



University of Sistan and
Baluchestan

Department of Mechanical Engineering-Mechatronics

Computational Nanotechnology

Instructors: Tahereh Fanaei, Amin Behzadmehr

Credits: 3

Subject: Fundamentals of Analytical and numerical Modeling for nano and micro scales Devices and Technologies.

Course Goal: The goal of this course is to improve the students with the analytical and numerical solutions for modeling micro and nano devices and technologies. Provide the students with enough basic knowledge, so they can understand literature related to their desired topic and allow them to begin developing new theories and technologies.

Course Details

Week	Contents	References
1	Introduction and Preliminaries	Ref. 1
2	Finite Element concepts	Ref. 1
3	FEM for Solid Mechanics Problems	Ref. 1
4	Discretization	Ref. 1
5	Assembly and Solution	Ref. 1
6	Project Discussion 1	
7	Project Discussion 2	
Midterm Exam		
8	Physical Principles: Electric Charges, Fields, Capacitive Devices	Ref. 2
9	Physical Principles: Magnetism and Induction Devices	Ref. 2
10	Physical Principles: Piezoelectric Effect	Ref. 2
11	Physical Principles: Thermoelectric Effect	Ref. 2
12	Physical Principles: Photovoltaic Devices	Ref. 2
13	Ballistic and Diffusive Transport	Ref. 3
14	Two Terminal Quantum Dot Devices	Ref. 3
15	Project Discussion 3	
16	Seminar	
Final Exams		

References:

1. Klaus-Jürgen Bathe, "Finite Element Procedures:", Second Edition, 2008.
2. Handbook of Modern Sensors: Physics, Designs, and Applications, By: Jacob Fraden, Springer, 2010.
3. S. Datta, "Lessons from Nanoelectronics: A New Perspective in Transport", World Scientific, 2012.

Evaluation

- Seminar: 10%
- Project: 20%
- Midterm exam: 20%
- Final exam: 50%