



Course Specifications

Course Title:	Principles of Nanotechnology
Course Code:	2044103-2
Program:	Bachelor in Chemistry
Department:	Department of Chemistry
College:	College of Sciences
Institution:	Taif University

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A. Course Identification

1. Credit hours: 2 (Theoretical)
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: 10 th Level / 4 th Year
4. Pre-requisites for this course (if any): General Chemistry 2 (2042103-3)
5. Co-requisites for this course (if any): NA

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3 Theoretical hours/ Week	100%
2	Blended	-	-
3	E-learning	-	-
4	Distance learning	-	-
5	Other	-	-

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	-
3	Tutorial	-
4	Others (specify)	-
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed as an introductory course of the latest technology in science. It's been built on the most recent research in the field of nanotechnology to shed light into the properties of materials and biomaterials at the atomic/molecular level and the scaling laws governing these properties.

2. Course Main Objective

The main purpose of this course is to introduce students to changes in surface properties as decrease size of structures and preparation methods of nanomaterials.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding:	
1.1	Recognize the changes in surface properties as decrease size of structures.	K1
1.2	List five techniques used to characterize nanomaterials.	K2
2	Skills :	
2.1	Distinguish between zero, one and two nanostructures	S1

CLOs		Aligned PLOs
2.2	Outline the impact of nanotechnology on technology, health, energy and environment.	S3
3	Values:	
3.1	Illustrate the concept of personal responsibility for achieving duties by teamwork.	V1

C. Course Content

No	List of Topics	Contact Hours
1	Nanotechnology: introduction and classification	3
2	Properties of nanomaterials-Effects of the nanometer length scale	3
3	Fabrication methods - Top-down and Bottom-up processes	3
4	Characterization of nanomaterials: introduction and classification	3
5	Microscopy techniques. Electron microscopy. Scanning probe techniques.	3
6	Diffraction techniques. Spectroscopy techniques. Surface analysis and depth profiling.	3
7	Zero-dimensional nanostructures: Nanoparticles. One-dimensional nanostructures: Nanowires and Nanorods. Two-dimensional nanostructures: Thin Films.	3
8	Special nanomaterials: Carbon-based nanomaterials, Fullerenes and Carbon Nanotubes.	3
9	Special nanomaterials: Carbon-based nanomaterials, Graphene.	3
10	The impact of nanotechnology: Scientific, Technical and Environmental Impacts.	3
Total		30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Recognize the changes in surface properties as decrease size of structures	Lecture	Written exam
1.2	List five techniques used to characterize nanomaterials	Lecture	Written exam
2.0	Skills		
2.1	Distinguish between zero, one and two nanostructures	Discussion	Homework Assignments
2.2	Outline the impact of nanotechnology on technology, health, energy and environment	Discussion	Homework Assignments
3.0	Values		
3.1	Illustrate the concept of personal responsibility for achieving duties by teamwork	Collaborative Learning	Individual presentations

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework Assignments (Electronic)	Throughout Semester	10%
2	Individual presentations	Throughout Semester	10%
3	Mid Term Exam	6	30%
4	Final exam	11/12	50%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Commitment to the rules of the Academic Advising Department at the university in accordance with the academic guidance manual approved by the university and the attached forms, there are different arrangements made by teaching staff to support student consultations including;

- Office hours: 8 hours per a week for each academic member.
- Academic guidance: an academic member has a number of students to guide them throughout degree journey.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	<ul style="list-style-type: none"> • Nanostructures and Nanomaterials: Synthesis, Properties, and Applications. Guozhong Cao, 2011, Latest Edition. World Scientific. ISBN: 978-4322-50-8. https://www.worldscientific.com/worldscibooks/10.1142/7885 • Nanotechnology: An Introduction, Jeremy J. Ramsden, 2016, Latest Edition. Elsevier. ISBN: 9780323393119. https://onlinelibrary.wiley.com/doi/pdf/10.1002/anie.201206358
Essential References Materials	<ul style="list-style-type: none"> • Nanoscale Science and Technology. Latest Edition R. Kelsall, I. Hamley, and M Geoghegan, 2005, Latest Edition. John Wiley & Sons, Ltd. (USA). ISBN: 9780470850862. https://onlinelibrary.wiley.com/doi/book/10.1002/0470020873
Electronic Materials	<ul style="list-style-type: none"> • Saudi Digital Library (SDL) https://apps.tu.edu.sa/sdl/default.aspx
Other Learning Materials	<ul style="list-style-type: none"> • Learning Management System (Blackboard) https://lms.tu.edu.sa/

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	A classroom with movable tables and chairs conducive to group discussion and teamwork.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, smart board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	--

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and assessment	Students	Survey (indirect method)
Extent of achievement of course learning outcomes	Program leader	Reports (Direct method)
Quality of learning resources	Peer referees Students	Reports (Direct method) Survey (indirect method)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

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

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Department Council/ Quality assurance committee
Reference No.	2-5-1444
Date	01/11/2022