

# The Cooper Union

## Albert Nerken School of Engineering

### ESC 221 Basic Principles of Electrical Engineering

Spring 2026

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<b>Class Meetings:</b> Thursday, 3:00 PM – 4:50 PM Room # 506, Academic Building Students are expected to be present at all class and lab meetings. With prior announcement, or as required by the School, class meetings may be held virtually. Virtually class meetings will be held via Zoom or the class MS Teams portal, as announced.	<b>Laboratory</b> There will be several laboratory experiments. Each experiment requires an individual written Laboratory Report due as indicated, and each is graded as discussed. Pre-lab preparatory work is to be completed prior to each scheduled laboratory class.
<b>Grading Distribution:</b> Two Exams – 40% (20% each exam) Final Exam (Cumulative) – 35%; Laboratory Projects – 15% (Average of All Assigned Experiments) Homework – 10% (Average of All Assigned Homework)	<b>Homework:</b> Homework will be collected and checked for completeness. Homework is due one week after being assigned, unless otherwise indicated, and each is graded as discussed.
<b>Office Hours:</b> By appointment. Initial meeting requests should be made by email. Please include the course number when writing.	<b>Exams:</b> Two Exams and a Cumulative Final Exam Exam 1: 2/12; Exam 2: 4/2; Final Exam: 5/14 Exams are closed book and will be held during scheduled class hours.

#### Planned Course Outline / Schedule\*

	<u>Class Date</u>	<u>Topic</u>	<u>Lecture No.</u>	<u>Planned Format</u>	<u>Text Chapter</u>	<u>HW / Lab Due</u>	<u>Exam</u>
1.	1/22	Current, Voltage, Sources, Ohm's Law, Kirchhoff's Laws	1	Class	2, 3	H1: 1/29	(1)
2.	1/29	DC Circuit Theory, Voltage and Current Division, Laboratory 1 Review, Laboratory Safety, Laboratory Reporting	2, Lab Info	Class	3	H2: 2/5	(1)
3.	2/5	Exam 1 Review, Laboratory 1 – Resistor Circuit, Multimeter, Ohm's Law		Class, Lab		L1: 2/26	(1)
4.	2/12	Exam 1		Class			
5.	2/19	Laboratory Work		Lab			
6.	2/26	Loop and Node Analyses, Delta-Wye, Superposition	3	Class	4,5	H3: 3/5	(2)
7.	3/5	Thevenin and Norton Equivalents, Maximum Power Transfer, Laboratory 2 Review	4	Class	5	H4: 3/12	(2)
8.	3/12	Operational Amplifiers, Laboratory 2 Superposition, Exam 2 Review	5	Class	6	H5: 3/23; L2: 3/30 (Tu)	(2)
9.	3/19	No Class – Spring Recess					
10.	3/26	Capacitors and Inductors	6	Class	7	H8: 4/9	(F)
11.	4/2	Exam 2		Class			
12.	4/9	Differential Equations for Solution of Circuits, Transients and Initial Conditions in Circuits, Laboratory 3 Review, Laboratory 4 Review	7	Class	8	H9, H10: 4/16;	(F)
13.	4/16	Laboratory 3 Maximum Power Transfer, Laboratory 4 – R-C Waveforms on the Oscilloscope		Lab		L3: 4/23	
14.	4/23	RLC and Second-Order Circuits, Sinusoidal Steady State	8	Class, Lab	9	H11: 4/30; L4: 5/7	(F)
15.	4/30	Coupled Coils Final Exam Review and Questions	9	Class	10, 13	H12: 5/7	(F)
16.	5/7	No Class – Study Period					
17.	5/14	Final Exam		Class			

\* The planned course outline / schedule is subject to change to accommodate varying class discussions.

**Textbook**

Hayt, W.H. and Kemmerly, J.E. "Engineering Circuit Analysis", McGraw Hill, 2019, 9<sup>th</sup> ed.

**Course Description**

Survey of Electrical Engineering for the non-major. Selection of topics from signal and circuit analysis, DC and AC circuits, transients, frequency response and filters, power systems. Additional topics may be covered as time permits.

**Course Goals and Objectives**

Provide an introduction to the fundamentals of circuit theory, specifically to circuit analysis.

**Course Material**

Course documents other than the course textbook will be available on MS Teams, including the Syllabus. Students are expected to submit homework assignments and laboratory reports electronically via MS Teams.

**Software**

Specific software is not required for this class, other than MS Word for completion of laboratory reports.

**Course Meetings, In Person**

Class will meet at the assigned times in the classroom indicated.

It is the student's responsibility to be present in the classroom for the entire scheduled class meeting. Brief breaks may be given, and it is the student's responsibility to return to their location in the classroom at the end of any break, without disrupting others as the class resumes. A portion of class time may occasionally be allocated toward laboratory preparation work, typically for a short period at the beginning of a class session, and may be announced via email ahead of the class. Students may work independently during such allocations, either in the classroom or where the student may have improved computing access.

**Course Meetings, Virtual (if announced)**

Occasionally class may be held virtually for various reasons, including, if required by the School or to deliver course material by a more effective delivery method, for example certain video presentations or certain online interaction. If announced, class will meet virtually at the assigned times via the class MS Teams portal or via a Zoom meeting or via another virtual method. If a class meeting is to be held via Zoom, a Zoom ID and Meeting Passcode will be sent to students via email in advance of the class, otherwise the class meeting will be held via the class MS Teams portal, or as announced. Students are expected to maintain appropriate technology to support online class delivery, should it be announced.

It is understood that having a class meeting entirely via a virtual environment may have certain challenges.

Reasonable efforts may be made to adjust to these circumstances. Students are to log on using identifiable names. It is the student's responsibility to log on and remain online and engaged for the duration of the class.

**Laboratory Work**

Laboratory work is expected to be conducted using laboratory equipment and materials. Laboratory assignments must be read, and pre-laboratory preparation work is to be completed, prior to each scheduled laboratory class. Students will perform all theoretical research, preparation of tables for recording of data and preparation of their own schematic or wiring diagrams, and any other required diagrams, charts or tables, and have all such materials completed and available for use at the beginning of each scheduled laboratory and prior to beginning any laboratory work. Each laboratory experiment will be concluded by submission of an individually prepared, typewritten laboratory report, produced using technical report writing style and format. Laboratory reports will be typewritten by the student with correct grammar, spelling and formatting. Hand-written reports and/or hand-written diagrams will not be accepted. Copying parts of the Laboratory Manual or laboratory introduction slides will not be acceptable for laboratory diagrams or tables. Each report, at a minimum, will have a cover page with an experiment title and date, an introduction of the subject material and description of theoretical expectations, a schematic or wiring diagram for each circuit constructed, a clear presentation of experimental data, and a discussion of each set of experimental results with respect to predictions with concluding remarks. Additional discussions within the report will be added for clarity and as required. Laboratory reports missing parts may not be eligible to receive full credit. Reports are to be submitted electronically as a single file for each report, and accepted formats of electronic files submissions are MS Word (preferred) or PDF, only. Other file formats will not be accepted. MS Word is the software for Laboratory reports, as formatting irregularities from other software may result in reduced credit for assignments. Laboratory work may be completed individually or in groups or teams, as will be discussed in class, however, each student is required to individually prepare and submit their own laboratory report, including their own analysis and interpretation of data collected.

Each Laboratory assignment will generally consist of three stages: 1) pre-laboratory review and preparation, 2) circuit construction and exercising, and 3) writing a culminating laboratory report. Each of the three stages are to be completed in order, with the second stage to be completed in the laboratory. The concluding technical laboratory report is the only item to be submitted for grading, and it must include and integrate details of the other two stages for full credit. Students must be present in the laboratory during the second stage to be eligible to receive full credit.

### **Classroom Laboratory Environment**

Equipment and materials for performing experiments are expected to be available in the classroom laboratory. Laboratory safety practices shall always be followed. Food or drink should not be present on or near any laboratory work area or laboratory equipment. Students are to come to the laboratory with advanced preparations completed.

### **Class Policies**

- Course policies are developed to support fair and equitable treatment in the classroom and to set high performance standards. If you are having any issues related to me, the course, or your fellow students, please make an appointment to speak with me for discussion toward resolution. The earlier any issue or concern is brought to my attention, the better the opportunity for successful resolution.
- Students are expected to be present in class for the entire scheduled meeting time. Attendance in class is important for student success and for the classroom environment.
- For any virtual class meeting, students are expected to sign on using their full name and remain online and engaged with the class for the entire scheduled meeting time. Students are requested to keep their video on during class times, and their audio muted unless participating in class discussion.
- Class lectures are not recorded and lecture aides, slides and/or materials supplementary to the textbook will not be available following the conclusion of each class session, unless distributed via the class MS Teams portal. Students are expected to take appropriate notes and pose relevant questions during class sessions. Lecture material can be discussed during an office consultation.
- All Health protocols of The Cooper Union shall be followed at all times.
- All School policies shall be followed at all times.
- Students are expected to be prepared for each class prior to beginning the class session. Preparation should include prior review of the text sections and/or reading materials planned for discussion. All assignments must be completed on time to maintain preparation for subsequent discussions.
- Students are expected to check their Cooper Union email and the class MS Teams at least daily for any announcements or other relevant course communications. Any changes to the planned course outline, course schedule, or other course components will be announced via the School email and/or posted to MS Teams.
- MS Teams will be used for course communications and assignments. Documents relevant to the course will be posted to MS Teams.
- All class material is solely for the use of students registered in the class and only during the scheduled class semester and may not be shared by any means with anyone not registered and attending class.
- Assignments are due according to the dates in the Course Outline, and at the time of the scheduled beginning of the class session. Once class starts, any assignments due that day will be considered late. Late assignments are not guaranteed to be accepted and may be automatically assigned a zero grade. Any accepted late assignment will be subject to a reduction in grade for lateness. Any assignment not received prior to beginning the associated exam review according to the Course Outline will be recorded as zero credit.
- Any issue concerning a deadline is to be brought to the attention of the Instructor at least three full school days prior to the due date and time, for potential discussion or review. However, as the course progression is already determined, there may not be any opportunity for flexibility. Students are encouraged to plan accordingly.
- Each student will create and hand in their own individual Laboratory Report for each laboratory assignment. Laboratory Reports must be turned in via MS Teams, must be computer generated, not handwritten, and must be fully legible to receive credit. Students are encouraged to review their uploaded files for legibility, as it is the student's responsibility to ensure assignments are legible for grading. Laboratory Reports will each have a title page cover sheet identifying the author and experiment title and be in formal technical writing report format. Accepted formats of electronic files submissions are MS Word (preferred) or PDF, only. MS Word is the recommended software for Laboratory reports, as formatting irregularities from other software may result in reduced credit for assignments. Other file formats will not be accepted. Paper or hard-copy submissions will not be accepted.
- Homework, assignments, and any Project or laboratory material for submission must be turned in individually via the class MS Teams portal and must be complete and fully legible to receive credit and viewable via native Microsoft Windows computer systems. Submissions made in other formats will not be considered as received. Paper or hard-copy submissions will not be accepted. It is recommended to include the student's name and the assignment number within the filename of the assignment being turned in. Students are encouraged to review their

uploaded files for legibility. Accepted formats of electronic files submissions are MS Word (preferred) or PDF, only. Other file formats will not be accepted.

- There will be NO Make-up Examinations. In the event of extreme extenuating circumstances, and only with prior notification and agreement, an alternate plan may be discussed; however, there may not be an opportunity to obtain full credit. Once an Exam is given, unless the student is present to take the Exam, any opportunity to obtain credit for that Exam shall expire. Please plan accordingly.
- There is no extra-credit work or make-up work associated with this class.
- Electronic devices for note taking and laboratory work are permitted during class. Photographic, video and/or audio recording of lectures in whole or in part is prohibited. Use of headphones, mobile phones, tablets, laptop computers or any other devices possessing communication capability are prohibited during exams, and any such use will result in a zero grade being assigned for that exam. Electronic calculators or calculation devices are permitted during exams, provided the device does not possess any communication capability, and any memory within such device shall be erased immediately prior to the exam. Students are expected to come to class and to exams fully prepared and with all materials for that class or exam.
- Any special needs or special accommodations requirements are to be reported to the School according to School policy, and students with disabilities or who need special accommodations for this class are required to notify the Dean of Students and meet with me, in person or virtually, so that arrangements can be made. The Cooper Union has limited resources and extra lead time is required for such arrangements to be feasible. In order to receive accommodations for an exam, you must notify me yourself in writing at least two weeks before the accommodations are needed for each event and you must also be registered with the Dean of Students. Students will not be afforded any special accommodations retroactively, e.g., for academic work completed prior to disclosure to me.
- During class sessions background noise should be eliminated to avoid disrupting the class. Interactions in class should be civil, respectful, and supportive of an inclusive learning environment for all students.
- The Cooper Union School of Engineering Policy on Academic Integrity will always be followed.

### **Grading**

Each homework assignment is to be individually submitted electronically via the class MS Teams portal and will be graded for completeness. Homework is due as indicated, and each is graded on a check-plus (10) / check (7) / check-minus (4) / zero (0) basis. Generally, a check-minus is earned when at least one problem is fully attempted and completed, a check is earned when most problems are fully attempted and completed, and a check-plus is earned when all problems are attempted and completed. Screenshots or photographs of handwritten homework is acceptable, provided the work is legible following submission, and photographs of work may, for example, be inserted into an MS Word document for submission. It is the students' responsibility to ensure homework assignments are legible and viewable via native Microsoft Windows computer systems (e.g., file formats .jpeg, .png, .pdf, etc.). Submissions made in other formats will not be considered as received. An average of grades of all assigned homework assignments is used to compute the semester homework grade.

Each laboratory experiment requires an individual written Laboratory Report due as indicated, and each laboratory is graded on a scale of zero (0) through ten (10), based on the individual laboratory report turned in. Any report turned in with incomplete data, missing required experiments, and/or missing question or calculation solutions, will be eligible for no more than a score of 6, and may be less depending on how many such elements are omitted. Any report turned in that does not follow the required technical report format will be eligible for no more than a score of 7, and may be less depending on the severity of the lacking format. All experimental elements must be complete and accurate, and all technical report formatting must be followed for the report to be eligible for the maximum score of 10. Eligibility of a maximum score does not guarantee the maximum score, and each submitted report will be evaluated individually. An average of grades of all assigned laboratory assignments is used to compute the semester homework grade. Failure to hand in one laboratory assignment will result in a final maximum grade of a C, with other points earned calculated and scaled to this grade. Failure to hand in two or more laboratory assignments will result in a final maximum grade of a D, with other points earned calculated and scaled to this grade.

Each exam is taken individually and graded out of 100 points, each, and each exam point score earned will count toward the final class grade according to the distribution, above. Generally, each exam question will be worth the point value indicated on the exam, out of the available 100 points.

The raw point score total according to the distribution, above, for the class will be used for assignment of the final class letter grade for each student. Typically, a raw class score must be within 10 points of the maximum available points of 100 points to receive an A, and then the next lower letter grade for each next set of 10 points. Borderline grades may, but not guaranteed, be rounded up in certain cases, for example when a student has demonstrated substantial effort by completing fully all assignments and submitting all of them on time.

**Office Hours**

Office hours are not regularly scheduled. Consultation is available for discussion of any course-related matter by appointment only. Email is recommended for correspondence, and the course number and section should be included. A virtual meeting via MS Teams or Zoom is preferred and may be arranged, however it must be agreed to and arranged in advance to ensure appropriate technology is available and active. Students are encouraged to attempt course assignments prior to meeting, so specific questions can be answered, and for the most productive use of the meeting time.

**ABET Student Outcomes:**

ESC221 supports student achievement of outcomes 1 and 7

- 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

**Copyright Statement**

Course material and/or content accessed from the class MS Teams portal or received via email, or by other methods, or presented or distributed during class, is for the exclusive use of students who are currently enrolled in the course, and only during the course. Such content cannot be reused or distributed without specific written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder, is a violation of Federal copyright law, as well as a violation of School policy.

**Academic Integrity**

The Academic Standards and Regulations Policy of The Albert Nerken School of Engineering of The Cooper Union shall be followed at all times. This policy describes plagiarism in part as, "...the presentation of another person's "work product" (ideas, words, equations, computer code, graphics, lab data, etc.) as one's own. Whether done intentionally or unintentionally, plagiarism is not tolerated in the School of Engineering."

**Special Notes**

- It is a goal of Cooper Union that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. Students with disabilities are to contact the Director of Student Care and Support to formally establish accommodations. Students with accommodation letters must provide me with a copy of your letter and make an appointment to meet with me as soon as possible to discuss your needs.
- While I want you to feel comfortable coming to me with issues you may be struggling with or concerns you have, please be aware that I have reporting requirements that are part of my responsibilities as a member of the faculty. If you inform me of an issue of sexual harassment, sexual assault, or discrimination, I will keep the information as private as I can, but I am required to report the basic facts of the incident to Cooper's Title IX Coordinator.
- Counseling Services at The Cooper Union are coordinated through the Office of Student Affairs.