ECE 6501 Fall 2017	Schedule: Tu,Th 1 pm (may be some exceptions--check schedule for exact dates)
Instructor: Prof. David Citrin	email (best way to contact me): david.citrin@ece.gatech.edu
Office Hours: By appointment	Cell (emergencies only!) +1 404 717-3085

Course Description
This course concerns Fourier techniques applied primarily to the spatial properties of imaging systems. In addition, the course discusses analog character recognition, synthetic aperture radar, and holography, as well as other applications.

Objectives
- Students will master techniques related to imaging system design from the standpoint of Fourier optics.
- Students will master other applications in diffraction, radar, microscopy, and holography.

Text
Introduction to Fourier Optics, J. W. Goodman. We will use the current edition; however, previous editions are likely to be adequate, although page and chapter/section numbers might differ. Class notes will also be posted on T-Square.

Useful Background
Basic knowledge of Fourier transforms, electromagnetic propagation, elementary optics.

Homework policy
Homework sets will be assigned from time to time. They will not be graded; solutions will be distributed. It will provide essential practice for the midterm.

Exam policy
There will be one in-class midterm on 16 March.

Failure to take the midterm (see above) may result in a grade of zero unless you present **written documentation** that you have a valid excuse and that I accept the excuse. If you have any questions, please consult me. Unless the excuse is related to an obviously unforeseen emergency, this documentation must be presented one week prior to the midterm or a grade of zero may result.

The midterm must be taken on the dates indicated. Failure to take the midterm at the indicated time will result in a grade of zero. The midterm time might be changed only for the entire class under exceptional circumstances, provided no student objects, but not for individual students. Please consult the syllabi for all your courses immediately so that you can budget your study time.

Paper/Presentation
There will be a final paper/presentation in this course. More information is contained in a separate handout that will be discussed in detail in class. **Due to the large anticipated enrollment, I encourage you to work in pairs on this assignment.**

Please note the due dates for the outline, first draft, and paper. Note that a grade will only be given for the final draft of the paper (and the presentation).

Grading policy
The course grade will be computed according to the following weights:
Midterm: 50 %
Research Paper/Presentation: 50 % (25 % written paper/25 % oral presentation)

Class Attendance Policy
Class attendance is mandatory! Class attendance is the easiest way I know of to attain a first attempt at an understanding of the material. Participation in lectures will be an important way to stay engaged with the

course. (Of course, this has to be supplemented by working homework problems, reading the text and other materials, and other practice.)

Academic Conduct
See Student-Faculty Expectation agreement below.

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.

You are free to work with other students on problem sets and with regard to the final project. You must work strictly alone on the midterm. Policy concerning notes, books, calculators, electronic devices permitted on midterm and final exam will be announced.

Students in this class are expected to abide by the Georgia Tech Honor Code and avoid any instance of academic misconduct, including but not limited to:

- Possessing, using, or exchanging improperly acquired oral or written information in the preparation of a quiz or the final project.
- Submission of material that is substantially identical to that created or published by another individual, except as noted below.
- False claims of performance or work that has been submitted by the student.

Be sure to report observed instances of violations of the Honor Code! Remember, the Honor Code is about honor. Apart from devaluing your own work, the work of your classmates, and the Georgia Tech degree, Violations of the Honor Code carry significant penalties, here at Tech, and for life. Do you want to be labeled as having cheated? The trustworthiness of engineering and science (as well as the reliability and safety of products!) relies on the basic honesty of engineers and scientists. Students may work in groups on the final project as will be discussed in a future handout, though each must student make a good-faith effort to contribute to the group. Each student must also write up and turn in his/her work to integrate the knowledge.

Please turn off notifications on cell phones, etc. Some students may choose to use computers for note taking during class; however, if I perceive that they are a distraction, I might ask that they be put away.

More detailed information concerning materials and other aids allowed in quizzes will be given later. See the Georgia Tech Honor Code for further information or ask instructor.

Student-Faculty Expectations Agreement
Georgia Tech thinks 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.

Communications
You are responsible for all announcements (which may include information about the problem sets, the research paper/presentation, midterm, and the final exam) made in class. The midterm and the final will likely strongly reflect material covered in class. If you miss class, do not ask me what was covered. Handouts may also be distributed from time to time in class; *it is your responsibility to obtain information from classmates if you are not present when information is given or materials are distributed*. T-Square will be the regular means by which I will distribute materials. I may also email the class various

information. *It is your responsibility to save emails containing information about the class*.

The best way to contact me is via email (**put "ece6501" in the subject line**), briefly immediately after class (but another class may need the room), or by appointment.

Getting Help
The material in this course builds on earlier material, so it is very important to not fall behind. Be sure to contact me (see above) or use other resources that are available. As noted above, email questions or arrange for an appointment.

Miscellaneous
Audible notifications on cell phone and similar devices must be turned off in class.

Tentative Syllabus: Dates to be added soon

It is unlikely that the listed topics will exactly match the listed dates. This is just a rough estimate of how the material will flow to give you a sense of where we are headed. However, the midterm date is unlikely to be changed.

: Outline of paper/presentation due.
: Midterm: First draft of paper due.
: Final draft of paper due.

Week	Date	Topic	Reading
1		Introduction and 2-D functions; convolutions & correlation; 2-D Fourier transform; polar-coordinate transformations	1.1, 1.2; 2.1, 2.2 2.3
2		Polar-coordinate transformation; sampling & replication; Optical wave fields	2.3, 2.4; Chap 3
3		Wave propagation; angular spectrum; Fresnel regime propagation **PAPER OUTLINE DUE**	4.1, 4.2
4		Fraunhofer regime propagation	4.3, 4.4
5		Fraunhofer regime; non-monochromatic	4.4-4.7
6		Fourier transforming property of lenses	5.1, 5.2
7		Fourier transforming property of lenses cont'd **MIDTERM** Imaging spatially coherent objects	5.2-5.5; 6.1
8		Imaging spatially coherent objects	6.2, 6.3; 6.4-6.6
9		Imaging spatially coherent objects	7.1, 7.2; 7.3-7.7
10		Imaging transparent objects	8.1-8.74
11		Holography Coherent Optical Spectrum Analysis	11.1, 11.2; 12
12		Coherent/Incoherent Spatial Filtering	13, 14
13		Synthetic Aperture Radar **FIRST DRAFT PAPER DUE**	
14		Project Presentations*	
15		**PAPER DUE** Project Presentations*	

*Number of days for student presentations will depend on how many students are enrolled in the class.
Numbers following topics refer to sections in the textbook.