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# **Transfer Course Descriptions**

## **INTENDED MAJOR: ENGINEERING PHYSICS**

### **INSTRUCTIONS (please read carefully—failure to follow instructions may negatively impact your application):**

Match your completed (and any in-progress) coursework to the corresponding Cornell courses listed. Complete the right-hand column with the requested details of each of your corresponding courses. Cut and paste the course descriptions directly from your previous/current institution(s) courses of study. **NOTE: do not list coursework that you are planning to take during the summer.**

* If more than one course fulfills a particular recommended Cornell Engineering course, include the applicable course information for all relevant courses.
* Leave blank any section for which you do not have a corresponding course.
* If you have AP/GCE A-Level/IB exam credit for a course, only the AP/GCE A-Level/IB course name, exam date and score are needed. If one of these exams may be used to satisfy a requirement, it is noted in the left-hand column for each relevant course along with the required exam score. Please note that we will only award credit for test results that are based on Cornell University policy—not that of your current institution.
* We **will not** use SAT or ACT test scores to satisfy any requirements.
* If you have taken a placement test at your current institution for one of the required courses, **DO NOT** list it. We will not accept placement tests offered at other institutions to satisfy any required coursework.
* Please note that we require you upload a copy of your course syllabus for **select courses**. Please read through carefully. You only need to provide a syllabus for the requested classes. See directions below.
* **Questions?** E-mail Cornell Engineering Admissions at [engr\_trans\_adm@cornell.edu](mailto:engr_trans_adm@cornell.edu).

### **SUBMIT YOUR COMPLETED FORM:**

* **Save** completed form as a .pdf (preferred) or .doc/.docx file named ***Last Name, First Name*** *– CD*
* **Upload** to your application using the Cornell Application Status Page
  + **Once you have submitted your application to Cornell, you will receive access to an application status page. Using this page you may upload supplemental material including the course description form and required syllabi. When uploading syllabi, please try to consolidate into one document. Do not embed syllabi in this document.**
  + On the right-hand side, using the drop-down menu, select **TRCD Course Description** for the course description form,andselect **TRCS Transfer Course syllabus** when uploading required syllabi.
  + Click *Choose File*
  + Follow the instructions to attach your file

### PLEASE PROVIDE THE FOLLOWING:

* **Student Name:**
* **Email Address:**
* **Phone Number:**
* **Date of Birth:**
* **Current Institution:**
* **Course Catalog Website:**

**REQUIRED COURSEWORK FOR ALL TRANSFER APPLICANTS**

| **CORNELL COURSEWORK** | **YOUR COLLEGE-LEVEL COURSEWORK** |
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| **MATH 1910, Calculus for Engineers**  4 credits. Essentially a second course in calculus. Topics include techniques of integration, finding areas and volumes by integration, exponential growth, partial fractions, infinite sequences and series, tests of convergence, and power series.  **Exam(s) and relevant score(s) that will also satisfy this requirement:**  AP Calculus BC exam: 5 | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION:** [paste course description text here]  Textbook information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):**  **Please provide a syllabus for your equivalent course through application status page (do not embed in document).** If you are using AP credit to satisfy this requirement, you do not need to upload a syllabus. |
| **MATH 1920, Multivariable Calculus for Engineers**  4 credits. Introduction to multivariable calculus. Topics include partial derivatives, double and triple integrals, line and surface integrals, vector fields, Green’s theorem, Stokes’ theorem, and the divergence theorem. | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION:** [paste course description text here]  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):**  **Please provide a syllabus for your equivalent course through application status page (do not embed in document).** |
| **PHYS 1112 w/PHYS 1110 OR PHYS 1116 w/PHYS 1110 (EP only)**  **PHYS 1112, Physics I: Mechanics & Heat**  3 credits. First course in a three-semester introductory physics sequence. Covers the mechanics of particles with focus on kinematics, dynamics, conservation laws, central force fields, periodic motion. Mechanics of many-particle systems: center of mass, rotational mechanics of a rigid body, rotational equilibrium, and fluid mechanics. Temperature, heat, the laws of thermodynamics. At the level of University Physics, Vol. 1, by Young and Freedman.  **OR**  **PHYS 1116, Physics I: Mechanics and Special Relativity**  4 credits. First in a three-semester introductory physics sequence. Explores quantitative modeling of the physical world through a study of mechanics. More mathematical and abstract than a typical mechanics course - for example, considers how choice of coordinate system (Cartesian, cylindrical, etc.) influences the nature of kinematical equations. Fast paced. Includes kinematics, dynamics, conservation laws, central force fields, periodic motion, and special relativity. At the level of An Introduction to Mechanics by Kleppner and Kolenkow.  **WITH**  **PHYS 1110, Introduction to Experimental Physics**  1 credit. This laboratory course is an introduction to the nature and skills of experimentation in physics. Students will engage in multi-week investigations, creatively design their own experiments, and explore questions of how we develop models in physics through experiments. Students will learn how to design experiments, analyze data, develop interesting research questions, and consider issues of ethics in physics experiments. Students will also develop communication and collaboration skills. The course aims to provide an opportunity for students to consider the nature of measurement and experimentation and evaluate the relationship between physical theories and experimental data.  **Exam(s) and relevant score(s) that will also satisfy this requirement:**  AP Physics C-Mechanics exam score needed: 5  GCE A-Leve exam score needed: A or B  IB Physics HL exam score needed: 6 or 7 | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION:** [paste course description text here]  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):**  **NOTE:** If you took the equivalent of PHYS 1112 and it included a lab component, you will receive credit for both PHYS 1112 and PHYS 1110**.** If the equivalent course taken did not include a lab component, then you will have to PHYS 1110 at Cornell. If you use exam credit to satisfy this requirement, you will need to take PHYS 1110 at Cornell.  **Please provide a syllabus for your equivalent course through application status page (do not embed in document).** If you are using exam credit to satisfy this requirement, you do not need to upload a syllabus. |
| **CHEM 2090, Engineering General Chemistry**  4 credits. Covers basic chemical concepts, such as reactivity and bonding of molecules, introductory quantum mechanics, and intermolecular forces in liquids and solids and gases. Attention will be focused on aspects and applications of chemistry most pertinent to engineering. (Course includes a laboratory component.)  **Exam(s) and relevant score(s) that will also satisfy this requirement:**  AP Chemistry exam score needed: 5  GCE A-Level exam score needed: B  IB Chemistry HL exam score needed: 6 or 7 | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION:** [paste course description text here]  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):**  **Please provide a syllabus for your equivalent course through application status page (do not embed in document).** If you are using exam credit to satisfy this requirement, you do not need to upload a syllabus. |

**STOP:** **If you have not taken the equivalent of all four of the above courses, your application will not be reviewed.**

**RECOMMENDED COURSEWORK TO OBTAIN SOPHOMORE STANDING**

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| **CORNELL COURSEWORK** | **YOUR COLLEGE-LEVEL COURSEWORK** |
| **CS 1110 or CS 1112**  **CS 1110, Introduction to Computing: A Design and Development Perspective**  4 credits. Programming and problem solving using Python. Emphasizes principles of software development, style, and testing. Topics include procedures and functions, iteration, recursion, arrays and vectors, strings, an operational model of procedure and function calls, algorithms, exceptions, object-oriented programming. Weekly labs provide guided practice on the computer, with staff present to help.  **OR**  **CS 1112, Introduction to Computing: An Engineering and Science Perspective**  4 credits. Programming and problem solving using Python. Emphasizes the systematic development of algorithms and programs. Topics include iteration, functions, arrays, strings, recursion, object-oriented programming, algorithms, and data handling and visualization. Assignments are designed to build an appreciation for complexity, dimension, randomness, simulation, and the role of approximation in engineering and science. Weekly discussion section provides guided practice on the computer, with staff present to help. NO programming experience is necessary; some knowledge of Calculus is required.  **Exam(s) and relevant score(s) that will also satisfy this requirement:**  AP Computer Science A exam score needed: 5 | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |
| **ANY ENGRI Course**  View a full list of [ENGRI course options](http://courses.cornell.edu/content.php?filter%5B27%5D=ENGRI&filter%5B29%5D=&filter%5Bcourse_type%5D=-1&filter%5Bkeyword%5D=&filter%5B32%5D=1&filter%5Bcpage%5D=1&cur_cat_oid=36&expand=&navoid=9301&search_database=Filter#acalog_template_course_filter). | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |
| **Cornell First-Year Writing Seminar #1**  3 credits. Seminars require six to twelve writing assignments on different topics, totaling a minimum of 30 pages. For other courses to be substituted, students must demonstrate that they have done similar writing in a formal course. (It is not sufficient to write, for example, one 30-page paper.) Find more information about the [First-Year Writing Seminars and transfer credit](http://knight.as.cornell.edu/fws-guidelines#ap-&-transfer-credit).  **Exam(s) and relevant score(s) that will also satisfy this requirement:**  AP Literature and Composition exam score needed: 5  AP Language and Composition exam score needed: 5  GCE A-Level English exam score needed: A  IB English Higher Level exam score needed: 7 | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |
| **Cornell First-Year Writing Seminar #2**  See above  **NOTE: you can only receive credit for one of the two first-year writing requirements using exam credit.** | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |

**ADDITIONAL COURSEWORK TO OBTAIN JUNIOR STANDING**

| **CORNELL COURSEWORK** | **YOUR COLLEGE-LEVEL COURSEWORK** |
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| **MATH 2930, Differential Equations for Engineers**  4 credits. Introduction to ordinary and partial differential equations. Topics include: first-order equations (separable, linear, homogeneous, exact); mathematical modeling (e.g., population growth, terminal velocity); qualitative methods (slope fields, phase plots, equilibria, and stability); numerical methods; second-order equations (method of undetermined coefficients, application to oscillations and resonance, boundary-value problems and eigenvalues); and Fourier series. A substantial part of this course involves partial differential equations, such as the heat equation, the wave equation, and Laplace’s equation. (This part must be present in any outside course being considered for transfer credit to Cornell as a substitute for MATH 2930.) | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |
| **MATH 2940, Linear Algebra for Engineers**  4 credits. Linear algebra and its applications. Topics include matrices, determinants, vector spaces, eigenvalues and eigenvectors, orthogonality and inner product spaces; applications include brief introductions to difference equations, Markov chains, and systems of linear ordinary differential equations. May include computer use in solving problems. | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |
| **AEP 3200, Introductory Mathematical Physics**  4 credits. Covers review of vector analysis, tensor calculus, Dirac Delta functions, complex variable theory, Cauchy-Rieman conditions, complex Taylor and Laurent series, Cauchy integral formula and residue techniques, conformal mapping, calculus of variations, Fourier Series. | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):**  **Please provide a syllabus for your equivalent course through application status page (do not embed in document).** |
| **AEP 3630/PHYS 3360, Electronic Circuits (recommended)**  4 credits. Practical electronics as encountered in a scientific or engineering research/development environment. Analyze, design, build, and test circuits using discrete components and integrated circuits. Analog circuits: resistors, capacitors, operational amplifiers, feedback amplifiers, oscillators, comparators, passive and active filters, diodes, and transistor switches and amplifiers. Digital circuits: combinational and sequential logic (gates, flipflops, registers, counters, timers), analog to digital (ADC) and digital to analog (DAC) conversion, signal averaging, and computer architecture and interfacing. Additional topics may include analog and digital signal processing, light wave communications, transducers, noise reduction techniques, and computer-aided circuit design. At the level of Art of Electronics by Horowitz and Hill.  **AEP 3630 may also be fulfilled by taking the two following courses: Cornell Course # ECE/ENGRD 2100 AND ECE/ENGRD 2300**  **ECE/ENGRD 2100, Introduction to Circuits for Electrical and Computer Engineers**  4 credits. This course is an introduction to electronic circuits. We start with the basic quantities used to characterize circuit operation (like current, voltage, and power) and then enforce several physical laws to form the basis of our approach to circuit analysis. Networks comprising passive circuit elements such as resistors, inductors, and capacitors will be examined under constant dc, transient, and sinusoidal steady-state conditions. Active components including transistors and Op-Amps will be introduced and used to build simple amplifiers and switching power converters. Many of these ideas will be unified mathematically through the use of Laplace transforms and associated transfer functions. In the lab part of the course, we will learn how to use modern instruments to test circuits, and explore the concepts from lecture applied to real circuits. Finally, we will develop some simple modeling software in MATLAB to numerically predict the results from analysis and experiment.  **AND**  **ECE/ENGRD 2300, Digital Logic and Computer Organization**  4 credits. This course provides an introduction to the design and implementation of digital circuits and microprocessors. Topics include transistor network design, Boolean algebra, combinational circuits, sequential circuits, finite state machine design, processor pipelines, and memory hierarchy. Design methodology using both discrete components and hardware description languages is covered in the laboratory portion of the course. | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):**  **Please provide a syllabus for your equivalent course through application status page (do not embed in document).** |
| **ANY ENGRD Course** View a full list of [ENGRD course options](http://courses.cornell.edu/content.php?filter%5B27%5D=ENGRD&filter%5B29%5D=&filter%5Bcourse_type%5D=-1&filter%5Bkeyword%5D=&filter%5B32%5D=1&filter%5Bcpage%5D=1&cur_cat_oid=36&expand=&navoid=9301&search_database=Filter#acalog_template_course_filter). | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |
| **PHYS 2213 or PHYS 2217**  **PHYS 2213, Physics II: Electromagnetism**  4 credits. Second in a three semester introductory physics sequence. Topics include: electric forces and fields, electric energy and potential, circuits, magnetic forces and fields, magnetic induction, and Maxwell’s equations. Taught at a level somewhat higher than University Physics, Vol. 2, by Young and Freedman. The math prerequisite is essential: line, surface, and volume integrals are done routinely and occasional use is made of gradient, divergence, and curl.  **OR**  **PHYS 2217, Physics II: Electricity and Magnetism**  4 credits. Second in a three semester introductory physics sequence. Explores quantitative modeling of the physical world through a study of electricity and magnetism. More mathematical and abstract than a typical introductory electricity and magnetism course. Topics include electrostatics, behavior of matter in electric fields, circuits, magnetic fields, Faraday’s law, AC circuits, and electromagnetic waves. Makes substantial use of vector calculus. At the level of Electricity and Magnetism by Purcell. | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |
| **PHYS 2214 or PHYS 2218 w/PHYS 2210**  **PHYS 2214, Physics III: Oscillations, Waves, and Quantum Physics**  4 credits. For majors in engineering (including bio-, civil, and environmental engineering), computer and information science, physics, earth and atmospheric science, and other physical and biological sciences who wish to understand the oscillation, wave, and quantum phenomena behind everyday experiences and modern technology including scientific/medical instrumentation. Covers the physics of oscillations and wave phenomena, including driven oscillations and resonance, mechanical waves, sound waves, electromagnetic waves, standing waves, Doppler effect, polarization, wave reflection and transmission, interference, diffraction, geometric optics and optical instruments, wave properties of particles, particles in potential wells, light emission and absorption, and quantum tunneling. With applications to phenomena and measurement technologies in engineering, the physical sciences, and biological sciences. Some familiarity with differential equations, complex representation of sinusoids, and Fourier analysis is desirable but not essential.  **OR**  **PHYS 2218, Physics III: Waves and Thermal Physics**  3 credits. This course is divided into two parts. The larger segment of the course typically focuses on wave phenomena. Topics include coupled harmonic oscillators, strings, sound and light waves, superposition principle, wave equations, Fourier series and transforms, diffraction and interference. The discussion is at the level of The Physics of Waves by Georgi. The second segment of the course covers thermodynamics and statistical mechanics at the level of Thermal Physics by Schroeder.  **WITH**  **PHYS 2210, Exploring Experimental Physics**  In this laboratory course, students will build on the knowledge and skills developed in Physics 1110 (Introduction to Experimental Physics) to conduct semester-long experimental physics projects. Students will work in lab project teams to iteratively develop a research question, write a proposal that is reviewed by their peers and experts, engage for multiple weeks with their project, and present their findings in a public poster session at the end of the semester. Students will learn additional skills in experimental design and data analysis, with broader focuses on how to generate interesting, testable, and feasible research questions, how to provide critical and constructive feedback to others, and how to present research to a broad audience. The course provides an early opportunity for students to get a glimpse of experimental physics research, employ creativity to generate an answer to a novel research question and/or design a unique experimental approach. | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):**  **NOTE:** If you took the equivalent of PHYS 2218 and it included a lab component, you will receive credit for both PHYS 2218 and PHYS 2210**.** If the equivalent course taken did not include a lab component, then you will have to PHYS 2210 at Cornell. |
| **Liberal Studies Course #1**  Courses in humanities, arts and social sciences. Six liberal studies classes/18 credit minimum (not including writing seminars) are required for graduation. | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |
| **Liberal Studies Course #2**  See above | College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if av available available ail (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |

| **PLEASE LIST ANY ADDITIONAL COLLEGE-LEVEL COURSEWORK BELOW – Add rows as needed** |
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| College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |
| College/University:  Course #:  Course Title:  Semester/Year Taken (e.g. Fall 2018):  Credit Hours:  Laboratory Component? Y N  **COURSE DESCRIPTION: [paste course description text here]**  Textbook Information, if available (Name, Author, Edition Number):  **Grade Received (IP=In Progress):** |