

## Bachelor of Engineering Program Plan

Name:

Date Submitted:

Advisor Name:

Advisor Signature:

BE Committee Approval:

Dual Degree College:

Major

Note: Please include course numbers of courses taken at your home institution.

| At least 6 courses must include Significant Engineering Design Content<br>(See INSTRUCTIONS BELOW)                                                   |                                                                                                         | Term &<br>Year<br>(e.g., 08F) | Math &<br>Natural<br>Science | Engineering<br>Science &<br>Design | Significant<br>Design<br>Content |
|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------|------------------------------------|----------------------------------|
| One of ENGS 91, 92 or 93 is required and may be counted either as a<br>mathematics elective or as an engineering sciences elective.*                 |                                                                                                         |                               |                              |                                    |                                  |
| <b>A. MATHEMATICS AND NATURAL SCIENCE</b>                                                                                                            |                                                                                                         |                               |                              |                                    |                                  |
| 1. Math 3 or credit by equivalence                                                                                                                   |                                                                                                         |                               | 1                            | -                                  | -                                |
| 2. Math 8 or credit by equivalence                                                                                                                   |                                                                                                         |                               | 1                            | -                                  | -                                |
| 3. Math 13                                                                                                                                           |                                                                                                         |                               | 1                            | -                                  | -                                |
| 4. Phys 13                                                                                                                                           |                                                                                                         |                               | 1                            | -                                  | -                                |
| 5. Phys 14                                                                                                                                           |                                                                                                         |                               | 1                            | -                                  | -                                |
| 6. Chem 5 or credit by equivalence                                                                                                                   |                                                                                                         |                               | 1                            | -                                  | -                                |
| 7.                                                                                                                                                   | See INSTRUCTIONS for allowable<br>elective courses in Mathematics &<br>Natural Science                  |                               | 1                            | -                                  | -                                |
| 8.                                                                                                                                                   |                                                                                                         |                               | 1                            | -                                  | -                                |
| 9.                                                                                                                                                   |                                                                                                         |                               | 1                            | -                                  | -                                |
| <b>B. ENGINEERING CORE</b>                                                                                                                           |                                                                                                         |                               |                              |                                    |                                  |
| 1. ENGS 20 (or COSC 5)                                                                                                                               |                                                                                                         |                               | -                            | 0.5                                | -                                |
| 2. ENGS 21                                                                                                                                           |                                                                                                         |                               | -                            | 1                                  | √                                |
| 3. ENGS 22                                                                                                                                           |                                                                                                         |                               | -                            | 1                                  | -                                |
| 4. ENGS 23                                                                                                                                           |                                                                                                         |                               | -                            | 1                                  | -                                |
| <b>C. ENGINEERING DISTRIBUTIVE CORE</b>                                                                                                              |                                                                                                         |                               |                              |                                    |                                  |
| 5. ENGS                                                                                                                                              | Select 2 from<br>ENGS 24, 25, 26, 27                                                                    |                               | -                            | 1                                  |                                  |
| 6. ENGS                                                                                                                                              |                                                                                                         |                               | -                            | 1                                  | -                                |
| <b>D. ENGINEERING GATEWAY COURSES</b>                                                                                                                |                                                                                                         |                               |                              |                                    |                                  |
| 7. ENGS                                                                                                                                              | Select 2 from ENGS 31 or 32, 33 or<br>34, 30, 35 or 36, 37                                              |                               | -                            | 1                                  |                                  |
| 8. ENGS                                                                                                                                              |                                                                                                         |                               | -                            | 1                                  |                                  |
| <b>E. ENGINEERING ELECTIVES</b>                                                                                                                      |                                                                                                         |                               |                              |                                    |                                  |
| 9.                                                                                                                                                   | Up to 2 of these 3 electives may be<br>courses in Mathematics and Natural<br>Science (See INSTRUCTIONS) |                               |                              |                                    |                                  |
| 10.                                                                                                                                                  |                                                                                                         |                               |                              |                                    |                                  |
| 11.                                                                                                                                                  |                                                                                                         |                               | -                            | 1                                  |                                  |
| 12.                                                                                                                                                  | Three course engineering<br>concentration**, one with significant<br>design content.                    |                               | -                            | 1                                  |                                  |
| 13.                                                                                                                                                  |                                                                                                         |                               | -                            | 1                                  |                                  |
| 14.                                                                                                                                                  |                                                                                                         |                               | -                            | 1                                  |                                  |
| In which area/subdiscipline of engineering are you concentrating your studies?<br>*Why these three courses?<br>What are your immediate career plans? |                                                                                                         |                               |                              |                                    |                                  |

| <b>F. CAPSTONE ENGINEERING DESIGN</b>                          |  |                 |                    |               |
|----------------------------------------------------------------|--|-----------------|--------------------|---------------|
| 15. ENGS 89                                                    |  | -               | 1                  | √             |
| 16. ENGS 90                                                    |  | -               | 1                  | √             |
| <b>C. TOTALS (25 COURSES MINIMUM REQUIRED FOR THE BE)</b>      |  | <b>Math/Sci</b> | <b>Engineering</b> | <b>Design</b> |
| Minimum courses required for ABET                              |  | 9               | 13.5               | 6             |
| Thayer requirements for the B.E.: MATH/NAT'L SCI + ENGS ≥ 24.5 |  |                 |                    |               |

\*Only ENGS 91, 92, and 93 may be counted for engineering sciences credit and NOT any Math courses allowed in lieu of them.

\*\*With the exception of one of either ENGS 34 (prerequisites 20,22, 23) or ENGS 36 (prerequisites 20,22,25), courses to be included in the area of "three-course concentration" will be numbered above ENGS/ENGG 40 and will require at least one prerequisite either from the series ENGS 20-37 or from advanced courses within the sciences. With permission, suitable advanced science courses may count within this three-course concentration. To include ENGS 86 or 88 in the three course concentration, a proposal, which includes prerequisite courses, a syllabus, learning objectives, and what principles of engineering will be mastered, needs to be submitted in advance (before the fourth week of the term prior to which ENGS 86 or 88 will be taken) and approved by the B.E. Committee. The Computer Science courses permitted in the three-course concentration are COSC 50, 55-83 (except 56, 71, 73, 74). The excluded courses COSC 51, 56 and 84, may be used as engineering electives. Although the requirement is a three-course concentration, students are encouraged to enroll in four courses in their area of concentration.

## INSTRUCTIONS

1. **ADMISSIONS** Apply for admission and financial aid (if needed) to the Thayer School Academic & Student Affairs Office (Room M103). For students enrolled in the engineering sciences major or dual-degree program, completion of the A.B. major with a GPA of 2.0 or higher in the major guarantees admission to the Thayer School B.E. program. However, one must still file a Student Information Form, a Program Form, and a Financial Aid application (if needed) with the Academic & Student Affairs Office.

**ENGS 21 is a prerequisite for admission to the B.E. program. It must be taken prior to enrollment in ENGS 89/90**

2. **UNDERGRADUATE PROGRAM** Indicate in the appropriate space if you completed the Dartmouth engineering sciences major, engineering physics major, modified major (give the modifying subject), or dual degree program (give your college and major and include course #'s of courses taken at your home institution).

3. **DEGREE REQUIREMENTS: OVERALL**

The courses listed on this form in satisfaction of degree requirements must meet the following minimum ABET\* requirements:

- One year of mathematics and natural science, which is 9 courses (or course equivalents).
- 1.5 years of engineering science or engineering design, which is 13.5 courses (or course equivalents).
- A significant component of engineering design, which is interpreted to be six courses with significant design content
- One-half year of humanities and social sciences, which is covered by the Dartmouth A.B. program.

For the B.E. degree, Thayer School requires 2 additional courses beyond these minimum ABET\* requirements bringing the total number of required math and engineering, computer and natural sciences courses to 25. Of the 25, one full course (ENGS 20 or COSC 1 and 10) is allowed 0.5 engineering credits, hence the 24.5 appears elsewhere on the form.

4. **MATHEMATICS AND NATURAL SCIENCE (SECTION A)** The following courses in mathematics and natural science are required: Three courses in calculus, through multivariable (MATH 3, 8, 13); two courses in physics (PHYS 13, 14); one course in general chemistry (CHEM 5). AP Credit for MATH 3, MATH 8 and CHEM 5 may be used to satisfy ABET Math and Natural Science requirements. One of the applied mathematics courses ENGS 91, 92, or 93. Two more non-introductory courses, from the following list: ASTR 15 and above; BIOL 12 and above (except 52); CHEM 6, 10 and above (except 63); EARS 31, 33, 35, 37, 40-52, 59, 62, 64, 66-75, 79 and above; ENVS 30 and 79; MATH 17 – 29, 31, 32, 35, 38, 39, 40, 42, 43, 50 and above; PHYS 19 or 24, 41 and above (except 48); PSYC 21, 40, 45, 46, 65; COSC 30/ENGS 66, COSC 31, 35, 39, 40, 49, 71, 73, 74.
5. **ENGINEERING CORE AND GATEWAY COURSES (SECTIONS B, C, D)** The following engineering sciences courses are required for all B.E. candidates regardless of undergraduate major: One course in computer science (ENGS 20 OR COSC 1 AND 10 OR COSC 5), counted as 0.5 ENGS ; ENGS 21, 22 and 23; two courses selected from ENGS 24, 25, 26 and 27; two courses selected from two of four different disciplinary areas including ENGS 31 or 32; ENGS 33 or 34; ENGS 30, ENGS 35 or 36; and ENGS 37. Students holding either a bachelor's degree in natural science or the Dartmouth AB in engineering modified with natural science may satisfy the distribution requirement for the gateway courses by electing two courses from the same disciplinary area.
6. **ENGINEERING ELECTIVES (SECTION E)** At least three of the 6 elective courses must form a coherent disciplinary concentration\*\* in engineering, e.g., EE, ME, etc. One of these three must carry design credit. The remaining 3 electives may be chosen from
  - ENGS or ENGG courses numbered 24-88 (except 66, 75, 80 and 87), 110-174, 192 and 199. Only one of ENGS 86 or 88, may be used in satisfaction of combined A.B. and B.E. degree requirements, and ENGS 87 may not be counted to satisfy B.E. degree requirements.
  - Engineering management (ENGM) courses are excluded from the B.E. program.
  - The applied math courses ENGS 91, 92, 93, 100, 104, 105, 106 may be counted as engineering sciences or as mathematics.
  - Outside Thayer School: COSC 50-84 (except 30, 31, 35, 39, 40, 49, 71, 73, 74) and 170-276 (except 174, 179, 189, 210);
  - Two of these 3 electives may include courses in mathematics and natural science as listed in Section 4 above.
7. **CAPSTONE DESIGN PROJECT (SECTION F)** The two-course capstone engineering design experience, ENGS 89/90 is required. **At least six engineering prerequisites are required, including ENGS 21 plus five courses selected from ENGS 22-76.**
8. **SIGNIFICANT DESIGN CONTENT (LAST COLUMN)** In addition to ENGS 21, 89/90, at least three additional courses in your program must include significant design content: These courses include: ENGS/ENGG 26, 31, 32, 33, 36, 37, 44, 51, 57, 58, 60, 61, 62, 64, 65, 69, 71, 73, 75, 76, 111, 124, 125, 126, 128, 129, 130, 135, 145, 146, 147, 150, 157, 158, 163, 165, 166, 169, 171, 173, 174, 240, and COSC 50. ENGS 86-88 may be approved for design credit by the B.E. program committee, based on evaluation of the work done.
9. **FILLING IN THE COLUMNS, TOTALS**
  - Fill in the term and year when each course was taken (e.g., 08F for fall term, 2008).
  - For two of the elective courses in Section E, place a 1 in the appropriate column to indicate credit for mathematics and natural science or engineering sciences.
  - Place a check in the design column for each course that has significant design content.
  - At the bottom of the form, add up the credits in the math/natural science, engineering sciences, and design columns. To be eligible for the B.E. degree, this total must include at least 25 courses with 9 courses minimum in math/natural science, 13.5 courses minimum in engineering sciences, and 6 courses minimum containing engineering design.

10. **APPROVAL** This form must be completed, signed by your advisor, and returned to the Thayer School Academic & Student Affairs Office, along with your Student Information and Financial Aid forms, at least three terms prior to the expected completion of your B.E. program. The program must be approved by the B.E. Program Committee. Revised program forms should be submitted to the Thayer School Registrar and must be approved by your advisor and the B.E. Program Committee.

11. **GRADE POINT AVERAGE FOR GRADUATION** For the award of the B.E. degree, a GPA of 2.33 or higher is required in all post-prerequisite courses taken at Dartmouth to satisfy the requirements.

\*ABET= the Engineering Accreditation Commission of ABET(Accreditation Board of Engineering and Technology), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012-telephone (410) 347-7700

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