

Carleton University
Department of Electronics
Engineering ELEC 4704 – Nanoscale Technology and Devices
Course Outline ----- Fall 2024

Introduction

This course examines emerging technologies and devices that rely on, or are influenced by, structure on the nanometer scale. Topics covered include:

- Quantum mechanics: particle confinement, band structure, effect of scale
- Analysis tools: microscopy, spectroscopy, etc.
- Materials & fabrication: thin films, nanoparticles, nanotubes, organics, graphene. etc.
- Structures & properties: quantum well devices, nanocrystals, nanostructuring, etc.
- Applications & devices: electronics, optoelectronic, photonic, etc.

Instructor

Steven McGarry Office: ME 5158
 Lab: ME 5190
 Email: stevenmcgarry@cunet.carleton.ca
 Web page: <http://www.doe.carleton.ca/~smcgarry>
 Course site: Brightspace

Teaching Assistant

William Fraser Office: ME 5174
 Email: WilliamFraser3@gmail.com

Text (optional)

“Introduction to Nanoelectronics”, Vladimir V. Mitin, Viatcheslav A. Kochelap, Michael A. Stroscio, Cambridge University Press, 2008 (this text contains some of the course material but is not followed in the lectures and is not sufficient on its own - it is NOT REQUIRED for the course).

Course Grade

The final grade will be determined using the following weighting:

Problem Sets/Labs	30 %
Midterm exam	20 %
Final exam	50 %

There are 5 Problem Sets/Labs in the course that must be completed and submitted in Brightspace – these are MANDATORY and required for successful completion of the course.

Midterm & Final Exams

The midterm exam will be in-class during the lecture period and the final exam will be a three hour in-person officially scheduled exam. For both exams you will be provided with equation sheets and all other information required for their completion, which will be available on the website prior to the exam.

Calculator Policy

Programmable calculators will not be allowed in the midterm or final exam. A “programmable calculator” is defined as a calculator that can store program steps or text at any level of sophistication and the rule applies irrespective of whether or not there appears to be anything stored. If you have any doubts about the eligibility of your calculator, please see me well before the exam.

Website Mark Listings

Marks will be available on the course website. Please check your marks online and report any discrepancies immediately. *Please note:* Near the end of the term, information will be posted on the course website concerning the final opportunity for mark argument/correction. After that time, the term marks will be closed and there will be no further opportunity for correction or argument. Please monitor the course website for the final deadline.

Final Exam Availability

In keeping with Faculty of Engineering policy, students are not entitled to the results of their final exam, which is considered to serve as an evaluation of performance rather than a pedagogical tool.

Academic Integrity

As with other courses it is assumed that work done by you for the course will be done with academic integrity. As potential future engineers it is expected that you will pursue your profession with integrity. The Universities academic integrity policy webpage can be found at:

<https://carleton.ca/registrar/academic-integrity/>

Note that the use of generative AI tools (such as ChatGPT) in course work is prohibited unless explicitly authorized by the course instructor for specific elements of the course and such use is considered an academic integrity violation.

Use of Course Materials

Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copy protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s).

Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www.carleton.ca/equity/>

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www.carleton.ca/equity/>

Academic Accommodations for Students with Disabilities: The **Paul Menton Centre** for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your **Letter of Accommodation** at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (*if applicable*) at <http://www.carleton.ca/pmc/>

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://www.carleton.ca/equity/>