



ENGINEERING

**INTRODUCTION TO DIRECTED ENERGY**  
**A UNM Global and National Security Policy Institute Online Course**  
**ECE 595 Section 004/GLNS 511/ECE 495 Section 001**  
**August 19 – October 11, 2024**

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**Additional Syllabus Information** – Please see the important information beginning on page 6 of this Syllabus.

**Logistics – How to Register for the Course**

If you are a University of New Mexico student, then registration is just as you would sign up for any other course. For Non-University of New Mexico prospective students, you first need to apply for admission as a non-degree student. Once you have completed this then you can register for the course. Go to <http://www.unm.edu/apply/>.

**I - Course Description**

Directed energy lasers and microwaves are a technology that offers the ability to deliver energy to a target at the speed-of-light with a very deep magazine. Advances in pulsed power technology, batteries, capacitors, and electronics have all contributed towards making directed energy a reality.

As directed energy technology transitions from the laboratory to the field, there will be an increasing number of personnel who will be active in the acquisitions process yet have little knowledge about directed energy or related policy issues. This course aims to fill that gap by providing an introduction to directed energy technology for the novice. The target audience includes personnel in acquisitions, those who serve in the military, policymakers, and anyone else interested in learning about the subject.

**II - Course Objectives and Methodology**

The primary goal of this course is to introduce the student to directed energy technology and related policy issues. This course will encourage students to develop critical thinking in the assessment of directed energy and its broad national security implications and objectives from a technology perspective.

**III – Learning Objectives**

1. Develop an understanding of the basics of directed energy lasers and microwaves.
2. Become knowledgeable of related policy issues.
3. Become knowledgeable of the global perspective on directed energy.
4. Forecast future global technological challenges in light of recent developments and security threats.



## ENGINEERING

### IV – Course Delivery

This course will be delivered on-line (distance learning) giving the students flexibility and ability to complete their academic work solely online. Course materials, such as reading assignments, power point presentations, video links, etc. will be available online. There is one required text for the course. Students are required to read the materials and to discuss with other students and the instructor the materials, including research that the students have undertaken as part of the requirements. There will be a 2-day workshop on October 10-11, 2024 **to be held jointly** with *Cybersecurity and National Security*. This workshop will be held virtually using Zoom (information to be provided week of October 07, 2024).

### V – Evaluation Procedures

- a) **Assignments/Discussions/Deliverables:** Students will be asked to engage in a discussion weekly (using the Discussion Tool in CANVAS) with other students and the faculty on a number of questions based on the reading assignment and the link between the materials and security. Some of the questions posed for discussion may require the students to engage on additional research beyond their course's reading assignment. These discussions are part of the overall grade of the course and will account for 50% of students' overall grade. The Discussions will be graded based on the depth of the arguments presented by the discussion.
- b) **Research Project:** Students will be required to work on a 15-20-page research project, on a topic previously approved by your instructor. In the interest of providing more benefits to every student (from their work but also from attending presentations by other students), the instructors will approve on a first-come first-serve basis a different technology area for each student. This way, a student will work on one technology area but listen to final presentations and engage in discussions in multiple areas. This research project will account for the remaining 50% of the student's final grade. The paper is due on the last week of class and will be presented by the student at the end of the course on October 10-11, 2024.  
**Project Description:** A critical success factor continues to be the ability to write clearly, concisely, and creatively. The goal of this research project is to examine the impact of some aspect, in a broad sense, of directed energy. Each student will work on a technology area of their choice that is of importance to national security, or some other aspect, and examine it in the global context. We are competing and collaborating with many other countries/regions in the world on many fronts. Your project should also consider likely global scenario changes in the next 20-25 years.
- c) **Research Paper Guidelines:** Times New Roman style 12 – point font, double-spaced, references should follow the Chicago Style guidelines:  
[http://www.chicagomanualofstyle.org/tools\\_citationguide.html](http://www.chicagomanualofstyle.org/tools_citationguide.html)
- d) **Grading Procedure:** Grading procedure will be based on the following criteria: a) Does the weekly discussion and the research upon which it is based have a clear, and creative core argument? b) Is that core argument well-supported? c) Is it well-written? And d) Can we draw policy implications from it?
- e) **Grading Scale:** Your final grade will be a combination of the points assigned to the Discussions (50 points) and your research paper project (50 points).

**The scale used is as follows:** 95-100 = A+/A, 90-95= A/A-, 85-90 = A-/B+, 80-85 = B+/B, 75-80 = B/B-, 70-75 = B-/C+, 65-70 = C+/C, <65 = F

**Honor Code:** UNM formally recognizes the responsibility of our students and professors to behave in an ethical manner.



## ENGINEERING

### Netiquette

- *“In following with the UNM Student Handbook, all students will show respect to their fellow students and instructor when interacting in this course. Take Netiquette suggestions seriously. Flaming is considered a serious violation and will be dealt with promptly. Postings that do not reflect respect will be taken down immediately.” (Rebecca Adams, OLIT 535)*
- *“This course encourages different perspectives related to such factors as gender, race, nationality, ethnicity, sexual orientation, religion, and other relevant cultural identities. The course seeks to foster understanding and inclusiveness related to such diverse perspectives and ways of communicating.”*
- *Link to Netiquette document: <https://canvasinfo.unm.edu/students/intro-to-canvas/netiquette.html>*

### Copyright Issues

All materials in this course fall under copyright laws and should not be downloaded, distributed, or used by students for any purpose outside this course.

### Accessibility

The American with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you have a disability requiring accommodation, please contact the UNM Accessibility Resource Center in 2022 Mesa Vista Hall at 277-3506 or <http://as2.unm.edu/index.html>. Information about your disability is confidential.

### Academic Misconduct

You should be familiar with UNM’s [Policy on Academic Dishonesty](http://pathfinder.unm.edu/campus-policies/other-campus-policies.html) and the [Student Code of Conduct](http://pathfinder.unm.edu/campus-policies/other-campus-policies.html) (<http://pathfinder.unm.edu/campus-policies/other-campus-policies.html>) which outline academic misconduct defined as plagiarism, cheating, fabrication, or facilitating any such act.

### Example Drop Policy:

This section states your departmental policy for dropping students.

*UNM Policies: This course falls under all UNM policies for last day to drop courses, etc. Please see <http://www.unm.edu/studentinfo.html> or the UNM Course Catalog for information on UNM services and policies. Please see the UNM academic calendar for course dates, the last day to drop courses without penalty, and for financial disenrollment dates.*

## VI - Technical Skills

In order to participate and succeed in this class, you will need to be able to perform the following basic technical tasks:

- Use UNM’s CANVAS platform ([www.canvas.unm.edu](http://www.canvas.unm.edu)).
- Use email – including attaching files, opening files, downloading attachments
- Copy and paste within applications including Microsoft Office
- Open a hyperlink (click on a hyperlink to get to a website or online resource)
- Use Microsoft Office applications



## ENGINEERING

- Create, download, update, save and upload MS Word documents
- Create, download, update, save and upload MS PowerPoint presentations
- Create, download, update, save and upload MS Excel spreadsheets
- Download, annotate, save and upload PDF files

### Technical Requirements

#### Computer

- A high-speed Internet connection is highly recommended.
- Supported browsers include: Internet Explorer, Firefox, Chrome, and Safari. Detailed Supported Browsers and Operating Systems: <https://canvasinfo.unm.edu/support/index.html>
- Any computer capable of running a recently updated web browser should be sufficient to access your online course. However, bear in mind that processor speed, amount of RAM and Internet connection speed can **greatly** affect performance. Many locations offer free high-speed Internet access including [UNM's Computer Pods](#).
- Microsoft Office products are available free for all UNM students (more information on the UNM IT Software Distribution and Downloads page: <http://it.unm.edu/software/index.html>).

**For UNM Canvas Technical Support:** <https://canvasinfo.unm.edu/support/index.html>

**VII - Reading List Content:** Readings for this course come from a variety of sources.

**Required Textbook:** P.E. Nielsen, *Effects of Directed Energy Weapons* (CreateSpace Independent Publishing Platform, an Amazon Company, Seattle, WA, 2012) available at the UNM Bookstore or from Amazon.com ([https://www.amazon.com/Effects-Directed-Energy-Weapons-Nielsen/dp/1478268573/ref=sr\\_1\\_1?s=books&ie=UTF8&qid=1484425668&sr=1-1&keywords=effects+of+directed+energy+weapons](https://www.amazon.com/Effects-Directed-Energy-Weapons-Nielsen/dp/1478268573/ref=sr_1_1?s=books&ie=UTF8&qid=1484425668&sr=1-1&keywords=effects+of+directed+energy+weapons)). Additional readings will be provided in the on-line folders.

#### **VIII – 2-Day Workshop**

Our meetings on October 10-11, 2024 will explore all areas that we have developed in class. In these days, we will conduct the instructor feedback as well as the wrap-up for the course and presentations of the final projects for each student. This will be held jointly with the *Cybersecurity and National Security* course.

### SYLLABUS<sup>1</sup>

#### **Week 1 – August 19, 2024**

Nielsen Chapter 1 – Basic Principles – supplemented by readings in the Week 1 Folder; participate in the weekly discussion.

#### **Week 2 – August 26, 2024**

Nielsen Chapter 3 – Laser Fundamentals (pp. 81-141) – supplemented by readings in the Week 2 Folder; participate in the weekly discussion.

#### **Week 3 – September 02, 2024**

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<sup>1</sup> Subject to updates and based on enrollment



## ENGINEERING

Nielsen Chapter 3 – Laser Fundamentals (pp. 142-205) – supplemented by readings in the Week 3 Folder; participate in the weekly discussion.

### **Week 4 – September 09, 2024**

Nielsen Chapter 4 – Microwaves – supplemented by readings in the Week 4 Folder; participate in the weekly discussion; submit proposal for final project.

### **Week 5 – September 16, 2024**

Directed energy laser efficacy, countermeasures, applications, ethics and policy issues – readings in the Week 5 Folder; participate in the weekly discussion; review feedback on proposal for final project.

### **Week 6 – September 23, 2024**

Directed energy microwave efficacy, countermeasures, applications, ethics and policy issues – readings in the Week 6 Folder; participate in the weekly discussion; work on final project.

### **Week 7 – September 30, 2024**

Global and geopolitical perspective on directed energy – readings in the Week 7 Folder; participate in the weekly discussion; work on final project.

### **Week 8 – October 07, 2024**

What are the barriers to the deployment of directed energy? – readings in the Week 8 Folder; participate in the weekly discussion; complete final project paper and prepare presentation [additional instructions on this will be conveyed to the students in the second week of the course]; **October 10-11, 2024** – joint workshop with *Cybersecurity and National Security* via Zoom.

**Final papers due by 5 PM Monday October 14, 2024**



## ENGINEERING

### FALL 2024 ADDITIONAL SYLLABUS INFORMATION

Accommodations: UNM is committed to providing equitable access to learning opportunities for students with documented disabilities. As your instructor, it is my objective to facilitate an inclusive classroom setting, in which students have full access and opportunity to participate. To engage in a confidential conversation about the process for requesting reasonable accommodations for this class and/or program, please contact Accessibility Resource Center (<https://arc.unm.edu/>) at [arcsrvs@unm.edu](mailto:arcsrvs@unm.edu) or by phone at 505-277-3506.

Title IX: The University of New Mexico and its faculty are committed to supporting our students and providing an environment that is free of bias, discrimination, and harassment. The University's programs and activities, including the classroom, should always provide a space of mutual respect, kindness, and support without fear of harassment, violence, or discrimination. Discrimination on the basis of sex includes discrimination on the basis of assigned sex at birth, sex characteristics, pregnancy and pregnancy related conditions, sexual orientation and gender identity. If you have encountered any form of discrimination on the basis of sex, including sexual harassment, sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. You can access the confidential resources available on campus at the LoboRESPECT Advocacy Center (<https://loborespect.unm.edu>), the Women's Resource Center (<https://women.unm.edu>), and the LGBTQ Resource Center (<https://lgbtqrc.unm.edu>). If you speak with an instructor (including a TA or a GA) regarding an incident connected to discrimination on the basis of sex, they must notify UNM's Title IX Coordinator that you shared an experience relating to Title IX, even if you ask the instructor not to disclose it. The Title IX Coordinator is available to assist you in understanding your options and in connecting you with all possible resources on and off campus. For more information on the campus policy regarding sexual misconduct and reporting, please see <https://policy.unm.edu/university-policies/2000/2740.html> and CEEO's [website](#).

If you are pregnant or experiencing a pregnancy-related condition, you may contact UNM's Office of Compliance, Ethics, and Equal Opportunity at [ceeo@unm.edu](mailto:ceeo@unm.edu). The CEEO staff will provide you with access to available resources and supportive measures and assist you in understanding your rights.

Student Support: **Confidential** services for students are available at [LoboRESPECT Advocacy Center](#), [Women's Resource Center](#), and the [LGBTQ Resource Center](#). The [Women's Resource Center](#) supports all students, including those who are pregnant or are parents. UNM's lactation stations are marked on the [UNM campus map](#).

Instructor Support: Information about how to handle disclosures and provide a referral is available on the [Title IX Coordinator page](#). Seek help from your Associate Dean or Dean of Instruction and the Title IX coordinator. [Ombuds Services](#) offers [workshops that include handling disclosures of sexual harassment](#). UNM representatives participate in [Action Collaborative on Preventing Sexual Harassment in Higher Education](#).

Credit-hour statement: This is a three credit-hour course. This is an 8-week online course during the Fall 2024 semester with no meetings except for the Workshop at the end. Please plan for a *minimum* of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.