CompE, Computer Security & Networks, 8 Semesters

This is an eight semester schedule oriented towards an interest in computer security and networks. I transferred through two majors (Materials Science & Engineering and General Engineering) before transferring to Computer Engineering, so this does not reflect the classes I actually took. Instead, it goes through the series of classes I wish I had taken in the order I wish I had taken them in. This schedule doesn't assume much of anything from your high school education. My high school did not have a strong math/science background, and I had never seen a circuit/written a line of code before coming to the University of Illinois. If you've completed some of the early math/physics or general education requirements prior to coming to UIUC, use that extra time for a study abroad semester or co-op with a company. This schedule would be appropriate for either a future in industry or graduate study (I’m planning on both). If you’re planning to go on to graduate school, I would suggest beginning undergraduate research as soon as possible.

**Fall, Freshman**

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>ECE 120 - Introduction to Computing</td>
<td>4</td>
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<tr>
<td>MATH 221 - Calculus I</td>
<td>4</td>
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<tr>
<td>PHYS 100 - Thinking About Physics</td>
<td>1-2</td>
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<tr>
<td>Gen Ed/RHET 105 - Writing and Research</td>
<td>3-4</td>
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The first required physics class for freshmen engineers is PHYS 211, but if your high school physics class didn’t prepare you well for college, your advisor might suggest PHYS 100. PHYS 100 covers the fundamental concepts of mechanics. You can take it for half a semester (1 credit) or a full semester (2 credits) depending on your comfort level with the material.

MATH 220 and 221 both cover the material in Calculus I, but at slightly different paces. If you've never seen any Calculus before, you should take MATH 220. It moves a little more slowly than 221 at the beginning of the semester. By the middle of semester they are essentially the same class, but MATH 220 is an additional credit hour.

There are two freshmen level courses in ECE: 110 and 120. For Computer Engineers, ECE 120 is the more pertinent. The class will cover the basics of digital logic and will give you a brief introduction to programming.

Three technical courses is enough for your first semester! Take a Gen Ed or RHET 105 to lighten the load.

**Spring, Freshman**

<table>
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<th>Course</th>
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<tr>
<td>ECE 110 - Introduction to Electronics</td>
<td>4</td>
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<tr>
<td>MATH 231 - Calculus II</td>
<td>4</td>
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<tr>
<td>PHYS 211 - University Physics, Mechanics</td>
<td>4</td>
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<tr>
<td>CHEM 102 &amp; 103 - General Chemistry I + Lab</td>
<td>3+1</td>
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This is a challenging semester, but it’s certainly doable if you hit the books! PHYS 211 covers the same fundamental concepts covered in 100, and some more advanced topics. MATH 231 is also a difficult class, but MATH 220/221 will prepare you well for it.

ECE 110 is an introduction to circuits and topics in electrical engineering. A strong background in circuits will be incredibly valuable to you, even if you plan on a career in programming. Fundamental understanding of computers extends from programming all the way down to electrical currents and circuits. This class will provide you with a great foundation for electronics, and the lab is a lot of fun.

**Fall, Sophomore**

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<tr>
<th>Course</th>
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<tr>
<td>ECE 220 - Computer Systems &amp; Programming</td>
<td>4</td>
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<tr>
<td>CS 173 - Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>MATH 241 - Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212 - University Physics, Electricity and Magnetism</td>
<td>4</td>
</tr>
<tr>
<td>Gen Ed</td>
<td>3</td>
</tr>
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</table>
This semester takes you through the next MATH and PHYS courses in the engineering sequence while simultaneously developing your programming skills.

In ECE 220, you will learn a lot about how computers work from a systems perspective. This class introduces you to programming in Assembly and then transitions into C, a higher level language. CS 173 develops your conceptual understanding of programming and algorithms.

Spring, Sophomore

ECE 210 - Analog Signal Processing 4
CS 225 - Data Structures 4
MATH 286 - Intro to Differential Eq Plus 4
PHYS 213 - University Physics, Thermal Physics 2
PHYS 214 - University Physics, Quantum Physics 2

By the end of your sophomore year, you should be done with your PHYS and MATH requirements. ECE 210 will further develop your understanding of circuits and will introduce you to signal processing. Even if this is not your area of interest, conceptual understanding of electronics is critical to understanding the operation of computers.

CS 225 remains one of the most valuable courses I’ve ever taken. It can be time consuming, but your programming skills will improve greatly over the course of the semester. By the end of CS 225 you should be very comfortable programming in C++ and be able to pick up other languages more rapidly.

Fall, Junior

ECE 391 - Computer Systems Engineering 4
CS 461 (ECE 422) - Computer Security I 3
CS 498 - Digital Forensics I 4
Gen Ed 3

This is where the fun begins! In ECE 391 you will work with three other students to build a primitive operating system over the course of the semester. I don’t think I’ve ever learned more in a class than I did in ECE 391. Additionally, if you’re interested in exploit development or reverse engineering malware, ECE 391 will be very helpful.

Digital Forensics I is an interdisciplinary introduction to Digital Forensics cross-listed with LAW. It’s a great class to take with 391 because there aren’t too many big projects, and it won’t take up too much time. You’ll still learn a lot about this relatively new field.

Computer Security I offers an introduction to many topics in the field of cyber security. It should give you a taste for what you might be interested in within computer security (it’s a big field).

Spring, Junior

ECE 340 - Solid State Electronic Devices 3
ECE 385 - Digital Systems Laboratory 3
CS 460 (ECE 419) - Security Laboratory 3
CS 498 - Digital Forensics II 4
Gen Ed 3
In this semester, you'll really start to dig into computer security. CS 460 provides weekly modules that teach you about hacking and penetration testing tools. Some of the things you'll learn to do include reverse engineering, exploitation, DOS attacks, and even lock-picking. At the end of the semester you work on an independent or team project as well as participate in an attack/defend competition against your fellow students.

Digital Forensics II is similar to Digital Forensics I in its inter-disciplinary approach, but has a stronger emphasis on the technical component. The lab in this class should teach you about the variety of tools you can use while conducting a digital investigation.

ECE 340 fulfills your EE Foundations requirement (it is one of six classes you can choose from). I suggest ECE 340 because I think it's important for computer engineers to understand how computers work from applications all the way down to electrons. This class will teach you all the dirty details of how transistors work.

ECE 385 will introduce you to the more practical side of logic design with SystemVerilog. You will use Verilog heavily in ECE 411, and this class offers a good introduction.

**Fall, Senior**

- ECE 411 - Computer Organization and Design 4
- CS 438 (ECE 438) - Communication Networks 3
- ECE 313 (MATH 362) - Probability with Engineering Applications 3
- Non-ECE Technical Elective 3
- Gen Ed 3

ECE 411 will teach you about the details of architecture design and advanced topics in computing. In this class you will design your own pipelined processor with two level cache in Verilog. Another very challenging but rewarding course.

CS 438 walks you through all the layers of internet and develops a conceptual understanding of each layer. By the end of this class, you will basically know how the internet works. It was one of the harder technical electives I've taken, but also very interesting.

ECE 313 is an engineering statistics class. It can be difficult, but has useful applications. If you can take it earlier, I would recommend trying to fit it in earlier than your fourth year.

**Spring, Senior**

- CS 374 (ECE 374) - Algorithms and Models of Computation 4
- CS 425 (ECE 428) - Distributed Systems 3
- CS 463 (ECE 424) - Computer Security II 3
- ECE 316 - Engineering Ethics 3
- Gen Ed 3

You're almost done! CS 463 delves into more advanced topics within computer security. There are also several very cool programming projects with Android and interesting guest lectures.

If you're interested in computer security and networks, CS 425 is a good class to take. It will introduce you to important concepts within the field of distributed computing.

I have not taken CS 374, but from what I've heard it's an excellent and valuable class. This class will solidify your theoretical understanding of programming and algorithms.

(article by Karen Lamb)