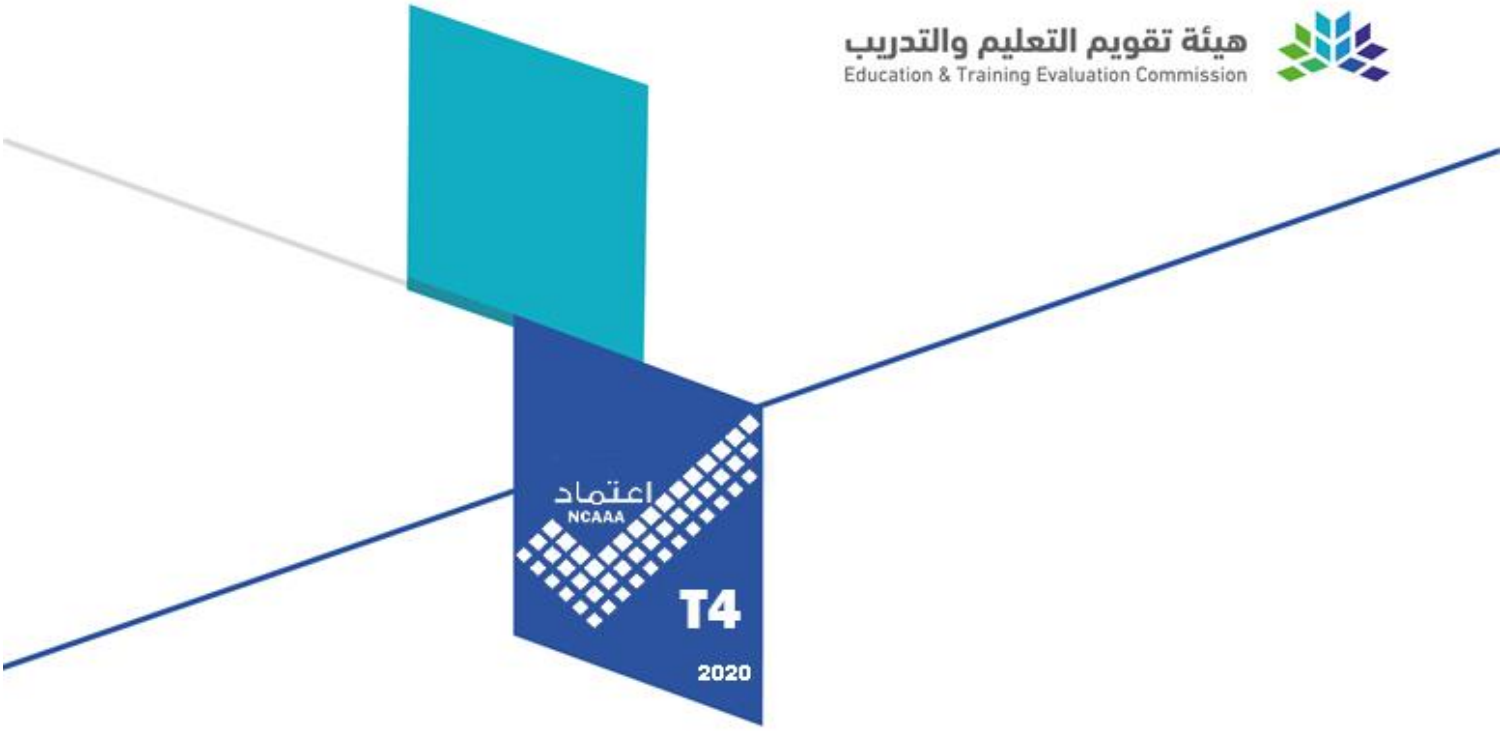
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Nanoscience and Technology**
Course Code:	**2034212-2**
Program:	**Bachelor in Physics**
Department:	**Physics Department**
College:	**College of Science**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours: 2
2. Course type **a.** University ☐ College ☑ Department ☐ Others ☐ **b.** Required ☐ Elective ☑
3. Level/year at which this course is offered: 11th level / 4th year
4. Pre-requisites for this course (if any)**: None**
5. Co-requisites for this course (if any)**: None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	3	100%
2	**Blended**	0	0%
3	**E-learning**	0	0%
4	**Distance learning**	0	0%
5	**Other**	0	0%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	**30**

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers important parts in nanotechnology and nanoscience. Students will study the effect of the nanoscale on the properties of matter. Fabrication methods of nanomaterials and nano-devices will be covered. Characterization techniques at the nanoscale will be considered. Furthermore, semiconductor nanomaterials will be studied in addition to their applications in nanoelectronics. Magnetic nanomaterials will be covered in addition to their applications. Finally, the benefits and risks of nanotechnology will be considered.

2. Course Main Objective

Basic concepts of nanoscience and nanotechnology. Fabrication techniques of nanomaterials and nanodevices. Studying magnetic nanomaterials and devices. Studying smart polymeric nanomaterials.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	State the basic concepts of nanotechnology and nanoscience and their role in our daily life.	K1
1.2	Describe the effect of the nanoscale on the properties of matter.	K3
2	**Skills :**	
2.1	Explain physical phenomena and concepts relevant to nanoscience and its applications.	S4
2.2	Develop physics problems solving skills	S2
3	**Values:**	
3.1	Show responsibility for working independently and for continuous improvement of personal capacities.	V1

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction to Nanotechnology:** ▪ **Classification and Fabrication** ▪ **What is Nanotechnology?** ▪ **Classification of Nanostructures.** ▪ **Nanoscale Architecture.** ▪ **Electronic Properties of Atoms and Solids.** ▪ **Effect of the Nanometer length scale.** ▪ **Fabrication Methods:** ▪ **"Bottom-up Process".** ▪ **"Top-down Process".**	6
2	**Charaterization Techniques:** ▪ **Imaging and Analytical Techniques.** ▪ **Microscopy Techniques.** ▪ **Spectroscopy techniques.** ▪ **Diffraction Techniques.** ▪ **Surface Analytical Techniques.**	4
3	**Organic and Inorganic Semiconductor Nanostructures and Devices:** ▪ **Introduction to Semiconductors.** ▪ **Inorganic Semiconductors.** ▪ **Quantum Confinements (Quantum Wells, Dots and Wires).** ▪ **Organic Semiconductors** ▪ **Organic Field Effect Transistor.** ▪ **Organic Light-emitting Devices.** ▪ **Organic Photovoltaics.** ▪ **Carbon Nanotubes.**	6
4	**Nanomagnetic Materials and Devices:** ▪ **Magnetism.** ▪ **Nanomagnetic Materials.** ▪ **Magnetoresistance.**	4

	Applications.	
5	**Smart Polymeric Systems and their Applications:** ▪ **Polymers (Macromolecules).** ▪ **Self-assembly.** ▪ **Polymer Thin Films.** ▪ **Smart Polymeric Materials.** ▪ **Applications.**	4
6	**Benefits and Risks of nanotechnology**: ▪ **Health.** ▪ **Environment.** **Military and Wars.**	4
	Final Review	2
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	State the basic concepts of nanotechnology and nanoscience and their role in our daily life.	Lecture	Written exam and Homework reports
1.2	Define the effect of the nanoscale on the properties of matter.	Lecture and Group discussion	Written exam
2.0	**Skills**		
2.1	Explain physical phenomena and concepts relevant to nanoscience and its applications.	Lectures	Written exam and Homework reports
2.2	Develop physics problems solving skills	Lecture and Group discussion	Homework reports
3.0	**Values**		
3.1	Show responsibility for working independently and for continuous improvement of personal capacities.	Group discussion	Project

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Activities	Periodically	10%
2	Midterm exam	6th	30%
3	Short exam	9th	10%
4	Final exam	12th	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 :

4 Hours per week during office-hours, in teacher's staffroom or as per the arrangement made by the teacher.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Nanoscale Science and technology, Robert Kelsall, Ian W. Hamley, Mark Geoghegan, Wiley 2005.
Essential References Materials	Nanostructured materials, Second Edition: Processing, Properties and Applications, William Andrew, 2006.
Electronic Materials	https://www.youtube.com/watch?v=L67VRh-iNgg
Other Learning Materials	NONE

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture room with max 60 seats Labs
Technology Resources (AV, data show, Smart Board, software, etc.)	data show, Smart Board, blackboard
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NONE

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	Students	Indirect
Evaluation of Teaching	Pear reviewer Program coordinator Departmental council Faculty council	Indirect
Improvement of Teaching	Program coordinator Relevant committee	Direct
Quality of learning resources	Students Instructor Faculty	Indirect
Extent of achievement of course learning outcomes,	Program coordinator Instructor	Direct
Course effectiveness and planning for improvement	Program coordinator Instructor	Indirect

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	
Reference No.	
Date	October 2, 2022