GUJARAT TECHNOLOGICAL UNIVERSITY

NANO TECHNOLOGY (39)
SIMULATION TECHNIQUES FOR NANO PARTICLE CHARACTERIZATION
SUBJECT CODE: 2183903
B.E.8th SEMESTER

Type of course: Computation, simulation and analysis.

Prerequisite: Basic and applied knowledge of nanomaterials, nanodevices and computing.

Rationale: To make students understand the use of design and simulation tools for making nanostructures, nanodevices or systems prior to its expensive fabrication. This is very useful for research as well as industrial applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
0	0	6	6	0	0	0	50	30	20	100

Content:

Sr. No.	Content
1	Introduction to simulation and software tools for modeling and data analysis.
2	Creating mathematical operations, Plotting graphs for 2D, 3D functions using MATLAB/Scilab/TCAD or other tools.
3	Use of some software tools such as MATLAB/TCAD/COMSOL for solving and analyzing optimization problems, building models, representing input data, results, interpretation and analysis.
4	To plot (i) the output characteristics and, (ii) the transfer characteristics of a MOSFET.
5	Design and simulation of nanostructures and their properties using software tools.
6	Design and Simulation of a MEMS/NEMS using software tools.

Reference Books:

1. Amos Gilat, MATLAB: An Introduction with Applications, Wiley, 2008.
2. Mathews and Fink, Numerical Methods Using MATLAB, Pearson, 2004.
3. J. C. Polking and D. Arnold, Ordinary Dierential Equations using MATLAB. Pearson, 2003.
4. Richard B. Ross and Sanat Mohanty, Multiscale Simulation Methods for Nanomaterials, Wiley, 2008.
5. A primer for the monte carlo method, llya M. Sobol, CRC Press

Course Outcome:
After learning the course the students should be able to:
1. To notify the learner about the design and simulation of nanomaterials.

2. To know about various simulation tools for nanotechnology.
3. To have knowledge about modeling and simulation software tools with their applications

Design based Problems (DP)/Open Ended Problem:

Open Ended /design based project: A group of students (Maximum Three) has to undertake one open ended problem/design problem. **(Students are free to select any area of science and technology may be based on their branch to define the project)**

Aims:

1. To provide experience in laboratory based experimentation, data recording and analysis and drawing of conclusions.
2. To develop report writing skills for scientific material
3. To develop the ability to undertake investigations where, as part of the exercise, the goals and methods have to be defined by the investigator.
4. To develop skills in literature searches and reviews.

List of Open Source Software/learning website:

http://ocw.mit.edu/courses/materials-science-and-engineering/
http://nanowerk.com
http://www.nanosworld.com/nano/education