B.S. in Electrical Engineering: Undergraduate Telecommunications Curriculum

1. Telecomm/Networking/DSP Track

Fresh 1 Fall	**Qtr 1**	**MATH 121** Calculus I 4 cr	**ENGR 100** CAD 1 cr	**CHEM 101** Chemistry I 3.5 cr	**ENGR 101** Freshman Design I 2 cr	**CS 121** Computation Lab I 1 cr	**ENGL 101, 102, 103; UNIV 101** General Education Elective and Seminars 11 cr
Fresh 2 Winter	**Qtr 2**	**MATH 122** Calculus II 4 cr	**PHYS 101** Physics I 4 cr	**CHEM 102** Chemistry II 4.5 cr	**ENGR 102** Freshman Design II 2 cr	**CS 122** Computation Lab II 1 cr	
Fresh 3 Spring	**Qtr 3**	**MATH 200** Multivariable Calculus 4 cr	**PHYS 102** Physics II 4 cr	**BIO 141** Essential Biology 4.5 cr	**ENGR 103** Freshman Design III 2 cr	**CS 123** Computation Lab III 1 cr	
Soph 1 Fall/Sp	**Qtr 4**	**ENGR 231** Linear Eng Systems 3 cr	**PHYS 201** Physics III 4 cr	**ENGR 220** Materials 4 cr	**ECE 200** Logic 3 cr	**ENGR 201, 202** Evaluation & Presentation of Experimental Data 6 cr	
Soph 2 W/Su	**Qtr 5**	**ENGR 232** Dynamic Eng Systems 3 cr	**Choice** 3 cr	**ECE 203** Programming for Eng 3 cr	**ECE 201** Circuits 3 cr		
Pre-J 1 Fall/Sp	**Qtr 6**	**Free Elective** 3 cr	**Core Elective** 4 cr	**Core Elective** 4 cr	**ECEL 301** ECE Lab. I 2 cr	**General Education Elective** 3 cr	
Pre-J 2 W/Su	**Qtr 7**	**MATH 291** Complex & Vector Analysis 4 cr	**Core Elective** 4 cr	**Core Elective** 4 cr	**ECEL 302** ECE Lab. II 2 cr	**General Education Elective PHIL 315** Engineering Ethics 3 cr	
Junior 1 Fall/Sp	**Qtr 8**	**ENGR 361** Stat of Engr Systems 3 cr	**Core Elective** 4 cr	**Core Elective** 4 cr	**ECEL 303** ECE Lab. III 2 cr	**General Education Elective** 3 cr	
Junior 2 W/Su	**Qtr 9**	**Free Elective** 3 cr	**Core Elective** 4 cr	**Core Elective** 4 cr	**ECEL 304** ECE Lab. IV 2 cr	**General Education Elective** 3 cr	
Senior 1 Fall	**Qtr 10**	**ECE 491** Senior Design I 2 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr	**Free Elective** 3 cr	**Track Elective** 3 cr	
Senior 2 Winter	**Qtr 11**	**ECE 492** Senior Design II 2 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr	**Free Elective** 0-3 cr	**Track Elective** 3 cr	
Senior 3 Spring	**Qtr 12**	**ECE 493** Senior Design III 4 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr		**Track Elective** 3 cr	

Notes:

1. Core Electives are generally 300-level ECE courses. For the Telecomm/Networking/DSP track, some combination of the following courses are recommended (but not all are required):
    - ECEC 357 - Introduction to Computer Networking
    - ECEE 302 - Electronic Devices
    - ECEE 304 - EM Fields and Waves
    - ECEE 354 - Wireless and Optical Electronics
    - ECES 302 - Transform Methods
    - ECES 306 - Introduction to Modulation and Coding
    - ECES 352 - Introduction to DSP
    - ECES 354 - Wireless Communications

2. ECE Tech Electives are 300- or 400-level ECE courses.

3. ECE Track Electives are 400-level ECE courses that are predominantly stand alone lecture or laboratory courses with a diverse range of topics that are continually updated to reflect the current state of the art. To fulfill the Track Elective requirement, some current courses and courses planned for the near future in the Telecomm/Networking/DSP track are listed below. The topics of these courses are intended to be fluid so as to remain up to date. With the exception of ECEE 471/472/473, all ECE Track Electives need not be taken in sequence.
    - ECEC 432- Internet Architectures
    - ECEC 433 - Network Programming
    - ECEC 490 - Network Security
    - ECEC 490/690 - Internet Lab
    - ECEC 490 - Wireless Embedded Networks Lab
    - ECEE 441 - Lightwave Engineering I
    - ECEE 471 - RF Components and Techniques
    - ECEE 472 - RF Electronics
    - ECEE 473 - Antennas and Radiating Systems
    - ECES 434 - Applied DSP (Fall 2008: Advanced DSP)
    - ECES 435 - Multi-disciplinary DSP (Winter 2009: Bioinformatics)
    - ECES 436 - Recent advances in DSP (Spring 2009: DSP Hardware Lab)
    - ECES 490 - Special topics in DSP and Telecommunications

4. General Education Electives are seven courses taken from the COE approved list. One of these courses must be PHIL 315. The COE approved list is available at this link: http://www.drexel.edu/catalog/degree/engineering-gen-ed.htm

5. "Choice" course may include PHYS 202 Modern Physics, ENGR 210 Thermodynamics, MATH 221 Discrete Math, CHEM 103 Chemistry III or a BIO/BMES course with Dept approval

6. The number of free elective credits will depend on the individual plan of study. Students who have taken 4 credit EE sequence or technical elective courses will need fewer free elective credits. Those who took 3 credit courses will need more. The total of all credits taken must add to at least 192 for the EE degree.

1.1 Program of study description

To recognize the increasingly interdisciplinary nature of electrical engineering, the Telecommunications/Networking/DSP track prepares students with a wide breadth of courses in the theory and the technology of the transmission and processing of information-bearing signals such as voice, audio, data, images and video. Students are encouraged to sample from a wide variety of lecture and laboratory courses in classical telecommunications, electromagnetics, networking, and signal processing.

2. Example Templates – Telecommunications (I)

Fresh 1 Fall	**Qtr 1**	**MATH 121** Calculus I 4 cr	**ENGR 100** CAD 1 cr	**CHEM 101** Chemistry I 3.5 cr	**ENGR 101** Freshman Design I 2 cr	**CS 121** Computation Lab I 1 cr	**ENGL 101, 102, 103; UNIV 101** Liberal Studies and Seminars 11 cr
Fresh 2 Winter	**Qtr 2**	**MATH 122** Calculus II 4 cr	**PHYS 101** Physics I 4 cr	**CHEM 102** Chemistry II 4.5 cr	**ENGR 102** Freshman Design II 2 cr	**CS 122** Computation Lab II 1 cr	
Fresh 3 Spring	**Qtr 3**	**MATH 200** Multivariable Calculus 4 cr	**PHYS 102** Physics II 4 cr	**BIO 141** Essential Biology 4.5 cr	**ENGR 103** Freshman Design III 2 cr	**CS 123** Computation Lab III 1 cr	
Soph 1 Fall/Sp	**Qtr 4**	**ENGR 231** Linear Eng Systems 3 cr	**PHYS 201** Physics III 4 cr	**ENGR 220** Materials 4 cr	**ECE 200** Logic 3 cr	**ENGR 201, 202** Evaluation & Presentation of Experimental Data 6 cr	
Soph 2 W/Su	**Qtr 5**	**ENGR 232** Dynamic Eng Systems 3 cr	**Choice** 3 cr	**ECE 203** Programming for Eng 3 cr	**ECE 201** Circuits 3 cr		
Pre-J 1 Fall/Sp	**Qtr 6**	**Free Elective** 3 cr	**ECES 302** Transform Methods 4 cr	**ECEC 357** Intro Computer Networking 4 cr	**ECEL 301** ECE Lab. I 2 cr	**General Education Elective** 3 cr	
Pre-J 2 W/Su	**Qtr 7**	**MATH 291** Complex & Vector Analysis 4 cr	**Core Elective** 4 cr	**Core Elective** 4 cr	**ECEL 302** ECE Lab. II 2 cr	**General Education Elective PHIL 315** Engineering Ethics 3 cr	
Junior 1 Fall/Sp	**Qtr 8**	**ENGR 361** Stat of Engr Systems 3 cr	**ECES 352** Intro DSP 4 cr	**ECES 306** Modulation and Coding 4 cr	**ECEL 303** ECE Lab. III 2 cr	**General Education Elective** 3 cr	
Junior 2 W/Su	**Qtr 9**	**Free Elective** 3 cr	**ECES 354** Wireless Communications 4 cr	**Core Elective** 4 cr	**ECEL 304** ECE Lab. IV 2 cr	**General Education Elective** 3 cr	
Senior 1 Fall	**Qtr 10**	**ECE 491** Senior Design I 2 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr	**Free Elective** 3 cr	**ECEC 490** Wireless Embedded Networks Lab 3 cr	
Senior 2 Winter	**Qtr 11**	**ECE 492** Senior Design II 2 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr	**Free Elective** 0-3 cr	**ECEC 490** Internet Lab 4 cr	
Senior 3 Spring	**Qtr 12**	**ECE 493** Senior Design III 4 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr		**ECES 436** DSP Hardware Implementations 4 cr	

The table above illustrates one possible plan of study for a student with an interest in the networking protocol stack view of Telecommunications.

3. Example Templates – Telecommunications (II)

Fresh 1 Fall	**Qtr 1**	**MATH 121** Calculus I 4 cr	**ENGR 100** CAD 1 cr	**CHEM 101** Chemistry I 3.5 cr	**ENGR 101** Freshman Design I 2 cr	**CS 121** Computation Lab I 1 cr	**ENGL 101, 102, 103; UNIV 101** Liberal Studies and Seminars 11 cr
Fresh 2 Winter	**Qtr 2**	**MATH 122** Calculus II 4 cr	**PHYS 101** Physics I 4 cr	**CHEM 102** Chemistry II 4.5 cr	**ENGR 102** Freshman Design II 2 cr	**CS 122** Computation Lab II 1 cr	
Fresh 3 Spring	**Qtr 3**	**MATH 200** Multivariable Calculus 4 cr	**PHYS 102** Physics II 4 cr	**BIO 141** Essential Biology 4.5 cr	**ENGR 103** Freshman Design III 2 cr	**CS 123** Computation Lab III 1 cr	
Soph 1 Fall/Sp	**Qtr 4**	**ENGR 231** Linear Eng Systems 3 cr	**PHYS 201** Physics III 4 cr	**ENGR 220** Materials 4 cr	**ECE 200** Logic 3 cr	**ENGR 201, 202** Evaluation & Presentation of Experimental Data 6 cr	
Soph 2 W/Su	**Qtr 5**	**ENGR 232** Dynamic Eng Systems 3 cr	**Choice** 3 cr	**ECE 203** Programming for Eng 3 cr	**ECE 201** Circuits 3 cr		
Pre-J 1 Fall/Sp	**Qtr 6**	**Free Elective** 3 cr	**ECES 302** Transform Methods 4 cr	**ECEE 302** Electronic Devices 4 cr	**ECEL 301** ECE Lab. I 2 cr	**General Education Elective** 3 cr	
Pre-J 2 W/Su	**Qtr 7**	**MATH 291** Complex & Vector Analysis 4 cr	**ECEE 352** Analog Electronics 4 cr	**Core Elective** 4 cr	**ECEL 302** ECE Lab. II 2 cr	**General Education Elective** **PHIL 315** Engineering Ethics 3 cr	
Junior 1 Fall/Sp	**Qtr 8**	**ENGR 361** Stat of Engr Systems 3 cr	**ECEE 304** EM Fields and Waves 4 cr	**ECES 306** Modulation and Coding 4 cr	**ECEL 303** ECE Lab. III 2 cr	**General Education Elective** 3 cr	
Junior 2 W/Su	**Qtr 9**	**Free Elective** 3 cr	**ECES 354** Wireless Communications 4 cr	**ECEE 354** Wireless & Optical Elect. 4 cr	**ECEL 304** ECE Lab. IV 2 cr	**General Education Elective** 3 cr	
Senior 1 Fall	**Qtr 10**	**ECE 491** Senior Design I 2 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr	**Free Elective** 3 cr	**ECEE 471** RF Components and Techniques 3 cr	
Senior 2 Winter	**Qtr 11**	**ECE 492** Senior Design II 2 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr	**Free Elective** 0-3 cr	**ECEE 472** RF Electronics 4 cr	
Senior 3 Spring	**Qtr 12**	**ECE 493** Senior Design III 4 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr		**ECEE 473** Antennas and Radiating Systems 4 cr	

The table above illustrates one possible plan of study for a student with an interest in more of the device and electromagnetic propagation aspects of Telecommunications.

4. Example Templates – Signal Processing

Fresh 1 Fall	**Qtr 1**	**MATH 121** Calculus I 4 cr	**ENGR 100** CAD 1 cr	**CHEM 101** Chemistry I 3.5 cr	**ENGR 101** Freshman Design I 2 cr	**CS 121** Computation Lab I 1 cr	**ENGL 101, 102, 103; UNIV 101** Liberal Studies and Seminars 11 cr
Fresh 2 Winter	**Qtr 2**	**MATH 122** Calculus II 4 cr	**PHYS 101** Physics I 4 cr	**CHEM 102** Chemistry II 4.5 cr	**ENGR 102** Freshman Design II 2 cr	**CS 122** Computation Lab II 1 cr	
Fresh 3 Spring	**Qtr 3**	**MATH 200** Multivariable Calculus 4 cr	**PHYS 102** Physics II 4 cr	**BIO 141** Essential Biology 4.5 cr	**ENGR 103** Freshman Design III 2 cr	**CS 123** Computation Lab III 1 cr	
Soph 1 Fall/Sp	**Qtr 4**	**ENGR 231** Linear Eng Systems 3 cr	**PHYS 201** Physics III 4 cr	**ENGR 220** Materials 4 cr	**ECE 200** Logic 3 cr	**ENGR 201, 202** Evaluation & Presentation of Experimental Data 6 cr	
Soph 2 W/Su	**Qtr 5**	**ENGR 232** Dynamic Eng Systems 3 cr	**Choice** 3 cr	**ECE 203** Programming for Eng 3 cr	**ECE 201** Circuits 3 cr		
Pre-J 1 Fall/Sp	**Qtr 6**	**Free Elective** 3 cr	**ECES 302** Transform Methods 4 cr	**ECEE 302** Electronic Devices 4 cr	**ECEL 301** ECE Lab. I 2 cr	**General Education Elective** 3 cr	
Pre-J 2 W/Su	**Qtr 7**	**MATH 291** Complex & Vector Analysis 4 cr	**Core Elective** 4 cr	**Core Elective** 4 cr	**ECEL 302** ECE Lab. II 2 cr	**General Education Elective PHIL 315** Engineering Ethics 3 cr	
Junior 1 Fall/Sp	**Qtr 8**	**ENGR 361** Stat of Engr Systems 3 cr	**ECES 352** Intro DSP 4 cr	**ECES 306** Modulation and Coding 4 cr	**ECEL 303** ECE Lab. III 2 cr	**General Education Elective** 3 cr	
Junior 2 W/Su	**Qtr 9**	**Free Elective** 3 cr	**Core Elective** 4 cr	**Core Elective** 4 cr	**ECEL 304** ECE Lab. IV 2 cr	**General Education Elective** 3 cr	
Senior 1 Fall	**Qtr 10**	**ECE 491** Senior Design I 2 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr	**Free Elective** 3 cr	**ECE Track Electives** DSP and Telecommunications applications and Special Topics 3 cr each	
Senior 2 Winter	**Qtr 11**	**ECE 492** Senior Design II 2 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr	**Free Elective** 0-3 cr		
Senior 3 Spring	**Qtr 12**	**ECE 493** Senior Design III 4 cr	**General Education Elective** 3 cr	**ECE Tech. Elective** 3 cr			

The table above illustrates one possible plan of study for a student with an interest in Signal Processing.