



Course Specification

— (Bachelor)

Course Title: Nano Technology

Course Code: 391B-MEC-2

Program: Bachelor of Science in Engineering

Department: Mechanical Engineering

College: College of Engineering

Institution: Najran University

Version: 1.0

Last Revision Date: 27 February 2024



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A. General information about the course:

1. Course Identification

1. Credit hours: (2)

2. Course type

A. University College Department Track Others
 B. Required Elective

3. Level/year at which this course is offered: (Fourth Year \ Level 8)

4. Course general Description:

Historical development of Nano science and technology, Formation of energy gap, Discreteness of energy levels. Tunneling currents and Formation and characterization of Nano layers, Applications of Nano layers. Synthesis and Fabrication of Nano particles, Characterization and Application of Nanoparticles. Top-Down Nano structuring Techniques, Nano devices and applications.

5. Pre-requirements for this course (if any):

213-MEC-3 (Mechanics of Materials)

6. Co-requisites for this course (if any):

NIL

7. Course Main Objective(s):

1. Easily understand about the dimensionality associated with the materials.
2. Check and apply the different properties of Materials at Nanoscale.
3. Use the information about the formation of energy gap and Discreteness of energy levels for its application.
4. Understand different techniques use for the formation and synthesis of nanoparticles and structures.



2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	15
5.	Others (specify)	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Impart the knowledge of Nano science and Technology.	1	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO.	-Test performance evaluation -Evaluation of participation in discussion and group assignments





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			<p>TS:4 – Conducting quizzes by the each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	
1.2	Knowledge of formation and synthesis of Nano particle and structure.	7	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Giving more assignment by the each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	<p>-Test performance evaluation</p> <p>-Evaluation of participation in discussion and group assignments</p>
2.0	Skills			
2.1	Easily understand about the dimensionality associated with the materials.	2	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p>	<ul style="list-style-type: none"> •Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			<p>TS:4 – Conducting quizzes by the each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	<ul style="list-style-type: none"> •Quizzes
2.2	Impart the knowledge to apply different properties of materials at Nano levels.	6	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Conducting quizzes by the each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	<ul style="list-style-type: none"> •Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes
3.0	Values, autonomy, and responsibility			
3.1	Knowledge about the formation of energy gap and Discreteness of energy levels for its application.	5	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Conducting midterm and Final</p>	<p>Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics</p> <ul style="list-style-type: none"> •Assignments involving critical and logical thinking questions •Quizzes





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			Exam by the each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	
3.2	Knowledge about the formation of energy gap and Top-Down Nano structuring Techniques, Nano devices and applications	3	TS:1-Interactive lectures using PowerPoint slides TS: 2 – Associating the topics in each chapter with the CLO. TS:3 – Conducting midterm and Final Exam for each chapter TS:4 – Giving more example programs in the lecture TS: 5 – Discussion with the students in the class hours	Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes

C. Course Content

No	List of Topics	Contact Hours
1.	Historical development of Nano science and technology, Formation of energy gap, Discreteness of energy levels.	10
2.	Tunneling currents and Formation and characterization of Nano layers, Applications of Nano layers.	10
3.	Synthesis and Fabrication of Nano particles, Characterization and Application of Nanoparticles.	15
4.	Top-Down Nano structuring Techniques, Nano devices and applications.	10
Total		45





D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	1-10	10%
2.	Quizzes	1-10	10%
3.	Mid-term	7	30%
4.	labs	-	-
5.	Final exam	12	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	“Nanotechnology and Nano electronics Materials, Devices, Measurement Techniques” R. Fahrner 2010 , Springer.
Supportive References	1.“Nanostructures and Nano materials synthesis, properties and applications ” Guo Zhong Cao 2011 , Imperial college press 2.Nanoparticles in the Water Cycle: Properties, Analysis and Environmental Relevance” Fritz H. Frimmel and R. Niessner2010, Springer
Electronic Materials	Online custom books
Other Learning Materials	NA

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms and laboratories
Technology equipment (projector, smart board, software)	--
Other equipment (depending on the nature of the specialty)	--



F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders and Peer Reviewer	Direct, Indirect
Effectiveness of Students assessment	Students & Faculty	Direct and Indirect
Quality of learning resources	Students & Faculty	Direct and Indirect
The extent to which CLOs have been achieved	Students & Faculty	Direct and Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT OF MECHANICAL ENGINEERING
REFERENCE NO.	
DATE	27/02/2024

