Chemical and Biomolecular Engineering

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Professional Master’s Program

It is our pleasure to welcome you to the Professional Master’s (MChE) program at Rice.

The MChE program offers a nonthesis, professional degree intended to prepare students for a career in the field of chemical engineering. Opportunities for new graduates span industries focused on energy engineering, petrochemical, materials, biotechnology, and environment and safety.

Students with a Bachelor’s degree in Chemical Engineering can complete the course work in two semesters. The curriculum also allows for students with a non-chemical engineering background to obtain the MChE degree. For such students, additional semesters are needed in order to take foundational chemical engineering courses that would be expected of a student with a bachelor’s degree in chemical engineering. Besides courses within the department, ample opportunities exist for students to take courses in other departments to fulfill degree requirements.

An important component of our program is the strong emphasis we place on the overall professional development of the student. Students will have opportunities to enhance their communication skills, understand engineering leadership and project management, and interact with industry representatives through seminars and career-development workshops offered under the aegis of the Professional Master’s program at Rice.

We in the department and the university continuously seek to revise and adapt the curriculum to maintain the highest academic standards and better meet current and expected future industry needs. Sample courses/plan given below should thus be treated only as a broad guideline to get you started in fashioning your studies at Rice.

Our heartiest best wishes as you embark on a new adventure!
1) Minimum of 30 hrs (10 three-credit hour) courses at 500 level or higher
2) MChE students are required to take the following core graduate chemical engineering courses: Thermodynamics (CHBE 611), Transport (CHBE 501, CHBE 602), Kinetics (CHBE 590), and Mathematics (CHBE 692)
   (A) If a student has a compelling reason for wanting to opt out of a core course, the petition needs to made to the MChE program Director. The final decision will be made by the Director in conjunction with the graduate studies committee.
3) Must maintain a GPA of B- or better in each course.
4) Students must meet the residency requirement.

Of the 30 hrs noted above

5) Minimum of 18 hrs (6 three-credit hour) CHBE courses
   (A) Students with non-Chemical Engineering Undergraduates need to take core chemical engineering courses that will not count towards the MChE degree.
6) Minimum of 3 hrs (1 three credit hour) approved mathematics training
7) Approved engineering, natural science, policy and management courses
Chemical and Biomolecular Engineering

Policies & Procedures

1. Rule for MChE Students to transfer to the MS Program/PhD program

MChE students cannot apply to the PhD program in Chemical Engineering at Rice. In exceptional cases, after the student has completed the MChE program, the graduate studies committee may consider the student’s request to transfer to the PhD program.

MChE students who have undertaken independent study with a faculty in the department, can with inputs from their faculty mentor apply to switch to the thesis-based MS program. On a case-by-case basis based on inputs from the faculty mentor and the Director of the MChE program, the graduate committee may allow the student to switch to the MS program.

2. Independent study (CHBE 695) and internships

The CHBE 695 course offered in Fall and Spring can be used to undertake independent study either in a research group in the department or outside in an industrial setting. The credit hours for this course is capped at 1 for work done outside the university and a maximum of 3 for work done on campus. Final decision on accepting the proposal for independent study rests with the director of the MChE program (also the instructor for CHBE 695) and the chair of the graduate committee.

For off-campus independent study the student needs to first present an offer letter (from the company) stating clearly the work the student will pursue. The student needs to make an initial written presentation on how the work will contribute to his/her professional and intellectual development in Chemical and Biomolecular engineering. After approval by the Director of the MChE program, the student is required to turn in biweekly reports (duly signed by the off-campus supervisor) documenting their progress. For such off-campus independent study, the student may accept appropriate financial support from the company offering the internship. Foreign students additionally need to have a curricular practical training endorsement for off-campus work.

For Summer Internships under ENGI 530, the student needs to secure the internship early in Spring and update the Director of the MChE program of the internship plans. ENGI 530 is lead by Dean Bart Sinclair, and the student needs to get in touch with him early and finalize the plans.

3. Satisfactory progress

MChE students are expected to make continuous and satisfactory progress towards fulfilling the degree requirements. Students must maintain a GPA of B- or better in each course. In accordance with university policy (see General Announcements at ga.rice.edu) students whose CGPA falls below 2.67 or the semester GPA falls below 2.33 are placed on probationary status. University policy further states that any student placed on probationary status for a second semester will lead to an automatic dismissal by the Office of Graduate and Postdoctoral Studies, unless the student’s department presents a plea for exception that is approved by the Dean of Graduate and Postdoctoral Studies.
Chemical and Biomolecular Engineering

Policies & Procedures

4. Rice University policies applicable to all graduate students

4.1 Leaves of Absence
All graduate students are expected to maintain continuous enrollment, unless an official leave of absence has been granted. Failure to register for any period without a leave of absence granted by the Associate Provost constitutes de facto withdrawal. If a student later wishes to resume study, reapplication is required. Readmission is given only on the recommendation of the department and the approval of the Associate Provost.

A leave of absence is granted only by the Office of Graduate and Postdoctoral Studies upon the recommendation of the department, and is granted only to students in good standing with the University. Leave must be approved in advance of the academic semester in question; it will not be granted after the student has registered for courses or after the registration period has passed. Normally, leave of absence is granted for no more than two consecutive semesters. No work toward a degree may be done at Rice or involve Rice faculty (or facilities) during a student's leave of absence.

4.2 Residency requirement and part-time status
Semester course load for full-time students is nine (9) hours or more for the fall and spring semesters to satisfy the residency requirement. Students dropping below the nine hours and registering for at least three hours are considered part-time. Students who wish to obtain part-time status must notify and obtain written permission from the MChE Director and the Department Coordinator before the semester begins. As a part-time student the tuition paid will be based on the number of registered hours times the hourly tuition rate. Rates are found in the General Announcements / Tuition, Fees & Expenses at ga.rice.edu.

5. Guidelines for dismissals, petitions, appeals, grievances, and problem resolution
Rice University graduate students have guidelines to assure fairness in problem resolution. These policies strive to uphold standards and raise the quality of graduate programs. They provide graduate students with an environment that has high standards, clear assessments of the student's achievements and fair and transparent procedures for handling cases of inadequate academic progress. Please find the complete list of guidelines in the General Announcements for graduate students at www.ga.rice.edu. These guidelines are to be followed by all Rice graduate students. The CHBE Graduate Studies Committee will be the standing committee for all issues regarding these guidelines.
6. Title IX sexual misconduct policy

Rice encourages any student who has experienced an incident of sexual, relationship, or other interpersonal violence, harassment or gender discrimination to seek support. There are many options available both on and off campus for all graduate students, regardless of whether the perpetrator was a fellow student, a staff or faculty member, or someone not affiliated with the university.

Students should be aware when seeking support on campus that most employees are required by Title IX to disclose all incidents of non-consensual interpersonal behaviors to Title IX professionals on campus who can act to support that student and meet their needs. The therapists at the Rice Counseling Center and the doctors at Student Health Services are confidential, meaning that Rice will not be informed about the incident if a student discloses to one of these Rice staff members. Rice prioritizes student privacy and safety, and only share disclosed information on a need-to-know basis. If you are in need of assistance or simply would like to talk to someone, please call Rice Wellbeing and Counseling Center, which includes Title IX Support: (713)348-3311.

Policies, including Sexual Misconduct Policy and Student Code of Conduct, and more information regarding Title IX can be found at safe.rice.edu.

7. Time Boundaries

Students in non-thesis master’s degree programs, including professional master’s programs, must submit a certification of non-thesis master’s through the department chair to the Office of Graduate and Postdoctoral Studies. Master’s students must be approved for candidacy before the beginning of the fifth semester of their enrollment at Rice. In order to qualify for a given commencement, students must meet the submission deadline for commencement per the Academic Calendar. The calendars can be found at registrar.rice.edu.
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CHBE Course Options

Our course offerings are continuously updated. The list below offers some suggestions on courses that are standardly given in the department. Courses marked with an asterisk are required.

1) CHBE 501 (Fall) Fluid Mechanics and Transport Processes*
2) CHBE 503 (Fall) Design Fundamentals
3) CHBE 523 (Fall) Bioengineering Systems & Control
4) CHBE 550 (Fall) Petroleum phase behavior and flow assurance
5) CHBE 555 (Fall) Two-phase flow & multiphase flow
6) CHBE 560 (Spring) Colloidal and Interfacial Phenomena (offered even years)
7) CHBE 570 (Fall) Industrial Catalysis and Petrochemical Processes
8) CHBE 580 (Fall) Protein Engineering
9) CHBE 590 (Fall) Advanced Reaction Engineering*
10) CHBE 594 (Spring) Properties of Polymers (offered odd years)
11) CHBE 602 (Spring) Physicochemical Hydrodynamics*
12) CHBE 603 (Fall) Rheology (not offered every year)
13) CHBE 611 (Spring) Advanced Topics — Thermodynamics*
14) CHBE 615 (Fall) Application of molecular simulation and statistical mechanics
15) CHBE 620 (Spring) Tissue Engineering
16) CHBE 640 (Fall) Metabolic Engineering
17) CHBE 571 (Spring) Flow and transport through porous media I (offered odd years)
18) CHBE 671 (Spring) Flow and transport through porous media II (offered even years)
19) CHBE 682 (Spring) Systems Biology of human diseases
20) CHBE 692 (Spring) Numerical Methods in Differential Equations*
21) CHBE 695 (Fall/Spring) Independent Study

For students entering with a non-Chemical Engineering background the following courses would be required (unless we determine otherwise on a case-by-case basis)

1) CHBE 390 (Fall) Kinetics & Reactor Design
2) CHBE 401/402 (Fall/Spring) Transport Phenomena I and II
3) CHBE 411/412 (Fall/Spring) Thermodynamics I and II
4) CHBE 503 (Fall) Design Fundamentals — course will count towards MChE degree requirements
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Possible Electives
(to give a flavor of what is available at Rice)

BIOE (Bioengineering)
1) BIOE 502 (Fall) Physical Biology
2) BIOE 518 (Spring) Introduction to Computational Biology
3) BIOE 523 (Fall) Control theory and Systems/synthetic biology
4) BIOE 543 (Fall) DNA Biotechnology, Biophysics, and Modeling
5) BIOE 552 (Fall) Introductory computational systems biology

CAAM (Computational and Applied Mathematics)
1) CAAM 508 (Fall) Nonlinear systems: Analysis and Control
2) CAAM 551 (Fall) Numerical Linear Algebra
3) CAAM 553 (Fall) Advanced Numerical Analysis I

CEVE (Civil & Environmental Engineering)
1) CEVE 501 (Fall) Environmental Chemistry
2) CEVE 502 (Fall) Sustainable Design
3) CEVE 505/ENGI 505 (Fall) Engineering Project Management & Economics
4) CEVE 528 (Spring) Engineering Economics

EARTH SCIENCE
1) ESCI 471 (Fall) Earth systems modeling: Numerical techniques and applications (course covers applying basic numerical methods using Matlab and COMSOL)
   (A) Students interested in this course, need to discuss with MChE director first
2) ESCI 518 (Fall) Dimensional Analysis in Earth Science (1 credit seminar course)

ELECTRICAL & COMPUTER ENGINEERING
1) ELEC 565 (Fall) Materials for energy and photocatalysis
2) ELEC 680/BIOE 680 (Fall) Nano-neurotechnology

ENGINEERING
1) ENGI 505 (Fall) Engineering Project Management and Economics
2) ENGI 530 (Fall/Spring) Engineering Practicum (internship must be identified before enrolling)
3) ENGI 610 (Fall) Management for Science and Engineering
Chemical and Biomolecular Engineering

Possible Electives
(to give a flavor of what is available at Rice)

ENST (Environmental Studies)
1) ENST 437/ECON 437 (Fall) Energy Economics.
   (A) Students interested in this course, need to discuss with MChE director first

MSNE (Material Science and Nanoengineering)
1) MSNE 502 (Fall) Mechanical Properties of Materials
2) MSNE 506 (Fall) Physical Properties of Solids
3) MSNE 661 (Fall) Nanophotonics, Spectroscopy, and materials for sustainability

PHYS (Physics)
1) PHYS 517 (Spring) Computational Physics
2) PHYS 533 (Fall) Nanostructure and nanotechnology I
3) PHYS 534 (Spring) Nanostructure and nanotechnology II

POST (Policy Studies)
1) POST 401 (Fall) Energy Policy.
   (A) Students interested in this course, need to discuss with MChE director first

STAT (Statistics)
1) STAT 615 (Fall) Introduction to Regression and Statistical Computing
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Sample MChE Plans

We are working on trying to have Independent Study/Engineering Practicum as a course possibility. We will keep you updated on developments in this regard. For a program with emphasis on only chemical engineering fundamentals, we show both a “relaxed” schedule and a two-semester program for students with a strong Chemical engineering background.

1) MChE with emphasis on Chemical Engineering fundamentals

<table>
<thead>
<tr>
<th>Fall (1st Semester)</th>
<th>Spring (2nd Semester)</th>
<th>Fall (3rd Semester)</th>
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<tbody>
<tr>
<td>CHBE 501</td>
<td>CHBE 560 or CHBE 594</td>
<td>Elective</td>
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<tr>
<td>CHBE 590</td>
<td>CHBE 602</td>
<td>Elective</td>
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<tr>
<td>CHBE 611</td>
<td>CHBE 692</td>
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<tr>
<td>Math elective or some course from another department</td>
<td>CEVE 528 or a suitable Economics/Policy/Management Course</td>
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2) MChE 2-semester plan with emphasis on Chemical Engineering fundamentals

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<td>CHBE 692</td>
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<tr>
<td>Math elective</td>
<td>CEVE 528 or a suitable Economics/Policy elective</td>
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<tr>
<td>CHBE elective (e.g., CHBE 550 / CHBE 580) or course from another department</td>
<td>CHBE 593 or 603 (if offered) or suitable elective from another departments</td>
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Sample MChE Plans

3) MChE with focus on Energy Engineering

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<thead>
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<tr>
<td>CHBE 501</td>
<td>CHBE 560</td>
<td>Energy Policy/Economics elective</td>
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<tr>
<td>CHBE 590</td>
<td>CHBE 602</td>
<td>CEVE 505</td>
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<tr>
<td>CHBE 611 / CHBE 615</td>
<td>CHBE 692</td>
<td>CHBE 593 or 603 (if offered)</td>
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<tr>
<td>CHBE 550 / CHBE 570</td>
<td>CHBE 571 or CHBE 671</td>
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<td></td>
<td>Possible Independent Study</td>
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4) MChE with focus on Bioengineering/Biophysics

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<td>BIOE 543</td>
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<tr>
<td>CHBE 640</td>
<td>CHBE 602</td>
<td>Project Management or similar elective suitable to the Biotech Industry</td>
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<tr>
<td>CHBE 611</td>
<td>CHBE 620</td>
<td>Elective</td>
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<tr>
<td>CHBE 580 / CHBE 523</td>
<td>BIOE 518</td>
<td>Elective</td>
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### Sample MChE Plans

#### 5) MChE with focus on Material Science and Nanotechnology

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<td>CEVE 505</td>
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<td>CHBE 611</td>
<td>PHYS 534 / ELEC 565</td>
<td>CHBE 593 or 603 (if offered)</td>
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<td>MSNE 502 / MSNE 506 / PHYS 533</td>
<td>ELEC 680</td>
<td>Math elective</td>
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