

MEng Degree: Outcomes & Assessment Protocols

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Preamble

The MEng degree at Cornell differs substantially from the MS and other primarily research degrees, being mostly regarded as a 'professional masters' program. It has been the subject of two highly in-depth reports over the past decade which have looked extensively at every aspect of the degree program, many of these having very direct relevance to the current document.

In assembling the attached summaries of the 15 subject foci, it should be observed that each program has circulated drafts amongst their colleagues for approval, and each has agreed that over time they can gather the stated data for self-evaluation. The express intent is not that each 'outcome' be assessed every year, but that each year one or more 'outcomes' will be investigated, the feedback from which can then be used to inform the conduct of the program.

The learning outcomes for all the MEng Programs are attached. The programs are:

- Aerospace Engineering
- Biological and Environmental Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil and Environmental Engineering
- Computer Science
- Electrical and Computer Engineering
- Engineering Management
- Engineering Mechanics
- Engineering Physics
- Geological Sciences
- Materials Science and Engineering
- Mechanical Engineering
- Operations Research and Information Engineering
- Systems Engineering

Although there is a broad spread of disciplinary foci represented here, there has been a broad agreement by most fields on somewhat common objectives (learning

outcomes) and methods of assessment, with most fields adjusting the precise flavor of these to match their disciplines. In *broad terms* these are:

- Mastery of core knowledge
- Problem formulation and solution
- Collaboration and teamwork
- Communication
- Self-directed learning and professional development

with corresponding assessment tools:

- Course deliverables
- Project reviews
- Presentation evaluations
- Student exit surveys
- Job placement statistics and recruiter feedback
- Alumni feedback and involvement
- Student peer evaluation
- Department program reviews

Significantly more detailed materials for each program have been lodged with the Graduate School to facilitate a more careful analysis, however we append a brief summary for each of the fields.

1. Aerospace Engineering

a. List of core learning outcomes:

- i. Mastery and Application of Core Disciplinary Knowledge
- ii. Problem Formulation and Planning of the Solution Process
- iii. Collaborative Problem Solving
- iv. Communication of Knowledge, Reasoning and Technical Results
- v. Learning and Professional Development

2. Biological and Environmental Engineering

a. List of core learning outcomes:

- i. Mastery and Application of Core Disciplinary Knowledge
- ii. Problem Formulation and Solution
- iii. Collaborative Problem Solving
- iv. Communication of Knowledge, Ideas and Decision Justification
- v. Professional Development and Career Advancement

3. Biomedical Engineering
 - a. List of core learning outcomes:
 - i. Mastery and Application of Biomedical Engineering Knowledge
 - ii. Problem Identification, Analysis, Solution and presentation of Results
 - iii. Communication of Knowledge, including Data Analysis and Presentation of Results
 - iv. Self-directed Learning and Professional Development

4. Chemical Engineering
 - a. List of core learning outcomes:
 - i. Mastery and Application of Chemical Engineering Knowledge
 - ii. Problem Formulation, Analysis, Solution and Presentation of Results
 - iii. Communication of Knowledge, including Analysis and Design
 - iv. Self-directed Learning and Professional Development

5. Civil and Environmental Engineering
 - a. List of core learning outcomes:
 - i. Mastery and Application of Core Disciplinary Knowledge
 - ii. Problem Formulation and Organization
 - iii. Collaborative Problem Solving and Issue Resolution
 - iv. Communication of Knowledge, Ideas and Decision Justification
 - v. Preparation for Self-directed Learning and Professional Development

6. Computer Science
 - a. List of core learning outcomes:
 - i. Mastery and Application of Core Disciplinary Knowledge
 - ii. Problem Formulation, Organization, and Planning of the Solution Process
 - iii. Collaborative Problem Solving and Issue Resolution
 - iv. Communication of Knowledge, Ideas and Decision Justification
 - v. Self-directed Learning and Professional Development

7. Electrical and Computer Engineering
 - a. List of core learning outcomes:
 - i. Gain Advanced Technical Knowledge
 - ii. Master Critical Professional Skills
 - iii. Gain Project Design Experience

8. Engineering Management

- a. List of core learning outcomes:
 - i. Mastery and Application of Core Disciplinary Knowledge
 - ii. Problem Formulation, Organization, and Planning of the Solution Process
 - iii. Collaborative Problem Solving and Issue Resolution
 - iv. Communication of Knowledge, Ideas and Decision Justification
 - v. Preparation for Self-directed Learning and Professional Development

9. Engineering Mechanics

- a. List of core learning outcomes:
 - i. Mastery and Application of Core Disciplinary Knowledge
 - ii. Problem Formulation and Planning of the Solution Process
 - iii. Collaborative Problem Solving
 - iv. Communication of Knowledge, Reasoning and Technical Results
 - v. Learning and Professional Development

10. Engineering Physics

- a. List of core learning outcomes:
 - i. Demonstrate broad knowledge in the fundamental areas of Applied Physics and advanced knowledge in a sub-discipline
 - ii. Demonstrate the ability to acquire skills to plan and organize an independent study project
 - iii. Demonstrated the ability to successfully complete an independent study project that contributes to an advance in an area of Engineering Physics
 - iv. Demonstrate oral and written communication skills
 - v. Develop a commitment to life-long learning and professional development

11. Geological Sciences

- a. This is a very small program, so has a high ability to tailor the program to each student and monitor each student's progress according to their particular needs.
- b. List of core learning outcomes:
 - i. Highly Individualized Program Tailored to each Student's Needs, depending on their Backgrounds
 - ii. Acquisition of Core Knowledge in one of Hydrology, Applied Geophysics, or Ocean Science and Technology
 - iii. Communication Skills via a Written Project

12. Materials Science and Engineering

- a. List of core learning outcomes:
 - i. Mastery of Broad Core Topics in the Discipline and In-depth knowledge of a Subfield
 - ii. Problem Formulation, Organization and Planning of Research Approach
 - iii. Working as Part of a Team
 - iv. Communication
 - v. Self-directed Learning and Professional Development

13. Mechanical Engineering

- a. List of core learning outcomes:
 - i. Mastery and Application of Core Disciplinary Knowledge
 - ii. Problem Formulation and Planning of the Solution Process
 - iii. Collaborative Problem Solving
 - iv. Communication of Knowledge, Reasoning and Technical Results
 - v. Learning and Professional Development

14. Operations Research and Information Engineering

- a. List of core learning outcomes:
 - i. Mastery and Application of Core Disciplinary Knowledge
 - ii. Problem Formulation, Organization and Planning of the Solution Process
 - iii. Collaborative Problem Solving and Issue Resolution
 - iv. Communication of Knowledge, Ideas and Decision Justification
 - v. Self-directed Learning and Professional Development

15. Systems Engineering

- a. List of core learning outcomes:
 - i. Mastery and Application of Core Disciplinary Knowledge
 - ii. Problem Formulation, Organization and Planning of the Solution Process
 - iii. Collaborative Problem Solving and Issue Resolution
 - iv. Communication of Knowledge, Ideas and Decision Reasoning
 - v. Self-directed Learning and Professional Development

The assessment tools for the above outcomes were broadly described in the preamble, their application is fairly natural, and are listed in a far more detailed manner within each field's submission as part of the documentation submitted to the Graduate School