the student must personally deliver a **final** copy of the dissertation to each member of the examining committee.

Information from the Graduate School indicates that once a dissertation is completed, the candidate should check with the editor at the Graduate School prior to the final typing of the document. This editor should **ONLY** be counted on to check that the dissertation meets format requirements (e.g. page numbering, margins, table and figure numbering, etc.). It is the candidate's responsibility to ensure that all format, stylistic, and grammatical rules are followed. A particular style, e.g. from the ACS style guide, must be followed consistently throughout the document.

Upon successful completion of the final exam, the department head should sign the Graduate School clearance card. The student should submit three (3) unbound copies (on 25% white cotton bond, 20-lb. paper) signed by the advisor that will be presented to the Graduate School Dean for signature. Before the advisor's signature can be obtained all obligations to the Department must be met (owed money must be paid and all keys must be returned). At this time, the following paperwork must be submitted to the Graduate School: NSF Survey of Earned Doctorates, signed Doctoral Dissertation Agreement Form, binding slip (sent to chair of committee by Graduate School) and binding fee receipt (issued by the Business office to the student after the student pays for binding). The 3 copies of the dissertation (with an abstract of not more than 350 words), the receipt for binding fees, and the signed binding slip will be deposited with the librarian in accordance with the schedule published by the Graduate School.

A candidate who fails in the final examination may (1) upon recommendation of the advisor and approval of the graduate dean, be granted a second examination after a lapse of at least one semester (or 16 weeks) or (2) be excluded from further candidacy for the degree. Failure in the 2nd examination disqualifies a candidate from obtaining the degree.

Required Forms (<http://gradschool.nmsu.edu/forms-index.html>)

Program of Study and Committee for Doctoral Students, Application for Degree (available at the Office of the Registrar; \$30 filing fee and, if applicable, a \$25 late fee), Committee for Doctoral Examination (check appropriate box each time - Comprehensive or Final), Binding Fee Slip (\$30 required fee payable at the Business Office) and receipt for binding fee (issued by the Business Office), NSF Survey of Earned Doctorates and signed Doctoral Dissertation Agreement Form (obtain from the editor), and Thesis/Dissertation Processing Form (available only on-line).

Doctor of Philosophy Degree Plan Checklist

Also see administrative checklist at <http://gradschool.nmsu.edu/Catalog/doccheck.html>.

Before or at Start of First Semester

- sign *Form 200* for financial support by teaching (TA) or research (RA) assistantships
- attend NMSU Graduate School Orientation Program for new students
- attend Chemical Engineering Orientation
- register for courses after consulting with the New Graduate Student Advisor
- receive teaching assignment (for TAs)

First Semester

- initiate formal course work attend graduate seminar
- choose an advisor and dissertation topic (if not already identified)
- with your advisor, form a doctoral committee

Second Semester

- continue course work attend graduate seminar

After completion of core graduate courses (Ch E 501, 506, 513, 516, 542)

- take qualifying exam and file results
- file "Program of Study and Committee for Doctoral Students"

Third Semester

- continue elective course work attend graduate seminar
- conduct literature review begin independent research

Fourth Semester

- continue elective course work attend graduate seminar
- continue independent research

Fifth Semester

- continue elective course work attend graduate seminar
- present at graduate seminar continue independent research
- submit dissertation proposal (written portion of comprehensive exam)
- take oral portion of comprehensive exam;
paperwork due in Graduate School 10 working days in advance
- obtain committee approval to write dissertation

Sixth Semester

- complete elective course work attend graduate seminar
- continue independent research present at graduate seminar

Seventh Semester

- continue writing of dissertation attend graduate seminar
- continue independent research present at graduate seminar

Eighth Semester

- complete writing of dissertation attend graduate seminar
- present at graduate seminar file "Application for Diploma"
- defend dissertation; paperwork due in Graduate School 10 working days in advance

NMSU Ch E PhD Degree course flow diagrams (08/09 catalog)

Suggested course flowsheet for the Ph.D. degree in Chemical Engineering at NMSU for students starting with an B.S. Ch E.

Coursework (36 cr)				Seminar (3 cr)	Research (18 cr)	Req'd Examinations	total credits = 57
Ch E 501 3 cr Intermediate Thermodynamics Fa	Ch E 516 3 cr Numerical Analysis Fa	Grad Elective 3 cr Experimental & Analysis Tools † Fa Sp	Ch E 690 1 cr Graduate Seminar Fa Sp				Year 1 - Fall 10 credit hours
Ch E 506 3 cr Intermediate Transport Phenomena Sp	Ch E 542 3 cr Intermediate Reactor Analysis and Design Sp	Ch E 513 3 cr Intermediate Engr. Data Analysis Fa	Ch E 690 1 cr Graduate Seminar Fa Sp			Qualifying Exam at completion of core Ch E coursework	Year 1 - Spring 10 credit hours
		Grad Elective 3 cr Experimental & Analysis Tools † Sp	Graduate Seminar Attendance	Ch E 699 3 cr Independent Research Program Fa Sp Su			Year 2 - Fall 6 credit hours
		Grad Elective 3 cr Analysis Tools † Sp	Graduate Seminar Attendance	Ch E 699 3 cr Independent Research Program Fa Sp Su			Year 2 - Spring 6 credit hours
		Grad Elective 3 cr Experimental Tools † Sp	Graduate Seminar Attendance	Ch E 699 3 cr Independent Research Program Fa Sp Su		Comprehensive Exam <i>defense of doctoral proposal</i> <i>(minimum 9 months prior to final oral exam)</i>	Year 3 - Fall 6 credit hours
		Grad Elective 3 cr Ch E Graduate Elective Fa Sp	Graduate Seminar Attendance	Ch E 700 3 cr Doctoral Dissertation Fa Sp Su			Year 3 - Spring 6 credit hours
		Grad Elective 3 cr Ch E Graduate Elective Fa Sp	Graduate Seminar Attendance	Ch E 700 3 cr Doctoral Dissertation Fa Sp Su			Year 4 - Fall 6 credit hours
† see the Chemical Engineering Graduate Student Handbook for a list of courses that fulfill these requirements.		Grad Elective 3 cr ENGR or Nat'l Sci Elective Fa Sp	Ch E 690 1 cr Graduate Seminar Fa Sp	Ch E 700 3 cr Doctoral Dissertation Fa Sp Su		Final Oral Exam defense of doctoral dissertation	Year 4 - Spring 7 credit hours

Suggested course flowsheet for the Ph.D. degree in Chemical Engineering at NMSU for students starting with an M.S. Ch E.

Coursework		Seminar	Research	total credits = 36
Grad Elective 3 cr Graduate Elective Course Fa Sp	Grad Elective 3 cr Experimental Tools † Fa Sp	Ch E 690 1 cr Graduate Seminar Fa Sp	Ch E 700 1 cr Doctoral Dissertation Fa Sp Su	Year 1 - Fall 8 credit hours
Grad Elective 3 cr Graduate Elective Course Fa Sp	Grad Elective 3 cr Analysis Tools † Fa Sp	Ch E 690 1 cr Graduate Seminar Fa Sp	Ch E 700 1 cr Doctoral Dissertation Fa Sp Su	Year 1 - Spring 8 credit hours
Grad Elective 3 cr Graduate Elective Course Fa Sp		Ch E 690 1 cr Graduate Seminar Fa Sp	Ch E 700 4 cr Doctoral Dissertation Fa Sp Su	Year 2 - Fall 8 credit hours
			Ch E 700 6 cr Doctoral Dissertation Fa Sp Su	Year 2 - Spring 6 credit hours
† see the Chemical Engineering Graduate Student Handbook for a list of courses that fulfill these requirements.			Ch E 700 6 cr Doctoral Dissertation Fa Sp Su	Year 3 - Fall 6 credit hours

Expectations and Responsibilities of graduate students performing experimental research projects in Chemical Engineering

To assist the principal investigator (PI) in the process of performing research, graduate students are expected to perform the following tasks:

Literature search and review

Students are expected to perform a search of the literature using both online and library resources. Online resources must include use of Science Citation Index to identify key publications and the ISI reference citation to identify additional related papers. Students should obtain an abstract of papers identified as relevant, and share such abstracts with the PI. Students should obtain electronic versions of the full paper for those abstracts that appear relevant, or order the key papers from Inter Library Loan, or request the PDF directly from the author(s).

Experimental design

Students should assure they understand the objectives of the project on which they are assigned to work. The project PI should supply a copy of any relevant proposals or project plan that will aid the student to understand the major tasks and challenges associated with the project, as well as provide guidance on anticipated results, as well as to barriers to success.

Students are expected to seek understanding of the experiment principles. Students should find a closely related paper, draft a flow diagram, and list major transport processes and reactions associated with the project.

With this understanding, students should draft a *Wish List* containing what they perceive as necessary chemicals, instruments, supplies, analytical methods. This list should then be discussed with the PI.

Students are expected to draft an Experimental Plan, that fully documents experimental procedures, major processing conditions, and safety considerations. This draft should include a finalized Process Flow Diagram (PFD) in electronic format for the process they intend to operate. The draft should also present selected instruments, chemicals, supplies, and a summary of all experimental conditions. The document should also outline anticipated results based on the reading of literature.

Purchasing chemicals and supplies

Students are expected to generate a *Shopping List* all items needed for their experimental work. This list should include vendors with price quotations. The list should be created on an approved purchase order form. Upon approval and signature of the PI, the student is expected to place the order. Once the order is placed, students should follow up on the order by contacting vendors for shipping date and checking with department office for shipments. Students should check the order for accuracy and completeness upon arrival, and sign off that the items were received with the departmental secretary.

Training

Students will enroll in and attend the appropriate safety training through the NMSU Environmental Health & Safety Office. Scheduling and Registration for these courses can be completed online at <http://safety.nmsu.edu/>. The following courses are required of **all** Ch E Graduate Students:

- Employee & Hazard Communication Safety (HazCom)
- Hazardous Waste Management
- Laboratory Standard

Any other courses that need to be taken should be discussed and approved by the PI.

Preparation of experimental unit

Students should setup the experiments following the PFD, seeking assistance from the PI, department technician, and fellow students where appropriate. Students are expected to use common sense and caution. Students should never begin an experiment unless a safety review has been performed.

Students are expected to be experts in the operation of all analytical instrumentation through reading of the instruction. Students are expected to consult vendors for clarification where the operating instructions are unclear.

Safety Review

Students will prepare all necessary safety review documentation. Students should secure a copy of any previously approved safety documents for their experimental work, and discussion with the PI and the Departmental Technician.

Experimental unit test run & modification plans

Students will complete a test run at design conditions and collect a set of data. Upon completion of one run, a discussion of the results with the PI should be scheduled before proceeding. Any necessary proposed modifications should be documented and executed. In some cases, this may require the safety review be modified and signed off on by appropriate personnel.

Operation of experimental units

Students should again review the experiment plan and assure they are following all documented safety procedures. Begin by preparing necessary sampling systems, before starting the experiments. Assure alarms are set.

Observe and monitor experiment progress closely. Assure that automatic control are working as intended, and that data logging is on and operating. Do not leave an experiment unattended unless the appropriate unattended experiment documentation is complete and signed. Clean up after each experiment, or on a daily basis.

Recording original experimental data

Observe the experiments carefully. Record in a bound notebook what you observed. Record any unusual procedures. Record all numerical data, including any *bad results* (or

unexpected results), always including units. Always record the time and date of the experiment. Never leave a lab notebook unattended

Processing and presenting experimental data

Transfer the original data into computer files (typically Microsoft Excel). Convert data into SI units. Develop a graphical presentation or plot the data, if possible. Compare results with that which was anticipated. Evaluate the data, and record the data file name in lab notebook. Attach the processed data to original data. Repeat experiments for questionable data points.

Prepare one-page summary of the results. Bring original lab notebook and processed data to meet with the PI. Also bring related literature or published data. Do your homework and be prepared to be challenged on your results, and to suggest solutions to problems occurred. Prepare a question list or shopping list prior to the meeting, and modify as necessary during the meeting.

Documentation of results

Collect all of the previously created experimental summaries from each experimental run, and use these to prepare a report or memo, comparing your results with literature or calculated expectations. Discuss with PI the expected format of the document. Seek and select a journal for publication of the work (obtain PI approval to proceed with the submission to the selected journal). Read the *instructions for authors* document for the selected journal, and download samples. Prepare an outline of the manuscript, including tables, figures and references. Work with PI to develop an editing schedule for completion of the manuscript.

Housekeeping and analytical instrument maintenance

Analytical instruments are expensive and are resources of the faculty member who secured their procurement. Before using an analytical resource, be sure you have the permission of the faculty member to whom the unit belongs.

Always clean up your mess in the lab. Label and store samples and chemicals properly as instructed in EHS training. Clean all instruments, containers, tools, and other items used in the process of performing your research. Housekeeping includes maintaining the floor and countertops clean. Dispose used chemicals and wastes as per EHS training.

Assure you close and lock the laboratory door when you leave the lab.

Emergency Contact

In an emergency, call 911 for Police, Fire, or Medical attention first. You will be put in direct contact with a dispatcher who will send the appropriate help. Then contact the PI.

Chemical Engineering Department Exit Checklist

This checklist has been prepared by the Ch E Faculty to assure a smooth transition from the department. This list must be completed with appropriate signatures at completion of the program in Chemical Engineering to prevent delays in the assignment of the degree.

<p>Department Secretary</p> <p>Name: _____</p> <p>Signature _____ date: ___ / ___ / ___</p> <p><input type="checkbox"/> departmental keys returned</p> <p><input type="checkbox"/> Shires Library materials returned</p>
<p>Department Technician</p> <p>Name: _____</p> <p>Signature _____ date: ___ / ___ / ___</p> <p>Research Advisor</p> <p>Name: _____</p> <p>Signature _____ date: ___ / ___ / ___</p> <p><input type="checkbox"/> chemical inventory disposition</p> <p><input type="checkbox"/> chemical waste disposal</p> <p><input type="checkbox"/> laboratory cleanup</p> <p><input type="checkbox"/> borrowed hardware/software returned</p>
<p>NMSU Librarian</p> <p>Name: _____</p> <p>Signature _____ date: ___ / ___ / ___</p> <p><input type="checkbox"/> no outstanding NMSU Library resources</p>
<p>Department Head</p> <p>Name: _____</p> <p>Signature _____ date: ___ / ___ / ___</p>