

Computer Engineering

Three Entry Paths and their Four Year Plans

1 Introduction

Many incoming university students have at least *some* uncertainty about what they want to major in. In fact, roughly *one-third* change majors at least once before graduation. This is completely natural, since it is difficult to understand the differences between majors until you have been exposed to them for a while. In the Computer Engineering program, most of our incoming students fall into one of three groups:

1. **Decided**: those who know from the start that they want to be a Computer Engineer,
2. **Engineering Undecided**: those who are undecided between Computer Engineering and one of the *Traditional Engineering Majors* (Biomedical, Chemical, Civil, Electrical, Environmental, Geological, Materials, or Mechanical Engineering).
3. **Computing Undecided**: those who are undecided between Computer Engineering and one of the other *Computing Majors* (Computer Science, Computer Systems Science, or Software Engineering).

To serve all three groups, we at Michigan Tech offer you the choice of three paths leading to your Bachelor's Degree in Computer Engineering. By choosing the path that is right for you, you should be able to change majors up until end of your freshman year, and *still complete your degree in four years*.

2 Descriptions of the Three Paths

The important core courses are the same in all three paths, while some electives and other courses vary between the paths. The differences between the three paths start immediately in the *first semester of your first year*, and continue through the remaining three years. The features of the three paths are:

2.1 Path A - Common Engineering First Year:

- **What does this path do?** This path delays your entry into computing courses, in favor of *University Chemistry I* that is a requirement for most other Engineering majors at Michigan Tech.
- **Why take this path?** Take it if you want to major in "*some kind of engineering*", but are undecided between Computer Engineering and one of the Traditional Engineering Majors. This path allows you to transfer seamlessly into any one of the Traditional Engineering Majors up through the end of your first year, or to continue in Computer Engineering if that is your ultimate decision. The first year engineering courses should help you decide.

- **How do you take this path?** This is the *default* path for all Engineering students. If you enroll in Computer Engineering, you will automatically be placed in this path, unless you specify otherwise.

2.2 Path B - Computer Engineering First Year:

- **What does it do?** This path:
 - (1) *replaces* University Chemistry I with a math/science elective of your choice, and
 - (2) *accelerates* your entry into computing courses.
- **Why take this path?** Take it if you have firmly decided on Computer Engineering or Electrical Engineering.
- **How do you take this path?** To take this path, simply enroll in Computer Engineering. You will adjust your schedule as needed during Orientation week.

2.3 Path C - Computer Science First Year:

- **What does this path do?** This path:
 - (1) *replaces* University Chemistry I with a math/science elective of your choice (may include EE1000),
 - (2) *replaces* the General Engineering courses with technical or computing electives of your choice,
 - (3) *further accelerates* your entry into computing courses, and
 - (4) *maximizes* the number of computing courses that you can take.
- **Why take this path?** Take it if you want to do “*something with computers*”, but are undecided between Computing Majors. This path allows you to transfer seamlessly between any of the Computing Majors up through the end of your first year.
- **How do you take this path?** To do so, simply contact the Admissions Office at mtu4u@mtu.edu or 1-888-688-1885, and say that you want to “*Enroll in Computer Science under Computer Engineering Path C.*” They will take it from there. To take this path, you must be enrolled in *Computer Science* for your freshman year; you can then transfer into Computer Engineering, if you choose, at the start of your sophomore year. (This must be done before your 1st semester classes begin).

3 Four Year Plans

Appendix A shows the details of the courses taken in each of the three paths to a Computer Engineering degree. It contains three tables, listing the suggested four year plan for each path. These tables are offered only for comparison. How an individual student progresses through the program depends on many factors, including readiness for calculus, summer internships, Coop jobs, and Enterprise participation.

4 General Advice

You may still be a little confused about which path is best for you. If so, *read each of the sentences listed below*, and then ask yourself which sentence best describes your feelings. If you are still confused, then contact the ECE department undergraduate advisor at jmdonahu@mtu.edu, or 1-906-487-2232.

1. I want to be *some kind of engineer*, but I am not sure what kind (Choose path A).
2. I am *leaning* toward Computer Engineering or Electrical Engineering, but I still may want to change majors to another *Traditional Engineering Major* (choose Path A).
3. I *definitely* want to be either a Computer Engineer or an Electrical Engineer, but I would like a little more exposure to topics from the other *Traditional Engineering Majors* (choose path B).
4. I am *leaning* toward Computer Engineering or Electrical Engineering, but I still may want to change majors to another *Computing Major* (choose Path C).
5. I want to be in *one of the Computing Majors*, but I am not sure which one (Choose path C).

Appendix A - Suggested Four-Year Plans

This Appendix lists a *suggested* four year plan for each of the three paths to a Computer Engineering degree. There is one Table for each Path. These tables are offered only for comparison. How an individual student progresses through the program depends on many factors, including readiness for calculus, internships, and Coop jobs, and Enterprise participation while at Michigan Tech..

Footnotes and Comments for Tables

- 1 Will accept MA-1161 (5 cr) in lieu of MA-1160 (4 cr). However, the 5th credit of MA-1161 does **not** count toward degree credits.
- 2 Will accept CS-1131 (4 cr), in Lieu of {CS-1121, CS-1122} (5 cr); the 1credit saved may be used as either an additional free elective or an additional technical elective credit.
- 3 May be replaced by another department's 6-credit senior design sequence with permission of both departments, and on the condition that all prerequisites for the CpE design sequence are satisfied. A student is considered "Senior Project Ready" upon completion of {EE-3173}.
- 4 Students enrolled in the Enterprise Concentration will take the entire Enterprise design sequence {ENT-3950, ENT-3960, ENT-4950, & ENT-4960} instead of the ECE Senior Design sequence {EE-4900, EE-4901, & EE-4910}. To graduate, a student must complete *either* the Enterprise design sequence *or* an approved Senior Design sequence (see note 3).
- 5 MTU requires all students to take 3 credits worth of Co-Curricular activities (e.g. PE courses). However, these credits *do not count* toward degree credits, and are not listed herein.
- 6 Eligible courses for the Math/Science Elective are:
Math: MA-1032 (if not qualified for calculus), MA-1090, MA-2310 or higher;
Biol: BL-1040 or higher;
Chem: CH-1150 or higher;
Phys: PH-2300 or higher
- 7 One or more of the following *must* be included among your chosen HASS Distribution courses:
SS-3520, SS-3530, SS-3630, SS-3640, SS-3800

Path A - Traditional Engineering First Year : This path delays your entry into computing courses, in favor of University Chemistry I (CH-1150,1151).

To take this path: Just enroll in Computer Engineering. This is the default path for Engineering students. Unless you specify otherwise, you will be placed in this path.

Semester 1			Semester 2		
CH-1150	Chemistry I Lecture	3	CS-1121	Intro Computer Science 1 [2]	3
CH-1151	Chemistry I Lab	1	ENG-1102	Engineering 2	3
CH-1153	Prob.Solv. Chem. I (Optional)	[1]	MA-2160	Calc. with Tech. 2 (Integral)	4
ENG-1101	Engineering 1	3	PH-2100	Univ. Physics 1 (Mechanics)	3
MA-1160	Calc. with Tech.1 (Differential) [1]	4	UN-1002	Gen. Ed. (World Cultures)	4
PH-1100	Physics Lab 1	1			
UN-1001	Gen. Ed. (Perspectives)	3			
Semester Credits 15			Semester Credits 17		
Semester 3			Semester 4		
CS-1122	Intro Computer Science 2 [2]	2	CS-2311	Discrete Structures	3
CS-1721	Object Oriented Programming	1	CS-2321	Data Structures	3
EE-2150	Intro to Signal Processing	3	EE-2110	Electric Circuits	3
EE-2173	Digital Logic	3	EE-2304	Logic & Signals Lab	1
EE-2303	Intro to ECE Lab	1	MA-3710	Engineering Statistics	3
MA-2321	Linear Algebra	2	UN-2002	Gen. Ed. (Institutions)	3
MA-3521	Differential Equations	2			
UN-2001	Gen. Ed. (Revisions)	3			
Semester Credits 17			Semester Credits 16		
Semester 5			Semester 6		
CS-2141	C++ & UML	3	EE-3173	H-ware/S-ware Sys. Integration	4
CS-3911	Intro to Numerical Methods	3	EE-4431	Computer Architecture	4
CS-3421	Computer Organization	4	EE-3160	Linear Systems & Control	3
EE-3130	Electronics	3	PH-1200	Physics Lab 2	1
EE-3305	Advanced Circuits Lab	1	PH-2200	Univ. Phys 2 (Field & Wav)	3
XX-????	HASS Distribution Electives [7]	3			
Semester Credits 17			Semester Credits 15		
Semester 7			Semester 8		
EE-4900	Design Fundamentals [3,4]	2	EE-4910	EE Design Project 2 [3,4]	3
EE-4901	EE Design Project 1 [3,4]	1	XX-????	Technical Electives	3
CS-4411	Intro. Operating Systems	4	XX-????	Technical Electives	3
XX-????	Technical Electives	3	XX-????	HASS Distribution Electives [7]	6
XX-????	HASS Distribution Electives [7]	6			
Semester Credits 16			Semester Credits 15		

[5] Total Program Credits 128

Path B - Computer Engineering First Year : Compared to Path A: This path replaces University Chemistry I (CH-1150,1151) with a math/science elective, and *accelerates your entry into computing courses* . It also allows you more flexibility in your math/science electives

To take this path: Enroll in Computer Engineering. You will adjust your schedule at your registration session during Orientation Week.

Semester 1			Semester 2		
EE-1000	Explorations in Computing	1	MA-2160	Calc. with Tech. 2 (Integral)	4
MA-1160	Calc. with Tech.1 (Differential) [1]	4	ENG-1102	Engineering 2	3
ENG-1101	Engineering 1	3	PH-2100	Univ. Physics 1 (Mechanics)	3
PH-1100	Physics Lab 1	1	CS-1122	Intro Computer Science 2 [2]	2
CS-1121	Computer Science 1 [2]	3	CS1721	Object Oriented Programmin	1
UN-1001	Gen. Ed. (Perspectives)	3	UN-1002	Gen. Ed. (World Cultures)	4
		Semester Credits			Semester Credits
		15			17
Semester 3			Semester 4		
CS-2321	Data Structures	3	CS-2141	C++ & UML	3
MA-2321	Linear Algebra	2	CS-2311	Discrete Structures	3
MA-3521	Differential Equations	2	EE-2110	Electric Circuits	3
EE-2150	Intro to Signal Processing	3	EE-2304	Logic & Signals Lab	1
EE-2173	Digital Logic	3	MA-3710	Engineering Statistics	3
EE-2303	Intro to ECE Lab	1	UN-2002	Gen. Ed. (Institutions)	3
UN-2001	Gen. Ed. (Revisions)	3			
		Semester Credits			Semester Credits
		17			16
Semester 5			Semester 6		
CS-3911	Intro to Numerical Methods	3	EE-3173	H-ware/S-ware Sys. Integ.	4
CS-3421	Computer Organization	4	EE-4431	Computer Architecture	4
EE-3130	Electronics	3	EE-3160	Linear Systems & Control	3
EE-3305	Advanced Circuits Lab	1	PH-2200	Univ. Phys 2 (Field & Wav)	3
XX-????	Math/Science Elective [6]	3	PH-1200	Physics Lab 2	1
XX-????	HASS Distribution Electives [7]	3			
		Semester Credits			Semester Credits
		17			15
Semester 7			Semester 8		
EE-4900	Design Fundamentals [3,4]	2	EE-4910	EE Design Project 2 [3,4]	3
EE-4901	EE Design Project 1 [3,4]	1	XX-????	Technical Electives	3
CS-4411	Intro. Operating Systems	4	XX-????	Technical Electives	3
XX-????	Technical Electives	3	XX-????	HASS Distribution Electives [7]	6
XX-????	HASS Distribution Electives [7]	6			
		Semester Credits			Semester Credits
		16			15

[5] Total Program Credits 128

Path C - Computer Science First Year: Compared to Path A: This path replaces University Chemistry I (CH1150,1151) with a math/science elective, replaces the General Engineering (ENG-1101 & 1102) with technical or computing electives, *further accelerates* your entry into computing courses, and *maximizes* your immersion in computing.

To take this path: Contact the Admissions Office at mtu4u@mtu.edu or 1-888-688-1885, and say that you want to “Enroll in Computer Science under Computer Engineering Path C.” You will be enrolled in *Computer Science* for your freshman year, and then transfer into Computer Engineering, if you choose, at the start of your sophomore year.

Semester 1			Semester 2		
EE-1000	Explorations in Computing	1	CS-1122	Intro Computer Science 2 [2]	2
CS-1121	Intro Computer Science 1 [2]	3	EE-2303	Intro to ECE Lab	1
MA-1160	Calc. with Tech.1 (Differential) [1]	4	MA-2160	Calc. with Tech. 2 (Integral)	4
UN-1001	Gen Ed (Perspectives)	3	PH-2100	Univ. Physics 1 (Mechanics)	3
XX-????	Gen. Ed. Distrib. Elective [7]	3	PH-1100	Physics Lab 1	1
			UN-1002	Gen. Ed. (World Cultures)	4
Semester Credits 14			Semester Credits 15		
Semester 3			Semester 4		
CS-2321	Data Structures	3	CS-2141	C++ & UML	3
CS-1721	Object Oriented Programming	1	CS-2311	Discrete Structures	3
EE-2173	Digital Logic	3	EE-2110	Electric Circuits	3
EE-2150	Intro to Signal Processing	3	EE-2304	Logic & Signals Lab	1
MA-2321	Linear Algebra	2	PH-1200	Physics Lab 2	1
MA-3521	Differential Equations	2	PH-2200	Univ. Phys 2 (Field & Wav)	3
UN-2001	Gen. Ed. (Revisions)	3	UN-2002	Gen. Ed. (Institutions)	3
Semester Credits 17			Semester Credits 17		
Semester 5			Semester 6		
CS-3911	Intro to Numerical Methods	3	EE-3173	H-ware/S-ware Sys. Integration	4
CS-3421	Computer Organization	4	EE-4431	Computer Architecture	4
EE-3130	Electronics	3	EE-3160	Linear Systems & Control	3
EE-3305	Advanced Circuits Lab	1	XX-????	Technical Electives	3
MA-3710	Engineering Statistics	3	XX-????	HASS Distribution Electives [7]	3
XX-????	Math/Science Elective [6]	3			
Semester Credits 17			Semester Credits 17		
Semester 7			Semester 8		
EE-4900	Design Fundamentals [3,4]	2	EE-4910	EE Design Project 2 [3,4]	3
EE-4901	EE Design Project 1 [3,4]	1	XX-????	Tech or Computing Electives	3
CS-4411	Intro. Operating Systems	4	XX-????	Tech or Computing Electives	3
XX-????	HASS Distribution Electives [7]	3	XX-????	HASS Distribution Electives [7]	6
XX-????	Technical Electives	6			
Semester Credits 16			Semester Credits 15		

[5] Total Program Credits 128