

**Georgia Institute of Technology**  
**School of Electrical and Computer Engineering**

**ECE Special Topics 4470**  
**Devices for Renewable Energy**



**Professor: Dr. Alan Doolittle**

**Office:** Petite 208 (note this is erroneously listed in some ECE websites)

**Work:** (404) 894-9884 (hard to reach – use email).

**Email:** alan.doolittle@ece.gatech.edu (by far, the best way to communicate with me).

**Credits:** 3 lecture hours, letter, pass/ fail, audit

**Prerequisites:** ECE3040 (or equivalent semiconductor physics class)

**Text: Online Text** <https://www.pveducation.org/pvcdrom/welcome-to-pvcdrom>

This superb online resource was written by Doctors Christiana Honsberg and Stuart Bowden. These two friends have asked that you supply feedback and help find errors and broken links. Please help.

**Web Resources:**

Official Class Web site: <https://alan.ece.gatech.edu/>

**Office Hours:** Officially: Monday 9:45-10:45. Most weeks I hold “open office hours” on MWTh where you can come by for help anytime that is pre-arranged (strongly recommended to insure I am there, preferably by email) or drop by unplanned (no guarantee I will be in my office). All students are strongly encouraged to consult me with any problem, academic, personal or professional!

**Course Outcomes:** Upon successful completion of the course, students will demonstrate:

- Knowledge of the science behind climate variability
- Knowledge of the potential impact and practical limitations renewable energy will have on climate variability
- Knowledge of the functionality and design of a photovoltaic device
- Knowledge of the differences in and performance advantages associated with various categories of photovoltaic designs
- Knowledge of traditional and emerging energy storage technologies
- Overview knowledge of mechanically driven renewable energy devices.

**Grading Schedule:**

Grades will be based on a 100 point scale (see note on the final exam below), but bonus points will frequently be awarded. Major grades will fall approximately every 5 weeks.

		<b>Approximate Date</b>
Exam 1	20%	~Feb 20 <sup>th</sup>
Note: the remaining timing cannot be set until after drop day when we know how many students will be presenting.		
Design Project	20%	~Due the week before the presentation
Presentation	20%	Order selected by random lottery but generally, the last 1/3 of class meetings.
Homework	2% each	~5 per term but may be substantially fewer.
Final Exam*	30%	Wednesday, May 3, 11:20 AM to 2:10 PM
Pop Quizzes	0.5% Bonus	As needed to insure attendance

**All students having a numeric grade higher than 89.99 at class end will be exempted from the final exam.**

Each homework is **ungraded** and adds a fixed 2 % (or 0%) if **ALL** (or some) assignments are **legitimately** attempted. Homework will be representative of test problems. If more than 5 homework assignments are made, all those above 5 will be counted as bonus points ( a good way to raise your grade a couple of points). If less than 5 are assigned, bonus points will be awarded to all to raise the homework contribution to 10%.

\*Final exams often have many bonus points, thus accounting for as much as 35-40% of your overall grade **IF** all bonus points are attempted.

**While curving is not expected to be needed in this class, I do not curve in the traditional GT way. Bonus points are added to the final exam to allow you to receive an “earned curve”. If you do not learn the material, you cannot get the benefit of a curve.**

**What is Expected of Students**

All students are required to follow the academic honor codes established by Georgia Tech.

All students are expected to be respectful of other students.

All students are responsible for materials covered in and/or assigned in class **REGARDLESS** of whether they attended class.

I strongly prefer an interactive class. Let me know if you do or do not understand what is being lectured. Ask questions!

### **Instructor Commitment to the Student.**

While statistics always result in some students who will perform poorly in this class, no student will perform poorly due to lack of access to the instructor. To that end, I will make every reasonable provision possible to ensure your success in this class. Students are strongly encouraged to seek help from this instructor with any problem, academic, personal or otherwise. Students are also strongly encouraged to supply the instructor with constructive criticism regarding all aspects of class activity. Such criticism (even/especially that considered negative) will be greatly appreciated.

### **Academic Integrity**

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit <http://www.catalog.gatech.edu/policies/honor-code/> or <http://www.catalog.gatech.edu/rules/18/>. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

### **Accommodations for Students with Disabilities**

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or <http://disabilityservices.gatech.edu/>, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

### **Student-Faculty Expectations Agreement**

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See <http://www.catalog.gatech.edu/rules/22/> for an articulation of some basic expectation that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

### **Absence Policy**

Students are responsible to make up work assignments for any excused absences but prior notice to the instructor of absences is required. Absence from exams is not excused without prior arrangement with the instructor (a rare event) and is only possible in extreme circumstances approved ahead of time by the instructor or due to extreme medical situations verified by the dean of students. All policies regarding make up work are consistent with the institute policies found at: <http://www.catalog.gatech.edu/rules/4/>

### **Semester Schedule**

Students are ***STRONGLY*** encouraged to read the material ***Before*** the class discussion.

Approximate Order of Coverage	Topic	Reading Material
1	Class introduction and policies Climate Change Solar Device Classes	Handouts TEXT Chapter 1
2	Properties of Sunlight	TEXT Chapter 2
3	P-N Junctions	TEXT Chapter 3
4	Solar Cell Operation	TEXT Chapter 4
5	Design of Silicon Solar Cells	TEXT Chapter 5
6	Design of thin film and advanced Solar Cells	Notes
7	Manufacturing of solar cells	TEXT Chapter 6 Notes
8	Modules and Arrays	TEXT Chapter 7
9	Selected Characterization topics	TEXT Chapter 8
10	Storage Technologies	TEXT Chapter 9
11	Abbreviated systems and economics overview	Notes
12	Student Presentations	
17	Final Exams	

## **Presentation Details:**

It is my desire to make your presentation topic as interesting and as useful to you as possible. All topics must be unique. No topic can be shared by another student. Papers regarding topics partially covered in class should provide much more detail than what was covered in our text and class discussions. If chosen carefully, the paper can be a benefit to you and fun to put together instead of a time liability.

The topic is accepted by written (paper) on or before the first exam. Fill out and turn in the form at the end of this syllabus (in person). The topics are on a first come first claim basis and all must be unique (no joint presentations). NOTE that this is a renewable energy device technology class and thus, a review of other devices is not an appropriate topic. How a device is made or how a material is fabricated or characterized is also an appropriate topic.

**I WANT TO SEE DETAIL!!!! TELL ME WHAT YOU LEARNED!** Ideally, I would like you to tell me something I do not already know. In the absence of this, (because I will likely be familiar with most topics) it should answer a “yes” to the question; “If I heard this topic from you for the first time, would I understand the topic well?”

## **Presentation specifications:**

Length dependent on class size: Generally, 10-15 minutes with details to come later (depends on the number of students in class at the presentation time).

Given in PowerPoint with both hard and electronic copies supplied to the instructor prior to your scheduled presentation. Presentation topics scheduled by random lottery order near the 2<sup>nd</sup> exam time. **REGARDLESS OF PRESENTATION TIME, ALL PRESENTATIONS WILL BE DUE SIMULTANEOUSLY AND CANNOT BE CHANGED AFTER SUBMISSION.**

Note: Reference everything, especially figures on the same slide as they appear (footnotes). Also, I may use some slides from exceptional presentations in future lecture slides.

# Presentation Topic Selection Form

Name (as appears on class role): \_\_\_\_\_

I have read this syllabus and specifically have read the grading procedures: \_\_\_\_\_  
(Initials)

Title of Presentation \_\_\_\_\_

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Rough idea of subtopics to be included (so I know you have at least read up on the topic a little before making your selection)

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