هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Bioengineering and Nanobiotechnology**
Course Code:	**2054206-3**
Program:	**Bachelor in Biotechnology**
Department:	**Biotechnology Department**
College:	**College of Science**
Institution:	**Taif University**
Version: :	**V4**
Last Revision Date:	**3/1445 – 9/2023**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 lecture, 1 lab)					
2. Course type					
A.	☐ University	☐ College	☒ Department	☐ Track	☐ Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: (8 th Level / 4 th Year)					
4. Course general Description:					
The knowledge gained in this course will enable the students to think and use nanotechnology as a new approach to address physical, chemical, biological, and environmental phenomena. It will cover synthesis methods, properties and applications of engineered nanomaterials, engineering aspects (micro-and nanofabrication, self-assembly, micro- and nanofluidic) of biosensors, lab-on-chips and biological/medical microdevices. The course will cover the development of new tools for food, agriculture, health, cosmetics production and monitoring and control biological and environmental processes and phenomena.					
5. Pre-requirements for this course (if any):					
Bioinformatics, 2054102-3					
6. Pre-requirements for this course (if any):					
None					
7. Course Main Objective(s):					
Recognize the wide range of applications of nanobiotechnology and its interdisciplinary aspect, the principles governing the effect of size on material properties at the Nano scale and perform quantitative analysis, a working knowledge in nanotechnology techniques and acquire the ability to use them to solve problems in bioengineering, biomedicine, and agricultural/environmental issues.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%

No	Mode of Instruction	Contact Hours	Percentage
2	E-learning	-	-
3	Hybrid ● 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**	15
3.	**Field**	-
4.	**Tutorial**	-
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	**Recognize various nanoparticles and various fabrications methods for the production of nanoparticles**	**K.1**	**Lecture**	**Written Exam**
1.2	**State types of the nano-biosensors and nanoparticles application in different fields**	**K.5**	**Lecture & Discussion**	**Written Exam**
...				

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	**Skills**			
2.1	**Illustrate the fabrication of lab chips**	**S.2**	**Discussion**	**Group Report**
2.2	**Analyze the role bio-nanotechnology in enzymes properties and drug delivery**	**S.2**	**Lecturer, Discussion**	**Written Exam.**
...				
3.0	**Values, autonomy, and responsibility**			
3.1	**Adopt the values of academic and professional morals**	**V.1**	**Project**	**Report, Presentation**
3.2	**Adapt to the vales and rules of the team work**	**V.2**	**Group Discussion**	**Performance Evaluation**
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Course overview, The world of small dimensions, Nanoscale Properties (Electrical, Optical, Chemical)	2
2.	Nanoscale visualization techniques 1: Electron microscopy (TEM, SEM, Cryo-SEM)	4
3.	Bionanomaterials 1: Biological building blocks, Bionanostructures (nanofibers, nanotubes, nanocellulose)	4
4.	Biological nanomachines 1: Ribosomes, Photosynthesis systems, Bionanomotors	2
5.	Engineered Nanomaterials 1: Carbon nanomaterials (fullerenes, graphene, nanotubes, nanofiber	3
6.	Engineered Nanomaterials 3: Magnetic nanoparticles (synthesis, properties and applications)	3
7.	Nanotechnology by self-assembly 3: Protein nanotechnology, Nanotechnology by self-assembly 4: DNA nanotechnology	4
8.	Diffusion in solid phase and drug delivery	2
9.	Biological and medical microdevices: lab on chips, organ-onchips, Biosensors (fabrication, functionalization, applications)	2
10.	Nanotechnology safety and the environment	4

Total	30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exam	Week 7	20%
2.	Periodical exam (Quiz)	Week 9	10%
3.	Report, Presentation	Week 11	10%
4.	Practical Exam, Performance Evaluation	Week 14	20%
5.	Final Exam	Week 15	40%

*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	Leggett, G. J.; Jones, R. A. L., Bio-nanotechnology. In Nanoscale Science and Technology, John Wiley &Sons,Ltd: 2005; pp 419-445. Bucke, C., Bio-nanotechnology—lessons from nature. By David S Godsell. Wiley-Liss, Hoboken, NJ, 2004. 352pp, ISBN 0 471 41719 X. Journal of Chemical Technology & Biotechnology 2005, 80 (8), 964-965. Lectures in Bioengineering and nanobiotechnology
Supportive References	Dong, H.; Hu, W., Organic Nanomaterials. In Springer Handbook of Nanomaterials, Vajtai, R., Ed. Springer, Berlin Heidelberg: 2013; pp 905-940. Gibbs, M. R. J., Nanomagnetic Materials and Devices. In Nanoscale Dong, H.; Hu, W., Organic Nanomaterials. In Springer Handbook of Nanomaterials, Vajtai, R., Ed. Springer, Berlin Heidelberg: 2013; pp 905-940. Gibbs, M. R. J., Nanomagnetic Materials and Devices. In Nanoscale
Electronic Materials	Journal of Nanobiotechnology. https://jnanobiotechnology.biomedcentral.com/
Other Learning Materials	Nanobiotechnology - Latest research and news | Nature https://www.nature.com/subjects/nanobiotechnology

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**One classroom with internet connection for 2 hours a week and one laboratory for 3 hours a week with internet facility.**
Technology equipment (projector, smart board, software)	**Data show and Smart board**
Other equipment (depending on the nature of the specialty)	**-Nanofabrication and nanomanipulation instruments: -** **3D Printing system for microfluidic devices** **- Characterization instruments: -** **High precision syringe pumps, Peristaltic pumps** **Potentiostates, Optical Waveguide Lightmode Spectroscope (OWLS), Atomic Force Microscope (AFM), Optical Microscopes (white light/epifluorescence), Electrical Impedance spectroscopy (EIS), Multi-frequency Lock-in Amplifier, Sub-femtoamp Remote, SourceMeter** **Instrument,** **-Molecular/cell biology instruments: -** **Biological safety cabinet (class II), Microwell plate readers, Protein and DNA electrophoresis systems, Microincubator Okolab, Nanodrop spectrophotometer, CO2 incubator for cells: Galaxy® 48 S, 48 L, 230 V/50/60 Hz standard, Cell culture cabin: Bioii-Advance 3. - Microfluidics instruments: -** **High precision syringe pumps, Peristaltic pumps**

F. Assessment of Course Quality

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

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT COUNCIL**
REFERENCE NO.	**6**
DATE	**5/11/2023**