APPLIED OPTICS

PHYS 4452, SECTION 010
SPRING 2020

CLASS MEETINGS – VIN 148
TR 11:00AM–12:15PM
W 2:00PM–4:50PM

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REQUIRED MATERIALS

CONTACT INFORMATION
Dr. Michael C. Holcomb
Office: VIN 123
Phone: 325.486.6787
Email: michael.holcomb@angelo.edu
Webpage: www.mcholcomb.com/teaching

Office Hours
Monday, Wednesday, Friday
10:00am–12:00pm
Tuesday, Thursday
2:00pm–4:00pm
Also available by appointment
COURSE OVERVIEW
This course will cover the fundamental properties of light propagation and the interaction of light with matter under the approximation of geometrical optics and scalar wave optics. Time permitting, quantum optics may also be introduced.

This course is intended to reinforce existing knowledge of the scientific method and expand understanding of the laws of physics. To this end, the course will emphasize a mix of conceptual questions, problem-solving skills, and the application of theoretical principles in a hands-on setting. The lab will provide an opportunity to explore the correlation between theory and practice, demonstrating how scientists can develop theories from experimental approaches.

Expected Learning Outcomes
The expected learning outcomes for the course, listed below, will be assessed through performance on guided classroom discussions and embedded questions within the exams.

- Be able to apply scientific reasoning and critical thinking to the solution of problems.
- Gain an understanding of fundamental principles, generalizations, and theories of optics.
- Develop and demonstrate technical knowledge of major topics outlined in the course overview.

COURSE COMPONENTS

Class Meetings & Attendance
Attendance is mandatory and will be recorded daily. A spirit of honesty will be maintained in the attendance policy. Note that you are responsible for everything that we do in class, so it is to your advantage to attend. The lecture and laboratory periods will not be treated as isolated components of the course. Lecture material may be introduced during the laboratory period and laboratory activities may be covered during the lecture periods.

Please thoroughly read the section of this syllabus regarding classroom etiquette for further information on expectations for attendance.

Preparation for Class Meetings
You are expected to bring your assigned texts, paper for notes, and a suitable writing utensil (preferably a pencil with an eraser), a scientific calculator, and your ASU Student ID with you to every class meeting. You will likely find it helpful to read ahead in the textbook before each class.

Laboratory
You will receive one grade for lecture and laboratory combined. Laboratory is not a separate course and is not in any way optional. Throughout the term you will work in groups to complete experiments which you will document in a laboratory notebook as outlined in the guidelines below. Your laboratory notebook will be reviewed by the lecturer and will directly contribute to your overall grade in the course. Additionally, you may be asked to present one or more of your experiments as either a poster, oral presentation, or journal article style manuscript.
Each student in this class will maintain their own individual laboratory notebook. It is understood that data recorded during experiments, calculations with those data, and relevant data analyses will be similar between group members; however, it is expected that each individual group member will document these by hand in their own notebook. The only exceptions are data visualizations (i.e. graphs or plots) which may be printed and pasted or stapled into the laboratory notebook.

Below is a list of formatting guidelines that will be observed:

• All handwritten entries will be made in pen only.
• Any errors will be denoted by a simple strikethrough (i.e. single horizontal line).
• The first three pages will be reserved for a table of contents.
• Every page of the notebook will be numbered sequentially on the bottom outside corner.
• Every entry will begin with the date and list of those working with you.
Homework
Homework will be assigned by chapter. It is strongly recommended that you solve all assigned homework neatly on standard letter sized notebook, graph, or printer paper. Homework will not directly count as a part of your final grade in the class; however, it is not optional. Completing all assigned homework is crucial for your understanding of the course material. You will likely find working through homework problems to be a decidedly productive way to prepare for exams.

In-Class Assignments (ICA)
Several times throughout the term you will be asked to complete in-class assignments. These can be either individual or team-based exercises and may or may not be announced. No makeup in-class assignments will be given.

Exams
Three (3) in-class exams will be administered as scheduled. No makeup exams will be given, so please plan accordingly. All exams will be given in our normal classroom. Please see the course calendar on the last page of this syllabus for scheduled exam dates.

Exam Rules
Calculators only are permitted. All other electronics must be stowed out of sight during exams. Cell phones and smart watches are not considered to be calculators regardless of what apps may have been installed. If you are seen attempting to use an electronic device during the exam, you will be asked to leave and issued a zero for the exam without exception.

GRADING POLICIES
The following scores will be recorded during the course of the semester: ICA, Lab, Exam 1, Exam 2, Exam 3, Final Exam. The course grade will be the weighted average of ICA at 15%, Lab at 25%, and Exams at 15% each.

How your final course grade is weighted:

There are no makeup exams; however, the final exam score can replace the lowest midterm. In other words, the four highest scores from Exam 1, Exam 2, Exam 3, Final Exam, and Final Exam will be considered for the course grade.

Your letter grade will be determined on the following scale: F (≤49), D (50-59), C (60-74), B (75-89), A (90-100).
Incomplete Grade Policy
It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. Please see ASU Operating Policy 10.11 Grading Procedures for more information.

STRATEGIES FOR SUCCESS
Be prepared! These tips will help you keep up, make for more productive classroom interaction, and help you be prepared for homework, labs, and exams that make up your semester grade.

• Read the material in the text before we cover it in class, and regularly study your notes from previous class meetings.
• Pay special attention to example problems and derivations introduced during class. Derivations provide examples of how equations can be manipulated and draw connections between seemingly unrelated phenomena. You will often find that many techniques used in derivations can also be applied when solving assigned problems.
• Begin all homework assignments as soon as possible. Don’t get behind or wait until just before an exam to begin.
• Make use of the free in-person and online tutoring services available through the Tutoring Center.
• Supplemental Instruction (SI) sessions for some classes are offered through the campus Tutoring Center. These sessions can help you review difficult concepts as a group.
• If you are stuck, come by my office with questions during office hours or make an appointment to meet at another time.
• Once you can work through a problem with your notes, book, study group, etc., be sure you can rework it entirely on your own.
• Don’t "blow off" any exam just because there is a dropped score. The purpose of the dropped score is in case of illness or other extenuating circumstances.
• Keep up with your laboratory notebook! Document while performing experiments rather than trying to write things down after the fact. Also, do your best to not put off any required data analysis. You will find it easier to work with the data when everything is fresh in your mind.

CLASSROOM ETIQUETTE
Attending lecture is mandatory. You are considered both advised and responsible for anything discussed during lecture.

Leaving lecture early or arriving late is considered both rude and distracting. If you have an expected reason to depart early, please inform the lecturer at the beginning of class and sit in a convenient location for leaving without disturbing the class.

All students are expected to be respectful of their peers during lecture by not becoming a distraction. If you become a distraction to other students, then you will be dismissed from class for that day. Some actions, including but not limited to the following, will result in you being considered a distraction to your peers: repeatedly arriving late, reading unrelated material, using your cell phone in any way outside of approved exercises, visiting with your neighbor, sleeping, eating, “vaping,” and the use of any and all tobacco products.

No laptops or any other electronic devices are allowed in class unless the need for such a device for reason of a disability is documented by Student Disability Services.
INCLUSIVE LEARNING ENVIRONMENT  (Adapted from Yale Center for Teaching and Learning)

**Civility and Respect**

Our university supports and wants to foster a civil, respectful, and open-minded climate so that all of us can live and work in an environment free of harassment, bias-motivated behaviors, unfair treatment, and fear. The university expects all members of our community to refrain from actions or behaviors that intimidate, humiliate, or demean persons or groups or that undermine their security or self-esteem based on traits related to race, ethnicity, country of origin, religion, gender identity/expression, sexual orientation, age, or physical or mental ability, including learning and/or developmental disabilities and past/present history of mental disorder or other category protected by state or federal law.

**Accommodations for Students with Disabilities**

Angelo State University is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs, and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs. For more information about the application process and requirements, visit the Student Disability Services website at [www.angelo.edu/ada](http://www.angelo.edu/ada).

**Point of Contact**

**Director of Student Disability Services**

Dallas A. Swafford  
Email: [dallas.swafford@angelo.edu](mailto:dallas.swafford@angelo.edu)

**Office**

Houston Harte University Center, Room 112  
Office Email: [ada@angelo.edu](mailto:ada@angelo.edu)  
Office Phone: 325.942.2047
Title IX at Angelo State University
All community members should enjoy an environment free of any form of harassment, sexual misconduct, discrimination, or intimate partner violence. The university prohibits discrimination based on sex, which includes pregnancy, sexual orientation, gender identity, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination including: sexual assault, sex-based discrimination, sexual exploitation, sexual harassment, public indecency, interpersonal violence (domestic violence and/or dating violence), and stalking.

Students are encouraged to report any incidents of sexual misconduct directly to ASU's Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator You may also file a report online 24/7 at www.angelo.edu/incident-form.

For more information about resources related to sexual misconduct, Title IX, or Angelo State's policy please visit: www.angelo.edu/title-ix.

Note from Dr. Holcomb: As a faculty member at Angelo State, I am a mandatory reporter and am obligated to report incidents involving sexual misconduct to the Title IX Coordinator. Should you wish to speak to someone in confidence about an issue, you may contact the University Counseling Center (325.942.2371), the 24-Hour Crisis Helpline (325.486.6345), or the University Health Clinic (325.942.2171).

Point of Contact
Director of Title IX Compliance and Title IX Coordinator
Michelle Boone, J.D.
Email: michelle.boone@angelo.edu

Office
Mayer Administration Building, Room 210
Office Phone: 325.942.2022
Report an incident: www.angelo.edu/incident-form
Student Absence for Observance of Religious Holy Days

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 Student Absence for Observance of Religious Holy Day for more information.

ACADEMIC INTEGRITY

Academic integrity is a core institutional value at Angelo State University. It means, among other things, truth in presentation, diligence and precision in citing works and ideas we have used, and acknowledging our collaborations with others. In view of our commitment to maintaining the highest standards of academic integrity, the ASU Code of Conduct and Academic Integrity policy specifically prohibits the following forms of behavior:

- cheating on examinations, problem sets and all other forms of assessment;
- falsification and/or fabrication of data;
- plagiarism, that is, the failure in a dissertation, essay or other written exercise to acknowledge ideas, research, or language taken from others;
- multiple submissions of the same work without obtaining explicit written permission from both instructors before the material is submitted.

This is not an exhaustive list of prohibited behaviors. I encourage each of you to read the Code of Conduct and Academic Integrity policy in full for more information. The College of Science and Engineering adheres to the university's Statement of Academic Integrity.

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from Angelo State University.

Plagiarism

Plagiarism is a serious topic covered in ASU's Code of Conduct and Academic Integrity policy in the Student Handbook. Plagiarism is the action or practice of taking someone else's work, idea, etc., and representing it as one's own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas, giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality. Resources to help you better understand this policy better are available at the ASU Writing Center.

Copyright Policy

Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.
Our tentative course calendar is below. I reserve the right to change this calendar as needed; however, I will inform you in class and via email in advance of any changes. Remember to check our Blackboard class page regularly for assigned readings and homework. Also remember to check your university email (RamMail) account regularly for class updates and other important university correspondence.

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<tr>
<th>Week of</th>
<th>Events</th>
<th>Lecture Topic</th>
<th>Chapter</th>
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<tr>
<td>Jan 13</td>
<td><strong>Monday, Jan 13:</strong> First class meeting</td>
<td>Mathematical Tools</td>
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<td><strong>Thursday, Jan 16:</strong> Last day to make schedule changes for this term</td>
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<td>Jan 20</td>
<td><strong>Monday, Jan 20:</strong> No Class (Martin Luther King Jr. Day)</td>
<td>Mathematical Tools</td>
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<td><strong>Thursday, Jan 23:</strong> EXAM 1 <em>(Mathematical Tools)</em></td>
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<td>Jan 27</td>
<td><strong>Thursday, Jan 30:</strong> Drops and withdrawals will now be recorded on transcripts</td>
<td>Nature of Light</td>
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<td>Feb 03</td>
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<td>Geometric Optics</td>
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<td>Feb 17</td>
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<td>Aberration</td>
<td>2, 20</td>
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<td>Feb 24</td>
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<td>20, 3</td>
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<td>Mar 02</td>
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<td>Optical Instrumentation</td>
<td>3, 19</td>
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<td>Mar 09</td>
<td>No Classes (Spring Break)</td>
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<td>Mar 16</td>
<td><strong>Thursday, Mar 19:</strong> EXAM 2 <em>(Ch. 1–3, 19–20)</em></td>
<td>Wave Optics</td>
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<td>Mar 23</td>
<td><strong>Thursday, Mar 26:</strong> Last day to drop or withdraw for this term</td>
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<td>Mar 30</td>
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<td>Apr 06</td>
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<td>Lasers</td>
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<td>Apr 13</td>
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<td>26,27</td>
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<td>Apr 20</td>
<td><strong>Thursday, Apr 23:</strong> EXAM 3 <em>(Ch. 4–6, 26-28)</em></td>
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<td>Apr 27</td>
<td><strong>Monday, Apr 27:</strong> Lab finals begin (through May 01)</td>
<td>Fiber Optics</td>
<td>9, 10</td>
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<td><strong>Thursday, Apr 30:</strong> Last class meeting</td>
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<td>FINALS</td>
<td><strong>Tuesday, May 05:</strong> FINAL EXAM, 10:30am–12:30pm in VIN 148</td>
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Online Course Transition Addendum:

*In response to the coronavirus (COVID-19) pandemic, Angelo State University has decided to extend spring break for its students one additional week (March 16-20) and will move all classes online for the remainder of the spring semester. This decision has been made out of continued concern for the health and safety of our faculty, staff, and students.*

For this course (PHYS 4452-010), the transition to online will necessitate the following updates to our syllabus:

**Office Hours:**

I will no longer be offering in-person office hours or appointments in my physical office, VIN 123; however, I will continue to hold regular office hours and offer one-on-one appointments via Blackboard Collaborate.

**Lecture & Participation:**

Lecture will still be offered synchronously. At our regularly scheduled lecture time (TR 1100-1215, W 1400-1650), I will be offering a verbal lecture via Blackboard Collaborate. All students will have access to log in through the Blackboard course and I will use the screen share feature in place of the chalkboard.

In addition to the synchronous lecture, asynchronous lecture material will be offered for those that cannot log in at the regularly scheduled time. A recording of the synchronous lecture and a PDF version of what I write on my screen will be available for download and review. The recording will either be offered as a full recording of the lecture or as several shorter segments divided by topic.

My recommendation is that everyone participate in the synchronous lecture and use the asynchronous materials to review and refresh as necessary. Following this recommendation will help to maintain the schedule and feel of the course that you have grown accustomed to; however, I understand that some people may be unable due to personal preference (i.e. learning style), external commitments, or access to technology (i.e. computer, high speed internet, etc.).

**Homework:**

Homework will continue to be assigned and handled as originally stated in the syllabus.

**In-Class Assignments (ICA)**

We will, unfortunately, no longer have access to the equipment I planned to use; however, will continue to complete ICA during the synchronous lecture as breakout groups via Blackboard collaborate. Assignments will vary depending on availability of online resources. In the event that someone cannot participate in the synchronous lecture, they
will, at my discretion, be given the opportunity to complete the work individually and submit it within a set timeframe.

**Exams:**

Exams will now all be administered as open-note and open-book take-home exams. This means that the exams will be longer and more comprehensive, but the formatting you have grown accustomed to will be maintained. You will be given one (1) week to complete each exam. To account for the fact that I will not be present to answer questions that you may have, you will be permitted to submit exams for what we will call early-evaluation.

If submitted for early-evaluation, I will briefly look through the exam and mark all questions which were answered incorrectly, and then return the marked exam to you so that you may reattempt the exam. Early-evaluation will not include a full grading of the exam, meaning that partial credit will not be assigned or identified, and directional feedback may or may not be given at my discretion. The number of early-evaluations will be part-dependent as follows:

- Part 1 (Conceptual): Three (3) Early-Evaluations Permitted
- Part 2 (Problem Solving): Three (3) Early-Evaluations Permitted
- Bonus: Zero (0) Early-Evaluations Permitted

A spirit of honesty will be maintained and I will expect you to follow the guidelines outlined on the front page of each take-home exam. They will be open-note and open-book; however, you are expected to refrain from using internet resources or copying the work of your peers, as would be expected of any in-class exam.

Instead of physically turning your exam, you will need to scan a copy of your completed homework and submit via Gradescope. If you do not have access to a scanner, there is an app called Microsoft Lens which is available for smartphones or tablets that will allow you to use your device’s camera to capture a PDF “scan” that you can submit. As students of Angelo State University, you have access to both Gradescope and Microsoft Lens (iOS, Android, Windows) at no additional cost. If you are student who does not have access to a scanner, tablet, or smartphone, please email me and we will figure something out.

**Course Calendar:**

Coverage will be affected by the additional week of spring break and the mandated transition of this course to being administered online. I have updated the course calendar and reserve the right to further adjust the calendar as needed.

<table>
<thead>
<tr>
<th>Week of</th>
<th>Events</th>
<th>Lecture</th>
<th>Chapters</th>
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<tr>
<td>January 13th</td>
<td>Monday 13th - First Day of Class</td>
<td>Mathematical Tools</td>
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<tr>
<td>January 20th</td>
<td>Monday 20th – Martin Luther King Jr. Day (No Class) Exam 1 (Math Tools)</td>
<td>Mathematical Tools</td>
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<td>Week of</td>
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<td>January 27th</td>
<td>Nature of Light</td>
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<td>February 3rd</td>
<td>Geometric Optics</td>
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<td>Aberration</td>
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<td>March 2nd</td>
<td>Optical Instrumentation</td>
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<td>March 9th</td>
<td>Spring Break</td>
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<td>March 16th</td>
<td>Spring Break Extension</td>
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<td>March 23rd</td>
<td>Thursday 26th – Last day to Drop</td>
<td>Wave Optics</td>
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<td>March 30th</td>
<td>Exam 2 (1-3, 19-20)</td>
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<td>April 6th</td>
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<td>April 13th</td>
<td>Lasers</td>
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<td>April 20th</td>
<td>Exam 3 (4-6)</td>
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Final Exam Tuesday, May 5th, 10:30am-12:30pm --- Remotely Administered Friday 1st – Thursday 7th
Online Course Transition Addendum:

In response to the coronavirus (COVID-19) pandemic, Angelo State University has decided to extend spring break for its students one additional week (March 16-20) and will move all classes online for the remainder of the spring semester. This decision has been made out of continued concern for the health and safety of our faculty, staff, and students.

For this course (PHYS 4452-02Z), the transition to online will necessitate the following updates to our syllabus:

Office Hours:

I will no longer be offering in-person office hours or appointments in my physical office, VIN 123; however, I will continue to hold regular office hours and offer one-on-one appointments via Blackboard Collaborate.

Laboratory:

The transition to online delivery inherently means that the equipment necessary to complete the planned laboratory experiments will no longer be accessible. Therefore, we shall henceforth complete group-based research projects focused on the development and modern use of complex optical systems. The following topics will be available on a first come first serve basis:

- Spectrometers and Spectrophotometers
- Microscopes (Optical, Confocal, Fluorescent, etc.)
- High-Energy Telescopes (Gamma, X-ray, Ultraviolet)
- Low-Energy Telescopes (Infrared, Microwave, Radio)
- Interferometers (Michelson, Fabry-Perot, etc.)
- Coherent Diffraction Imaging (X-ray)
- Medical Imaging (MRI, Ultrasound, etc.)

Groups will be expected to present a 20–30 minute oral presentation (making use of PowerPoint) over some of the optics-influenced instruments, equipment, and techniques (IET) within their assigned area. This will include, but is not limited to, answering the following prompts:

- How were the selected IET developed?
- What major or notable improvements and adjustments have been made over time?
- Describe how the modern iteration of IET works in detail. Provide schematics, diagrams, and informative graphics as needed and be able to explain its inner workings.
- Where are the modern iteration of IET used in current research? Give examples from multiple recently published, peer reviewed articles and be ready to explain how they were utilized.
- Pulling from the information you have gleaned by researching the selected IET, are there any improvements that you think could or should be made? Are there any areas that you think the IET is underappreciated and should be used more?
Lab Notebook:

In addition to the presentation, you will be expected to maintain and submit a research notebook for review weekly. This notebook should follow the spirit of the originally intended lab notebooks and maintain a complete record of all personal activities pertaining to the research project. Activities that should be recorded include but are not limited to:

- Websites that you visited to research your selected IET. Include dates that you accessed the website and a summary of what, if any, information that you found useful or beneficial.
- Books that you read to research your selected IET. Include dates and chapters that you looked through along with a summary of what, if any, information that you found useful or beneficial.
- Minutes of any group meetings pertaining to the project. Include a summary of any action plans, workload divisions, or discussions along with the date, time, and participants for every meeting. These will include any meetings you have with me to discuss project related material.
- Catalog your work on the presentation and include summaries of any additions, edits, or deletions that you may make.
- Document any practice runs or presentations that you may complete in preparation for April 29th and offer a summary of personal suggestions for how you could improve your performance.

Course Calendar:

Coverage will be affected by the additional week of spring break and the mandated transition of this course to being administered online. I have updated the course calendar and reserve the right to further adjust the calendar as needed.

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<td>March 2nd</td>
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<tr>
<td>March 9th</td>
<td>Spring Break</td>
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<td>March 16th</td>
<td>Spring Break Extension</td>
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<td>March 23rd</td>
<td>Thursday 26th – Last day to Drop</td>
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<td>March 30th</td>
<td>Wednesday 8th – Research Projects Assigned</td>
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<tr>
<td>April 6th</td>
<td>Wednesday 8th – Research Notebook Review</td>
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<td>April 13th</td>
<td>Wednesday 15th – Research Notebook Review</td>
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<td>April 20th</td>
<td>Wednesday 22nd – Research Notebook Review</td>
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<tr>
<td>April 27th</td>
<td>Wednesday 29th – Research Presentations</td>
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