

Carleton University
Department of Electronics
Engineering ELEC 4704 – Nanoscale Technology and Devices
Course Outline ----- Fall 2022

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

Teaching Assistant

Aaron English Office: 5128 ME
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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 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

As the access to calculating facilities is difficult to control during on-line examinations, the exams will be set such that having access to advanced features should not provide any advantage. You will be required to calculate numerical results during the examinations so it is recommended that you have access to a tool that you can use to efficiently perform such calculations.

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 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/new-and-current-students/dates-and-deadlines/>

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/>

Covid-19

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are a number of actions you can take to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton's symptom reporting protocols.

Masks: Carleton has paused the COVID-19 Mask Policy, but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in cuScreen as soon as possible. Please note that Carleton cannot

guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the University's COVID-19 website and review the Frequently Asked Questions (FAQs). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.

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).