

**MSE 4004-Fall 2026**  
**Materials in Electronic Applications**  
**Tues/Thurs 9:30 a m - 10:45 a m**  
**MRDC II 3403**

**Instructor**                    **Dr. Rosario Gerhardt**  
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**Office Hours:**                Tuesdays: 2:00pm-3:00pm (or by appointment)

**Overview**                      This course will emphasize the materials and fabrication methods used in conventional electronics as well as advanced electronic devices. This will include a study of electronic material classes and their properties. Using case studies of thin film transistor devices, fabrication methods such as lithography, etching, film deposition, thermal oxidation, surface functionalization and their needed characterization will be discussed. The latest trends in the manufacturing and design of hybrid electronics utilizing 1D, 2D and 3D components will also be covered. Additive manufacturing methods such as tape casting, screen printing, ink jet printing, roll-to-roll processing as well as subtractive methods besides etching will also be described. Inorganic and organic examples of materials and designs used to make devices such as capacitors, batteries, fuel cells, light emitting diodes and thin film transistors will be covered. Both small components as well as large area deposition methods used to pattern and integrate these systems will be included.

**Primary References**

1. Class notes & background readings and videos available on Canvas.
2. Sami Franssila, "Introduction to Microelectronics Fabrication", 2<sup>nd</sup> Edition, John Wiley & Sons, 2010.
3. Z. Cui, "Printed Electronics", Wiley, 2016.
4. R.C. Buchanan, ed., " Ceramic Materials for Electronics Processing, Properties and Applications," Marcel Dekker, Inc. 3rd edition, 2004.
5. GangWang, Chengyi Hou and HongzhiWang "Flexible and Wearable Electronics for Smart Clothing," Wiley-VCH, 2020

**Grading**                        The final grade in this course will be a weighted average of the following categories:

Homework	25%
Paper Review	15%
Exams	60% (20% each)

Below are the minimum weighted score grade ranges for the semester.

A	≥89.5%
B	74.5% - 89.4%
C	59.5% - 74.4%
D	49.5% - 59.4%
F	< 49.5%

A quiz or exam may be curved (i.e., extra points added to everyone's score) at the instructor's discretion. The curve for an exam or quiz will be announced both in class and on Canvas when the assessment is graded and returned to the class.

### **Homework**

Homework will be given throughout the semester. All homework must be entirely a student's own work. Discussion with other students on homework is encouraged but copying from one another will be considered academic misconduct. Homework represents 25% of the course grade thus, neglecting the homework will jeopardize the measurement of your performance in the class.

Homework grades will be graded as: 0% (did not turn in/no answer), 40% - 65% (partially correct answer), 66-89% (mostly correct answer) or 90-100% points (fully correct answer). All homework submissions must be scanned into one pdf file (be sure the scan is high quality and rotated in the correct direction) and submitted via Canvas (NOT VIA EMAIL). Your lowest homework score will be dropped when your grade for the course is calculated. No late homework will be accepted (see below for illness policies).

### **Paper Review**

Students will work in groups of 3-4 to review 5 related papers in a subfield (e.g. thin film transistors, biosensors, flexible batteries, etc.), synthesizing these findings into a short summary / critique (10 pages). The student groups will have four main deadlines: (1) Choose topic and assign member responsibilities (2) Preliminary complete version of presentation, (3) Final revised presentation, and (4) Final written paper review summary. Additional details on presentations and paper review summary due dates will be provided on the Canvas website.

### **Exams:**

There will be three closed book exams throughout the semester. Exams will be administered in-person during the scheduled class period. No computers or phones allowed. Answer the questions on the sheets of paper provided by Prof. Gerhardt.

### **Website**

Canvas will be used to post the course syllabus, lecture notes, recordings, homework, and homework solutions. You will also submit your assignments via Canvas. Important announcements will be posted on Canvas regularly so please enable notifications and check it regularly.

<b>Grade Accuracy</b>	If you believe that an error was made in grading exams or homework, you should write a short justification of your claim and attach a copy of your original submission. Send an electronic copy of this justification and the originally graded assignment to Prof. Gerhardt via MS Teams. The “statute of limitations” for such claims is 1 week after the assignment/test is returned.
<b>Accommodations</b>	The Georgia Institute of Technology encourages qualified persons with disabilities to participate in its programs and activities. If you anticipate needing any type of accommodation in this course or have questions about physical access, please tell the instructor as soon as possible and apply for accommodations at the Office of Disability Services early in the semester.
<b>Missed Tests</b>	Make-up exams/tests will only be permitted when absences are due to legitimate reasons such as illness, religious observance, or other events recognized by the Institute as a valid excuse. <u>In any case, you must contact the instructor in advance of the quiz via email to schedule a make-up quiz and provide documentation from the Institute through the Dean of Students.</u> If you miss an exam/quiz without either a certified medical excuse or prior instructor approval, you will earn zero credit for that exam.
<b>Academic Integrity</b>	Students should refer to the Institute’s policy on academic integrity found in the code of conduct. It is the instructor’s understanding and expectation that students neither give nor receive any unauthorized aid on exams or quizzes, including the use of unauthorized notes or other information on an electronic device. While group discussion is encouraged on homework assignments, individuals must submit their own assignments. Authorized aid on homework assignments includes discussing the interpretation of the problems, sharing ideas or approaches for solving the problems, and explaining the concepts and possible solutions involved in the problems. All cases of academic misconduct will be submitted to Office of Student Integrity.
<b>Student Expectations</b>	<ol style="list-style-type: none"> <li>1. Electronic devices (tablets, cell phones, calculators, etc.) are allowed during lectures if they do not distract you from learning. All these devices are banned during exams.</li> <li>2. During all course interactions (online or in person), students are expected to act in a professional manner that is courteous to the instructor and their fellow classmates.</li> </ol>
<b>Instructor’s Commitment</b>	You can expect your instructor to be courteous, punctual, well-organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if she is unable to keep them; to provide a suitable guest lecturer if she is traveling; and to grade uniformly and objectively all tests and assignments.

**Class Recordings** Classes may not be recorded by students without the express consent of the instructor unless it is pursuant to an accommodation granted by the Office of Disability services. Class recordings, lectures, presentations, and other materials posted on Canvas are for the sole purpose of educating the students currently enrolled in the course. Students may not record or share the materials or recordings, including screen capturing or automated bots, unless the instructor gives permission.

**Instructor Illness:** Faculty may cancel a class if they have an illness or emergency and cover any missed material at their own discretion. You will be notified as quickly as possible of changes to the course schedule via Canvas. The syllabus will be updated on an ongoing basis to reflect changes and corrections during the semester. Recorded lecture videos will be posted as needed to ensure that we maintain course progress.

**Tentative Schedule:** Details on lectures, assigned readings, homework assignments due, exam dates and review paper deadlines will be posted on Canvas website during the first week of classes

**Campus Resources for Students:** Direct links to different student services will also be posted on Canvas website.