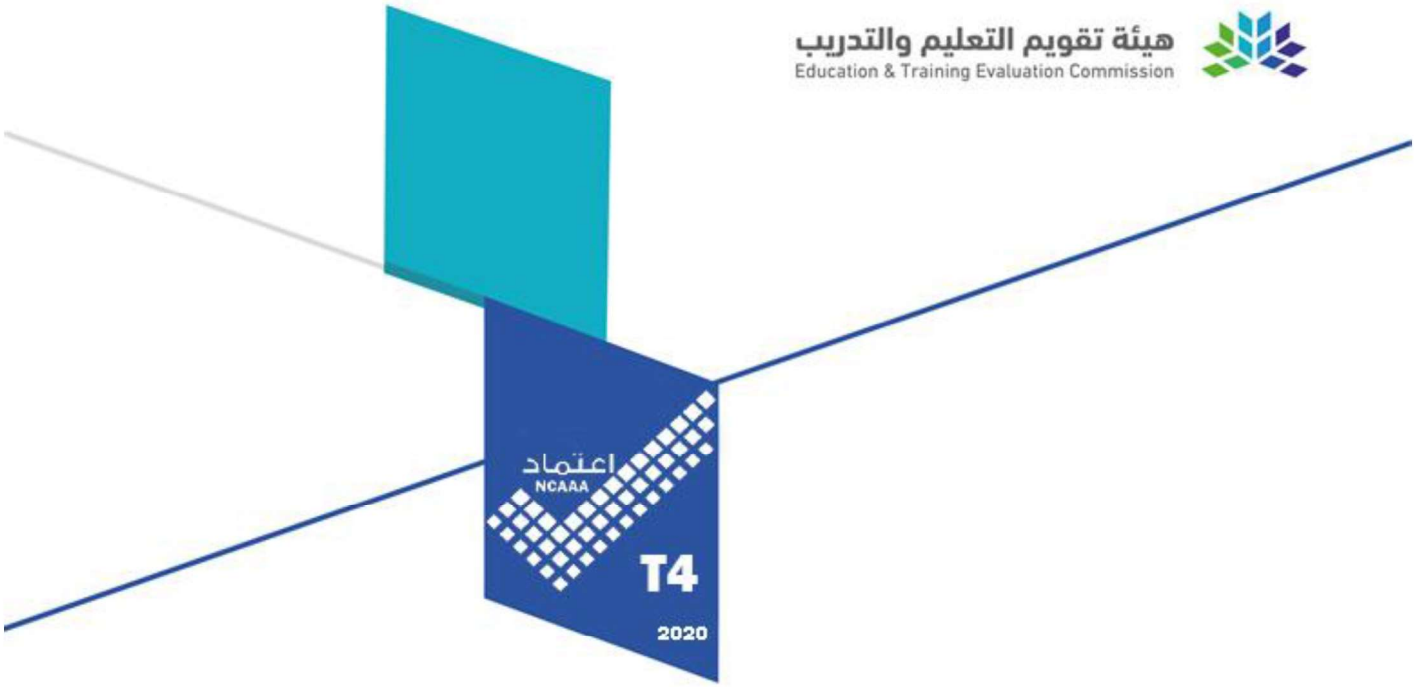
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	Protein Chemistry Engineering
Course Code:	**2054107-3**
Program:	**Bachelor of Biotechnology**
Department:	**Department of Biotechnology**
College:	**College of Science**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours: 3 (2 Lecture, 1 Lab)
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)**: Biochemistry, 2053101-3**
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**	60	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**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides a deeper knowledge of chemical, physical, and biological properties of proteins as well as engineering. Topics will include the detailed structure and function of protein, techniques for studying protein structure, approaches of protein engineering, approaches of protein design with novel properties, in vitro mutagenesis (site-directed mutagenesis), hybrid proteins, expression and characterization of the newly designed protein, diversity oriented (directed evolution) protein engineering, and computational protein design (rational design), and the high throughput protein engineering platforms for selection of novel proteins. The course will also cover case studies of proteins that are successfully engineered for therapeutics, enzymes, biomaterials and other biotechnological applications will be discussed.

2. Course Main Objective

Describe strategies to engineer and design novel proteins, demonstrate the skills and techniques to engineer and design novel protein, describe techniques to create diversity in protein. Use various computational tools to design protein, examples of proteins that are engineered for diverse application.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Recognize the various aspects of protein structure, function, and chemistry	K1
1.2	Outline the various approaches for protein mutagenesis and protein design	K1
1.3	Describe basics of protein engineering	K4
2	**Skills :**	
2.1	Evaluate the different methodology of protein engineering	S2
3	**Values:**	
3.1	Accept the moral of recent communication technologies	V3

C. Course Content

No	List of Topics	Contact Hours
1	Introduction and overview of the course, Protein engineering concepts	3
2	Review: Protein Chemistry and structure, Enzyme kinetics	3
3	Protein Folding – Molecular Energy and Forces	3
4	Protein Engineering Strategies: Directed evolution and Rational design (Computer modeling)	6
5	Protein Engineering Techniques, Library Construction	3
6	High-throughput Protein Engineering Platform	3
7	Examples of engineered proteins	3
8	Introduction to Rational Design	3
9	Rational Design (Computer Modeling	3
Total		30

List of practical topics	Contact hours
Fundamentals in protein structures	3
Strategies to engineer and design novel proteins	3
In vitro mutagenesis and site direction mutagenesis	3
Proteins screening and selection	3
Protein activity assay	3
Characterization of selected proteins	3
Molecular evolution and hybrid proteins	3
Application of protein engineering on enzymes	3
Enzymes selection and assays	3
Application of protein engineering on therapeutics	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**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.1	Recognize the various aspects of protein structure, function, and chemistry	Lecture	Written Exam
1.2	Outline the various approaches for protein mutagenesis and protein design	Lecture	Written Exam
1.3	Describe basics of protein engineering	Lecture, Project	Written Exam, Report
2.0	**Skills**		
2.1	Evaluate the different methodology of protein engineering	Problem solving	Written Exam (Practical)
3.0	**Values**		
3.1	Accept the moral of recent communication technologies	Project	Report

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm exam	5	20%
2	Periodical Exam	8	10%
3	Report	9	10%
4	Practical Exam	10	20%
5	Final Exam	11	40%

***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:

1. Every faculty member allocates 6 hours per week of office hours in his schedule for student academic consultations, advice about registration and drop/add courses, and academic difficulties if any.
2. The Academic Guidance Unit of the program offers personal, academic, and professional counseling to support students academically, behaviorally, and emotionally.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Protein Engineering and Design, Edited by Sheldon J. Park and Jennifer R. Cochran. CRC Press, 2010
Essential References Materials	Protein Engineering Handbook, Volume 3. Edited by Stefan Lutz and Uwe T. Bornscheuer. Wiley-VCH, 2013
Electronic Materials	**NBCI website (https://www.ncbi.nlm.nih.gov)**

Other Learning Materials	**1. Direct evolution design software** **2. Protein design and structure software** **3. Rational design software**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	One classroom with internet connection for 2 hours a week and one laboratory for 3 hours a week with internet facility.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, 2D protein analysis software, internet connection.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	1. Enzymes assay kits 2. *In vitro* mutagenesis kits 3. Hybrids proteins 4. Protein Electrophoresis

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Course management and planning	Students	Indirect
Effectiveness of teaching and assessment	Students	Indirect
Quality of learning resources	Students	Indirect
Effectiveness of Evaluation and exams	Students, Peer Reviewer	Indirect, Direct

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
Reference No.	7
Date	16-6-1443