Energy Transport at the Nanoscale
EML 6934 Section ET25, EFE2, EFED, EWEB
Class Periods: Mon, period 8 (3:00 PM ~ 3:50 PM)
Wed, period 8 (3:00 PM ~ 3:50 PM)
Fri, period 8   (3:00 PM ~ 3:50 PM)
Location: NEB 0102
Academic Term: Spring 2026

Instructor:
Jingjing Shi, shi.j@ufl.edu
Office Hours: Mon and Wed, 4:00 ~ 5:00 PM, Zoom link on Canvas

Course Description
Nanoscale energy transport in materials and across interfaces. Credits:3

Course Pre-Requisites / Co-Requisites
EML 4140 (Heat Transfer) or equivalent courses

Course Objectives
The objective for this course is to provide students with an understanding of the essential physics of energy transport (especially thermal energy) as well as some of the practical technological considerations and fundamental limits. The goal is to do this in a way that is broadly accessible to students with only a very basic knowledge of heat transfer. Students in this course will:
1. Gain an understanding of the fundamental elements of solid-state physics relevant to thermal transport.
2. Develop skills to derive continuum physical properties from sub-continuum principles.
3. Apply statistical and physical principles to describe thermal energy transport in modern small-scale materials and devices.

Recommended Materials
- Introduction to Solid State Physics 8th Edition, Charles Kittel, ISBN: 978-047141526
- Thermal Energy at the Nanoscale, Timothy S Fisher, https://doi.org/10.1142/8716
- David Tong: Lectures on Statistical Physics, https://www.damtp.cam.ac.uk/user/tong/statphys.html

Course Schedule
- Lattice structure: 2 Weeks
- Carrier statistics: 4 Weeks
- Basic thermal properties: 3 Weeks
- Landauer formalism: 3 Weeks
- Scattering in materials and interfaces: 3 Weeks
- Midterm 1: Feb. 20
- Midterm 2: Apr. 10

Evaluation of Grades
For undergraduate students:

Assignment	Percentage of Final Grade
Homework	50%
Midterm 1	25%
Midterm 2	25%

For Graduate students:

Assignment	Percentage of Final Grade
Homework	40%
Midterm 1	25%

Midterm 2	25%	
Project	10%	

Grading Policy

Percent	Grade	Grade Points
90.0 - 100	A	4.00
86.7 - 89.9	A-	3.67
83.4 - 86.6	B+	3.33
80.0 - 83.3	B	3.00
76.7 - 79.9	B-	2.67
73.4 - 76.6	C+	2.33
70.0 - 73.3	C	2.00
66.7 - 69.9	C-	1.67
63.4 - 66.6	D+	1.33
60.0 - 63.3	D	1.00
0 - 59.9	E	0.00

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
• Your academic advisor or Graduate Coordinator
• HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
• Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu

Policy on the Use of AI Tools (e.g., ChatGPT, Claude, Gemini, etc.)

In this course, YOU are ultimately responsible for your own learning and the work you submit. AI should never replace your own critical thinking, problem-solving, or mastery of the material.

Permitted Uses of AI

You may use AI in limited, supportive ways to help your learning and preparation, such as:
• Brainstorming approaches to a homework problem.
• Asking for hints or clarification on concepts.
• Reviewing background information on a topic.

Prohibited Uses of AI

You may not use AI in ways that replace your own work or demonstrate understanding that is not your own. Specifically, AI tools are not permitted for:
• Solving entire homework problems or generating final answers without your own effort.
• Writing full solutions, derivations, or explanations that you then submit as your own.
• Any use during exams or other closed-assessment situations.

Key Reminder

AI is a supplement, not a substitute. To succeed in this class and in engineering practice, you must develop your own problem-solving and critical thinking skills. Misuse of AI will be treated as an academic integrity violation.