

Individual Investigation Assignment

The primary purpose of this exercise is for you to independently research a theoretical topic relevant to the course beyond the regular classroom material. You should acquire enough knowledge about the topic to achieve one or more of the following:

1. Carry a derivation to a more technically sophisticated level,
2. Apply theory to a challenging real-world problem, or
3. Provide some other evidence of your thorough understanding of the technical details of a very focused topic in the area of electromagnetics.

This is an opportunity to demonstrate your knowledge and skills through an assessment method other than a traditional homework assignment or exam. The required meeting with me will also simulate to some extent the types of interactions that you will likely have with managers, graduate school advisors, and other authorities in your career. Engineers are often asked to research a subject and share their findings with their colleagues. Consequently, the only guidance that I will provide will be limited to clarifications of the specifications of the assignment and the grading criteria. I will not provide technical assistance other than the planned lecture material and homework support. If you find that you need additional technical expertise to thoroughly understand your topic, you must either find it yourself or pursue another avenue.

The assessment of your work will be in the form of a 30-minute (maximum) meeting with me at a mutually agreed time within a randomly assigned week during the semester (see below). The meeting must include a significant amount of analytical work on your part demonstrated on a whiteboard or via presentation software, and it will involve some discussion of the topic.

Assignment:

1. Select a topic or task within the scope of the course but not covered in detail in the lectures. Investigate the topic thoroughly so that you can discuss it knowledgeably with me for 30 minutes. You may choose a topic in the textbook that is not covered in lectures or one that is not included in the textbook at all. A list of representative topics will be posted at the course web site, but you do not have to choose one of the listed topics.
2. Your topic should be very focused, and your presentation should be built around significant analytical work. It should not be an overview of some type of technology. For example, a general discussion of what the Internet of Things (IoT) is and the impact it will have on society, while interesting, would not fit the scope of the assignment. However, you could show how the radiation pattern of an IoT antenna is determined.
3. Describe your proposed topic to me in a 100 to 200-word e-mail message. The description is due on the Tuesday before the week in which you will meet with me. For example, if your presentation is scheduled for the week of April 6–10, then you must contact me by Tuesday, March 31. However, I encourage you to contact me earlier to improve the chances that you will get your first-choice topic. Include details on what you intend to do and how your proposed work will meet the requirements of the assignment. If the topic is from the posted list, do not simply write “I want to do Topic #N.” Explain what you intend to present in your meeting with me. Your e-mail should show that you have done some preliminary research on your topic.

4. In your e-mail message, propose a date and time for our meeting within the one-week window assigned to you. We might have to negotiate a time.
5. Prepare for the meeting by reading background material, completing any required derivations of equations, and studying the topic thoroughly. Look for applications or implications of your topic that go well beyond any expositions in the textbook. These can be your own insights, or they can be gained through a separate reference. You must cite any external references that you use. **Using intellectual property without citing the source will result in a significant score reduction.**
6. Your presentation should take 20 minutes or less to leave approximately 10 minutes for follow-up questions from me. You should therefore practice your presentation to make sure that it is not too long.

Special Guidelines and Other Important Information:

1. Proposed topics and meeting times will be approved in the order in which they are received. If you propose a topic that is the same or similar to one that someone else has already chosen, you must propose a new topic.
2. Be prepared to meet at a time other than your first choice. You can get an idea of available times by consulting my weekly schedule at my personal web site at <https://www.eg.bucknell.edu/~dkelley/sked.html>. You may also check my Google calendar; however, I often have meetings, travel, or other obligations that are not listed. I am available 8:00–11:00 pm on many evenings. Zoom-based presentations will be considered if scheduling proves to be especially difficult.
3. You may bring any books, journal papers, notes, or other supporting documentation that you wish to the meeting.
4. A list of approved topics will be maintained on the Homework page at the course web site. Selected topics will be marked. You **do not** have to choose one of the listed topics.
5. The meeting will end at the scheduled time, regardless of when it begins. If you are late for any reason other than an extenuating circumstance, then you will have less time for your presentation. Arrive early to log in to the presentation computer, set up demos, etc. If a previous demonstration goes beyond its allotted time and encroaches on your time (unlikely), then your presentation start and stop times will be shifted to accommodate the delay, or your presentation will be rescheduled.

Score Determination:

This assignment will account for 10% of your overall course grade. A numerical score of 0–100 points will be assigned. The overall score will be the sum of the scores achieved in the categories listed in the table on the next page. The score for the 1st category (the topic proposal) will be reduced by 5 points per day if the proposal is late. The score for the 2nd category will be quantized in 10-point increments. The 3rd and 4th categories will be scored as follows:

- 20 pts high-quality and professional performance
- 15 pts acceptable but with minor deficiencies
- 10 pts below expectations
- 5 pts unprepared or significantly underprepared

The 5th category score will be either a 0 or a 5. Scores of 5 are infrequently assigned because they recognize truly exceptional work.

Available Points	Category
25	Clarity, focus, and thoroughness of topic proposal (preliminary e-mail message)
30	Level of accuracy and confidence of answers to follow-up technical questions (knowledge and skills)
20	Problem identification, formulation, and solution (knowledge and skills)
20	Effectiveness with which the concept is communicated (presentation quality)
5	Exceptional creativity/originality/effort applied to topic or its presentation and/or highly professional performance in any category above

Scores for late proposals will be reduced by 5 points/day (not including weekends), but if you contact me by the Tuesday deadline and our negotiations extend beyond it, there will be no score reduction for lateness.

Your score will be reduced by 10 points if you cancel your presentation at the last minute. If you miss the scheduled meeting time without prior notification, then your score will be limited to the points that you earned for your topic proposal (first line in the table below). Extenuating circumstances such as serious illness, injuries, or family emergencies will of course be accommodated but must be verified by the Dean's office, a health professional, or other authority.

Examples of effort that would earn 5 points in the last category include but are not limited to: 1) development of code that simulates and/or animates the concept; 2) application of advanced mathematical methods such as eigenvalue and eigenvector analysis, finite differencing, or matrix decompositions; 3) evidence of consultation of a large number of high-quality sources (technical literature); or 4) presentation of multiple derivations of an equation that highlight different technical perspectives.

Week Assignments:

The randomly assigned time windows for presentations are listed below. You may schedule a meeting with me by mutual agreement on any day of the week assigned to you. Weekend meetings will not be scheduled. If you wish to switch times with anyone, that person must agree, and you must notify me by the Tuesday preceding the earlier of the two weeks. If you have an unavoidable and significant time commitment beyond normal coursework during the week assigned to you (such as attendance at a conference, participation in a sports tournament, or tech week for a performance) that is confirmed by a university staff or faculty member, please let me know as soon as possible so that we can reschedule your assigned week.

Mar. 30–Apr. 3	Griffin, De La Cruz	Topic proposal due Mar. 24
Apr. 6–10	Wu, Kraiker, Ortiz	Topic proposal due Mar. 31
Apr. 13–17	Golden, Bui	Topic proposal due Apr. 7
Apr. 20–24	Chernova, Foster	Topic proposal due Apr. 14
Apr. 27–May 1	Prevuznak, Rios-Saldivar	Topic proposal due Apr. 21