Micro/Nanofabrication in optoelectronics (Opti-677)

Instructor: Mahmoud Fallahi

(Spring 2023)

This course is intended to give a broad understanding of various microfabrication techniques used in photonic and optoelectronic components. It covers epitaxial growth, lithography and processing steps of compound semiconductors frequently used in micro/nano-fabrication of optical and optoelectronic devices. Fabrication of waveguides and laser diodes and various integration techniques are also discussed. The course will be a combination of lecture and independent study followed by presentations on selected topics. The following topics are covered.

1. **Introduction to Microfabrication**
   - Sources of Contamination
   - Clean room and its operation

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2. **Lithography**
   - Photolithography
   - Resist processing
   - Exposure
   - Lift-off process
   - Electron Beam Lithography and nano-patterning
3. **Epitaxial Growth**
   - MBE
   - MOCVD
   - CBE and ALE
4. **Etching techniques**
   - Wet etching
   - Dry etching: RIE, ICP
   - What to choose
5. **Contact Metallization**
   - Ohmic contact
   - Schottky contacts
   - Annealing

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6. **Optoelectronic Fabrication**
   - Waveguides
   - Laser diodes
   - OEIC
   - Integration Techniques
7. **Passivation and packaging**

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Opti-677, Spring 2023

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Reference Books

Handbook of Compound Semiconductors: Holloway & McGuire
Semiconductor Lithography: Moreau

The UA Libraries provide free access to the following e-books for OPTI 677:

SEMICONDUCTOR LITHOGRAPHY:
http://ezproxy.library.arizona.edu/login?url=https://doi.org./10.1007/978-1-4613-0885-0

TECHNOLOGY OF QUANTUM DEVICES:
http://ezproxy.library.arizona.edu/login?url=http://dx.doi.org/10.1007/978-1-4419-1056-1

Course Grading

4 Topics presentations: Each 20%

Final Project Report: 20%