

## Curriculum for Ph.D. in Tissue Engineering

**Core Courses: 24**  
**Elective Courses: 6**  
**Thesis: 20**  
**Total: 50**

**Table A. Compensatory Courses**

Code	Courses	Credits			Hours			Prerequisite
		Theoretical	Practical	Total	Theoretical	Practical	Total	
1	Medical Information Systems	0.5	0.5	1	9	17	26	-
2	General Anatomy and Embryology	1	0.5	1.5	17	17	34	-
3	Histology	1	0.5	1.5	17	17	34	-
4	Cell Physiology	2	-	2	34	-	34	-
5	General Pathology	2	-	2	34	-	34	-
6	General Pharmacology	2	-	2	34	-	34	-
7	Fundamentals of Immunology	2	-	2	34	-	34	-
8	Cellular and Molecular Biology	2	-	2	34	-	34	-
9	Statistics and Research Methods	2	-	2	34	-	34	-
10	Genetics	1	-	1	17	-	17	-
11	Biomechanics	2	-	2	34	-	34	-
12	Fundamentals of Materials Sciences	2	-	2	34	-	34	-
13	Fundamentals of Biochemistry	2	-	2	34	-	34	-
14	Fundamentals of Biophysics	2	-	2	34	-	34	-
	<b>Total</b>	<b>25</b>						

According to the department schedule and by the approval of the Graduate Education Council, Ph.D. students are due to take a maximum of 16 credits from the aforementioned courses (Table A).

**Table B. Core Courses**

Code	Courses	Credits			Hours			Prerequisite
		Theoretical	Practical	Total	Theoretical	Practical	Total	
15	Principals of Tissue Engineering	2	0.5	2.5	34	17	51	02, 03, 04, 05, 06, 07
16	Care and Use of Laboratory Animals	1	1	2	17	34	51	-
17	Cell Culture	2	1	3	34	34	68	03
18	Histological Study Methods	1	1	2	17	34	51	-
19	Bioinformatics, Research Methods, Clinical Trials	1.5	2	3.5	26	68	94	08, 09
20	Mechanisms of Tissues and Organs Repair	2	0.5	2.5	34	17	51	15
21	Bio-scaffolds	2	1	3	34	34	68	-
22	Graft Biology and Immunology	1.5	0.5	2	26	17	43	07
23	Molecular Techniques and Advanced Cellular Signaling	2.5	1	3.5	43	34	77	08
24	Thesis				20			
	<b>Total</b>				44			

**Table C. Elective Courses**

Code	Courses	Credits			Hours			Prerequisite
		Theoretical	Practical	Total	Theoretical	Practical	Total	
25	Cellular Bank	1.5	0.5	2	26	17	43	15, 20
26	Angiogenesis	1.5	0.5	2	26	17	43	04, 05, 06
27	Effective Strategies for Communicating with Policymakers and Investors	1.5	0.5	2	26	17	43	-
28	Ethics in Medical Education	2	-	2	34	-	34	-
29	Molecular Genetics	1.5	0.5	2	26	17	43	08, 10
30	Nano-biotechnology	2	-	2	34	-	34	-
31	Three-dimensional Cell Culture	1	1	2	17	34	51	17
	<b>Total</b>				14			

## TEHRAN UNIVERSITY OF MEDICAL SCIENCES

With the supervising professor's consent and the approval of the Graduate Education Council, students are due to take 6 credits of the aforementioned courses (Table C) that are relevant to the subject of their Ph.D. thesis.

## **Course and Lesson Plan for the First Semester**

### **Course Plan**

- 1. General Anatomy and Embryology**
- 2. Histological Study Methods**
- 3. Cell Culture**
- 4. Fundamentals of Immunology**
- 5. Fundamentals of Materials Sciences**

## **Course and Lesson Plan for the Second Semester**

### **Course Plan**

- 1. Principals of Tissue Engineering**
- 2. Graft Biology and Immunology**
- 3. Molecular Techniques and Advanced Cellular Signaling**
- 4. Bio-scaffolds**
- 5. Three-dimensional Cell Culture**

## **Course and Lesson Plan for the Third Semester**

### **Course Plan**

- 1. Mechanisms of Tissues and Organs Repair**
- 2. Nano-biotechnology**
- 3. Cellular Bank**
- 4. Bioinformatics, Research Methods, Clinical Trials**
- 5. Care and Use of Laboratory Animals**

## First semester

No.	Course Name	Number of Credits			Type	Description
		Theoretical	Practical	Total		
1	Histological Methods	1	1	2	Core	Introduction to Cellular Phenotype Using Immunochemistry and Cell Sorting
2	Cell Culture	2	1	3	Core	Introduction to Cell Culture, Cell and Tissue Imaging and Application of Stem Cells in Tissue Regeneration
3	Fundamentals of Immunology	2	-	2	Compensatory	Introduction to the Immune System and Its Function
4	Fundamentals of Materials	2	-	2	Compensatory	Introduction to Materials, Their Properties and Biomedical Applications
5	General Anatomy and Embryology	1	0.5	1.5	Compensatory	Introduction to the General Human Anatomy and the Early Stages of Embryo Development
Total				10.5		

## Second Semester

No.	Course Name	Number of Credits			Type	Description
		Theoretical	Practical	Total		
1	Principles of Tissue Engineering	2	0.5	2.5	Core	Advanced Strategies in Tissue Engineering
2	Molecular Techniques and Advanced Cell Signaling	3	1	4	Core	Detailed Knowledge of the Regulatory Mechanisms of Cell and Molecular Techniques Commonly Used in Medical Research and Gene Therapy
3	Three-dimensional Cell Culture	1	1	2	Elective	Principles of Three-dimensional Cell Culture
4	Scaffolds in Tissue Engineering	2	1	3	Core	Introduction to Material Selection and Methods of Scaffold Fabrication and Characterization
5	Biology and Immunology of Transplantation	2	-	2	Core	Introduction to the Patient's Immune Reactions After Transplantation of Tissue Engineered Construct.
Total				13.5		

## Third Semester

No.	Course Name	Number of Credits			Type	Description
		Theoretical	Practical	Total		
1	Mechanisms of Organ Repair	3	-	3	Core	Understanding the Mechanisms of Regeneration in Organs and Tissue Engineered Constructs
2	Bioinformatics, Research Methods, Clinical Trial Methods	1.5	2	3.5	Core	The Use of Online Molecular Databases, Introduction to Research Methodology and Application of Statistical Software
3	Animal Models	1	1	2	Core	Handling Animal Models Used in Biomedical Researches
4	Cell and Tissue Banks	1.5	0.5	2	Elective	Overview of Cell-lines and Maintenance Procedures of Cells and Tissues
5	Nano-biotechnology	2	-	2	Elective	Introduction to Nano-biotechnology Concepts and Techniques
Total				12.5		

TEHRAN UNIVERSITY OF MEDICAL SCIENCES