



## Biomedical Engineering Program Specification

### 1- Course Specification of General Biology

#### Course Code (BE101)

I. Course Identification and General Information:					
1	Course Title:	General Biology			
2	Course Code & Number:	BE101			
3	Credit hours:	C.H			TOTAL
		Th.	Seminar	Pr	
		2	--	2	--
4	Study level/ semester at which this course is offered:	2 <sup>nd</sup> Level / 1 <sup>st</sup> Semester			
5	Pre –requisite (if any):	None			
6	Co –requisite (if any):	None			
7	Program (s) in which the course is offered:	Biomedical Engineering Program			
8	Language of teaching the course:	English			
9	Location of Teaching the Course:	Faculty of Engineering			
10	Prepared by:	Dr. Hala Jameel Aeid Al Jobory			
11	Reviewed by:	Dr. Mohammed Al-Olofi			
12	Date of Approval:				

### II. Course Description:

A coherent introductory course, that comes from different disciplines and brought together to provide the students with the fundamental concepts, principles, and theories of biology, so that

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the student acquires a comprehensive idea of life characteristics, macromolecules (carbohydrates, proteins, lipids, and nucleic acids), cell structure, cell membrane (transportation), as well as cell division (meiosis and mitosis), and cell signaling. Emphasizing anatomy and physiology biology from zoological perspectives, basic concepts of genetics are also included and finally, maintenance of homeostasis is discussed, all will allow the students to acquire knowledge of biological principles relevant to further studies.

<b>III. Course Intended learning outcomes (CILOs) of the course</b> <small>(maximum 8CILOs)</small>	<b>Referenced PILOs</b> <small>(Only write code number of reference Program Intended learning outcomes)</small>	
<b>A. Knowledge and Understanding:</b> Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
a1	Describe the fundamental concepts, principles and theories of modern biology.	A1 Describe and explain the underlying mathematical methods and theories; life scientific-principles; and engineering core concepts related to the Biomedical Engineering context.
a2	Discuss the normal structure and function of the human body at the whole body, organs, cellular, and molecular levels.	A1 Describe and explain the underlying mathematical methods and theories; life scientific-principles; and engineering core concepts related to the Biomedical Engineering context.
<b>B. Cognitive/ Intellectual Skills:</b> Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
b1	Demonstrate understanding of the biological subjects' inputs to the development of knowledge about the origin, different levels, and complexity of life.	B1 Apply engineering principles; basic of life-science; mathematical theories; and modern tools professionally in modelling, analyzing, designing, and constructing physical digital systems; devices and/or processes relevant to Biomedical

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		Engineering fields.
		B2 Identify, formulate and solve the complex problems related to the Biomedical Engineering fields in a creative and innovative manner by using a systematic and analytical thinking methods.
b2	Compare between and sketch the phases of both meiosis and mitosis, prokaryotes and eukaryotes, DNA and RNA.	<p>B1 Apply engineering principles; basic of life-science; mathematical theories; and modern tools professionally in modelling, analyzing, designing, and constructing physical digital systems; devices and/or processes relevant to Biomedical Engineering fields.</p> <p>B3 Design the biomedical systems or processes within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.</p>
b3	Link between the suitability of the structure and the function at the organs, cellular and molecular levels.	B5 Distinguish the main characteristics of biomedical systems, apply diagnostic skills and technical knowledge and perform failure analysis to these systems.
<p><b>C. Professional and Practical Skills:</b> Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:</p>		
c1	Tackle sufficient practical skills appropriate to the different biological topics understudy to ensure competence.	C1 Apply integrally knowledge of mathematics, life science, IT, design, business context and engineering practice to solve problems and to design systems/processes relevant to Biomedical

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		Engineering.
		C2 Use a wide range of analytical tools, techniques, IT, modern engineering tools, software packages and develop required computer programs to solve, modeling and analyzing Biomedical Engineering problems.
		C3 Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design and conduct experiments, collect, analyse and interpret data and present results in the biomedical systems practice.
		C4 Use rules and regulations of industrial safety as well as safe and diagnose systems at work, evaluate performance and observe the appropriate steps to manage risks concerning biomedical systems.
		C5 Demonstrate basic organizational and project management skills, apply quality assurance procedures, practice neatness and aesthetics and follow codes and standards to improve biomedical products design or services.
c2	Illustrate microscopic samples, anatomical and morphological features correctly and accurately and record observations and report the findings using the scientific methods.	C1 Apply integrally knowledge of mathematics, life science, IT, design, business context and engineering practice to solve problems and to design systems/processes relevant to Biomedical Engineering.

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		<p>C2 Use a wide range of analytical tools, techniques, IT, modern engineering tools, software packages and develop required computer programs to solve, modeling and analyzing Biomedical Engineering problems.</p>
		<p>C3 Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design and conduct experiments, collect, analyse and interpret data and present results in the biomedical systems practice.</p>
		<p>C4 Use rules and regulations of industrial safety as well as safe and diagnose systems at work, evaluate performance and observe the appropriate steps to manage risks concerning biomedical systems.</p>
		<p>C5 Demonstrate basic organizational and project management skills, apply quality assurance procedures, practice neatness and aesthetics and follow codes and standards to improve biomedical products design or services.</p>

**D. Transferable Skills:** Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:

d1	Employ the internet and electronic databases as a source of information	D2 Acquire entrepreneurial skills and effectively manage tasks, time, processes and resources.
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	and a mean of communication.	D4 Refer to relevant literatures, search for information, use databases, as well as, evaluate information and evidence from various sources in biomedical engineering.
		D5 Demonstrate efficient IT capabilities and communicate effectively both orally and in writing technical reports.
d2	Show ability to act independently with minimal supervision or as a part of a team within standard guidelines.	D1 Lead and motivate individuals, show capability to work in stressful environments and within constraints, collaborate effectively within multidisciplinary team.
		D2 Acquire entrepreneurial skills and effectively manage tasks, time, processes and resources.
		D3 Recognize the needs for, and engage in life-long self-learning.
		D5 Demonstrate efficient IT capabilities and communicate effectively both orally and in writing technical reports.

<b>(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:</b>		
<b>Course Intended Learning Outcomes</b>	<b>Teaching strategies</b>	<b>Assessment Strategies</b>
<b>a1</b> Describe the fundamental concepts,	• Interactive lectures & examples,	• Written tests (mid and final terms and quizzes),

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principles and theories of modern biology.	<ul style="list-style-type: none"> <li>• Presentation/seminar,</li> <li>• Interactive class discussions,</li> <li>• Exercises and home works,</li> <li>• Team work (cooperative learning),</li> </ul>	<ul style="list-style-type: none"> <li>• Oral exams,</li> <li>• Home works and assignments,</li> <li>• Presentations.</li> </ul>
<b>a2</b> Discuss the normal structure and function of the human body at the whole body, organs, cellular, and molecular levels.	<ul style="list-style-type: none"> <li>• Interactive lectures &amp; examples,</li> <li>• Presentation/seminar,</li> <li>• Interactive class discussions,</li> <li>• Exercises and home works,</li> <li>• Directed self- study,</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests (mid and final terms and quizzes),</li> <li>• Oral exams,</li> <li>• Short reports,</li> <li>• Home works and assignments,</li> <li>• Presentations.</li> </ul>
<b>(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:</b>		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
<b>b1</b> Demonstrate understanding of the biological subjects' inputs to the development of knowledge about the origin, different levels, and complexity of life.	<ul style="list-style-type: none"> <li>• Interactive lectures &amp; examples,</li> <li>• Presentation/seminar,</li> <li>• Interactive class discussions,</li> <li>• Exercises and home works,</li> <li>• Directed self- study,</li> <li>• Problem based learning,</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests (mid and final terms and quizzes),</li> <li>• Oral exams,</li> <li>• Short reports,</li> <li>• Home works and assignments,</li> <li>• Presentations.</li> </ul>
<b>b2</b> Compare between and sketch the phases of both meiosis and mitosis,	<ul style="list-style-type: none"> <li>• Interactive lectures &amp; examples,</li> <li>• Presentation/seminar,</li> <li>• Interactive class discussions,</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests (mid and final terms and quizzes),</li> <li>• Oral exams,</li> <li>• Short reports,</li> </ul>

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prokaryotes and eukaryotes, DNA and RNA.	<ul style="list-style-type: none"> <li>Exercises and home works,</li> <li>Team work (cooperative learning),</li> </ul>	<ul style="list-style-type: none"> <li>Home works and assignments,</li> <li>Presentations.</li> </ul>
<b>b3</b> link between the suitability of the structure and the function at the organs, cellular and molecular levels.	<ul style="list-style-type: none"> <li>Interactive lectures &amp; examples,</li> <li>Interactive class discussions,</li> <li>Exercises and home works,</li> <li>Team work (cooperative learning),</li> </ul>	<ul style="list-style-type: none"> <li>Written tests (mid and final terms and quizzes),</li> <li>Oral exams,</li> <li>Short reports,</li> <li>Home works and assignments,</li> </ul>

<b>(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:</b>		
<b>Course Intended Learning Outcomes</b>	<b>Teaching strategies</b>	<b>Assessment Strategies</b>
<b>c1</b> Tackle sufficient practical skills appropriate to the different biological topics understudy to ensure competence.	<ul style="list-style-type: none"> <li>Videos demonstrations,</li> <li>Presentation/seminar,</li> <li>Laboratory/Practical experiments based session,</li> <li>Computer laboratory-based sessions,</li> <li>Workshops practices,</li> <li>Directed self- study,</li> </ul>	<ul style="list-style-type: none"> <li>Written tests (mid and final terms and quizzes),</li> <li>Lab\Project report</li> <li>Practical lab performance assessment,</li> <li>Home works and assignments,</li> <li>Presentations.</li> </ul>

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<p><b>c2</b> Illustrate microscopic samples, anatomical and morphological features correctly and accurately and record observations and report the findings using the scientific methods.</p>	<ul style="list-style-type: none"><li>• Videos demonstrations,</li><li>• Presentation/seminar,</li><li>• Laboratory/Practical experiments based session,</li><li>• Computer laboratory-based sessions,</li><li>• Workshops practices,</li><li>• Directed self- study,</li></ul>	<ul style="list-style-type: none"><li>• Written tests (mid and final terms and quizzes),</li><li>• Lab\Project report</li><li>• Practical lab performance assessment,</li><li>• Home works and assignments,</li><li>• Presentations.</li></ul>
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(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
<p><b>d1</b> Employ the internet and electronic databases as a source of information and a mean of communication.</p>	<ul style="list-style-type: none"> <li>• Interactive lectures &amp; examples,</li> <li>• Exercises and home works,</li> <li>• Computer laboratory-based sessions,</li> <li>• Workshops practices,</li> <li>• Directed self- study,</li> <li>• Problem based learning,</li> <li>• Team work (cooperative learning),</li> </ul>	<ul style="list-style-type: none"> <li>• Written tests (mid and final terms and quizzes),</li> <li>• Oral exams,</li> <li>• Lab\Project report</li> <li>• Practical lab performance assessment,</li> <li>• Home works and assignments,</li> </ul>
<p><b>d2</b> Show ability to act independently with minimal supervision or as a part of a team within standard guidelines.</p>	<ul style="list-style-type: none"> <li>• Interactive class discussions,</li> <li>• Laboratory/Practical experiments based session,</li> <li>• Computer laboratory-based sessions,</li> <li>• Directed self- study,</li> <li>• Team work (cooperative learning),</li> </ul>	<ul style="list-style-type: none"> <li>• Oral exams,</li> <li>• Lab\Project report</li> <li>• Practical lab performance assessment,</li> <li>• Home works and assignments,</li> <li>• Presentations.</li> </ul>

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IV. Course Content:					
A – Theoretical Aspect:					
Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	<b>Introduction: The life characteristics</b>	a1, a2, b3, c1, d1	<ul style="list-style-type: none"> <li>- Life characteristics.</li> <li>- The chemical context of life (atomic structure, chemical bonding...etc).</li> <li>- Water and life (hydrogen bonds, cohesion, adhesion, surface tension, specific heat, .... etc).</li> <li>- Solutions, acids and bases, buffers, and pH scale.</li> </ul>	1	2
2/3	<b>The structure and function of the biological macromolecules</b>	a1, a2, b1, b2, b3, c1, d1	<ul style="list-style-type: none"> <li>- Carbon and the molecular diversity of life.</li> <li>- ATP molecules and polymers.</li> <li>- Carbohydrates (mono., di., and poly., structural and storage).</li> <li>- Lipids (structure, functions, types, phospholipids and steroids).</li> <li>- Proteins (structure, functions, types).</li> <li>- Nucleic acids (structure, functions, DNA and RNA).</li> </ul>	2	4
4/5	<b>The fundamental unit of life (the cell)</b>	a1, a2, b1, b2, b3, c1, c2, d1, d2	<ul style="list-style-type: none"> <li>- The cell definition, and the cell theory.</li> <li>- Microscope (functions, types).</li> <li>- Eukaryotic and prokaryotic cells.</li> <li>- Structure and functions of animal and plant cells (cell membrane, cell wall, cytoplasm and its organelles....., nucleus).</li> </ul>	2	4
6	<b>Cell membrane</b>	a2, b1, b3, c1,	<ul style="list-style-type: none"> <li>- Cell membrane (structure, movements across membranes:</li> </ul>	1	2

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	<b>structure and function</b>	d1, d2	diffusion, osmosis and tonicity, passive transport, active transport, endocytosis and exocytosis).		
7	<b>The cell cycle</b>	a1, b2, c2, d1, d2	- Definition of the cell cycle (key roles of cell division). - Mitosis. - Meiosis and sexual life cycle. - Meiosis Vs Mitosis.	1	2
8	<b>Mid-Term Theoretical Exam</b>	a1, a2, b1, b3, c1, c2, d1, d2	<b>Mid-Term Theoretical Exam</b>	1	2
9	<b>Animal tissues</b>	a1, a2, b1, b3, c1, c2, d1, d2	- Epithelial tissues. - Connective tissues. - Muscular tissues. - Nervous tissues.	1	2
10	<b>Digestive system and nutrition</b>	a1, b1, b3, c1, c2, d1, d2	- Overview of digestion (ingestion, digestion, movement, absorption, elimination). - Parts of the digestive system and their functions and enzymes. - Classes of nutrients (carbohydrates, proteins, lipids and minerals).	1	2
11	<b>Cardiovascular system</b>	a1, b1, b3, c1, c2, d1, d2	- Open and closed circulatory system. - Structure and functions of cardiovascular system (heart, blood vessels and blood). - Blood clotting. - The lymphatic system.	1	2
12	<b>Genetics</b>	a1, a2, b2, d1	- DNA and RNA. - The genetic code. - Transcription, processing and translation.	1	2

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13	<b>Hormonal system and regulation</b>	a1, a2, b1, b3, c1, d1, d2	<ul style="list-style-type: none"> <li>- Endocrine Vs exocrine glands.</li> <li>- Hormonal Vs nervous system.</li> <li>- Different forms of hormonal signals.</li> <li>- Classes of hormones.</li> <li>- Hormones (glands, target tissues and principal actions).</li> </ul>	1	2
14	<b>Nervous system and regulation</b>	a1, a2, b1, b3, c1, d1, d2	<ul style="list-style-type: none"> <li>- Coordination and control (digestion regulation, maintaining the heart's rhythmic beat.)</li> <li>- Nervous system disorders (schizophrenia, drugs addiction, Alzheimer disease, Parkinson's disease).</li> </ul>	1	2
15	<b>Excretory system</b>	a1, a2, b1, b3, c1, c2, d1, d2	<ul style="list-style-type: none"> <li>- Different excretory organs and tissues.</li> <li>- Structure of urinary system (kidneys, ureters, urinary bladder and urethra).</li> <li>- Function of the urinary system (excretion of metabolic wastes, maintenance of water-salt balance-maintenance of acid-base balance-secretion of hormones).</li> <li>- Nephron in details.</li> </ul>	1	2
16	<b>Final Theoretical Exam</b>	a1, a2, b1, b2, c1, c2, d1, d2	<b>Final Theoretical Exam</b>	1	2
<b>Number of Weeks /and Units Per Semester</b>				<b>16</b>	<b>32</b>

**B - Practical Aspect: (if any)**

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Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Biological safety and measurements I.	1	2	c1, d2
2	Biological safety and measurements II (lab equipment and measurements).	1	2	c2, d2
3	Acids, bases and pH scale (measuring the pH of different biological fluids).	1	2	a1, a2, b3, c1, c2, d2
4	Microscope structure and applications.	1	2	c1, c2, d2
5	Cell structure and function.	1	2	a2, b2, b3, c1, c2, d2
6/7	Biological macromolecules I, II.	2	4	a2, b2, c1, d1, d2
8	Permeability and osmosis.	1	2	a2, b2, c1, c2, d1, d2
9	<b>Mid-Term Practical Exam</b>	1	2	a1, a2, b2, b3, c1, c2, d1, d2
10/11	Mitosis and meiosis.	2	4	b1, b2, c1, d1
12/13	Animal tissues.	2	4	a2, b1, b3, c1, c2, d1, d2
14	Dissecting a rabbit or hamster in order to identify the different organs, their locations and link them to the information obtained theoretically.	1	2	b1, b3, c1, c2, d1, d2

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<b>15</b>	<b>Final Practical Exam</b>	1	2	a1, a2, b1, b2, c1, c2, d1, d2
<b>Number of Weeks /and Units Per Semester</b>			<b>15</b>	<b>30</b>

<b>C. Tutorial Aspect:</b>				
No.	Tutorial	B. Number of Weeks	C. Contact Hours	D. Learning Outcomes (CILOs)
1	None			
<b>Number of Weeks /and Units Per Semester</b>				

<b>V. Teaching Strategies of the Course:</b>
<ul style="list-style-type: none"> <li>• Interactive lectures &amp; examples,</li> <li>• Presentation/seminar,</li> <li>• Interactive class discussions,</li> <li>• Exercises and home works,</li> <li>• Laboratory/Practical experiments based session,</li> <li>• Computer laboratory-based sessions,</li> <li>• Workshops practices,</li> <li>• Directed self- study,</li> <li>• Problem based learning,</li> <li>• Videos demonstrations,</li> <li>• Team work (cooperative learning).</li> </ul>

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### VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Lab\Project report,
- Practical lab performance assessment,
- Home works and assignments,
- Presentations,
- Short reports,
- Oral exam.

### VII. Assignments:

No	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1	Homework (Search for answers to questions using the internet or the scientific references available in the library) .	a1, a2, b1, b2, b3, c1, c2, d1, d2	3 <sup>rd</sup> , 7 <sup>th</sup> , 10 <sup>th</sup>	4.5
2	Oral presentation.	a1, a2, b1, b2, b3, c1, c2, d1, d2	5 <sup>th</sup>	1.5
3	Self-learning (extracting information about the effect of minerals and the importance of excretory system).	a1, a2, b1, b3, c1, c2, d1, d2	9 <sup>th</sup> , 13 <sup>th</sup>	4
<b>Total</b>				<b>10</b>

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<b>VIII. Schedule of Assessment Tasks for Students During the Semester:</b>					
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Assignments	3 <sup>rd</sup> , 5 <sup>th</sup> , 7 <sup>th</sup> , 9 <sup>th</sup> , 10 <sup>th</sup> , 13 <sup>th</sup>	10	6.67%	a1, a2, b1, b2, c1, c2, d1, d2
2	Quizzes 1 & 2	6 <sup>th</sup> , 12 <sup>th</sup>	10	6.67%	a1, a2, b1, b2, b3, c1, c2, d1, d2
3	Mid-Term Theoretical Exam	8 <sup>th</sup>	20	13.33%	a1, a2, b1, b2, b3, c1, c2, d1, d2
4	Mid-Term Practical Exam	9 <sup>th</sup>	20	13.33%	a1, a2, b1, b3, c1, c2, d1, d2
5	Final Practical Exam including Project Presentation & Evaluation	15 <sup>th</sup>	30	20%	a1, b1, b2, b3, c1, c2, d1, d2
6	Final Theoretical Exam	16 <sup>th</sup>	60	40%	a1, a2, b1, b2, b3, c1, c2, d1, d2
<b>Total</b>			<b>150</b>	<b>100%</b>	

## IX. Learning Resources:

### 1- Required Textbook(s) ( maximum two ).

- Martha R. Taylor, M. R., *et al*; 2018: Campbell Biology Concepts and Connections, 9<sup>th</sup> Edition; Pearson.
- Reece, B. J., Wasserman, S. A., Urry, L. A., Minorsky, P. V., Cain, M. L., and Jackson, R. B., 2017: Campbell Biology, 11<sup>th</sup> Edition, Library of Congress Cataloging-in-Publication data.

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2- Essential References.	
	<ol style="list-style-type: none"> <li>1. Pendarvis &amp; Crawley, 2018: Lab Manual: Exploring Biology in the Laboratory Core Concepts, Morton Publishing, ISBN# 978-161731-9006.</li> <li>2. Cain, M. L., Damman, H., Lue, R., Yoon, C. K., and Morel, R., 2009: Discover Biology. 4<sup>th</sup> Edition, W.W. Norton &amp; Company.</li> </ol>
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	<p><b>Websites:</b></p> <ol style="list-style-type: none"> <li>1. Biology 2e, 2018 OpenStax- an open-source textbook available at y-2e  <a href="http://openstax.org/details/books/biology-2e">http://openstax.org/details/books/biology-2e</a></li> </ol>

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<b>2</b>	<p><b>Tardy:</b></p> <p>For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he/she will be considered as absent.</p>
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<b>4</b>	<p><b>Assignments &amp; Projects:</b></p> <p>In general one assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time, mostly one week after given the assignment.</p>

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<b>5</b>	<b>Cheating:</b> For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
<b>6</b>	<b>Plagiarism:</b> Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he/she will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university or according to the university roles.
<b>7</b>	<b>Other policies:</b> <ul style="list-style-type: none"><li>- Mobile phones are not allowed to use during a class lecture. It must be closed; <b>otherwise</b> the student will be asked to leave the lecture room.</li><li>- Mobile phones are not allowed in class during the examination.</li><li>- Lecture notes and assignments might be given directly to students using soft or hard copy.</li></ul>

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### Template for Course Plan (Syllabus) General Biology

<b>I. Course Identification and General Information:</b>				
1	<b>Course Title:</b>	General Biology		
2	<b>Course Code &amp; Number:</b>	BE101		
3	<b>Credit Hours:</b>	E. Credit Hours	F. Theory Hours H. Lecture    I. Exercise	G. Lab . Hours
		2	--	2      3
4	<b>Study Level/ Semester at which this Course is offered:</b>	2 <sup>nd</sup> Level / 1 <sup>st</sup> Semester		
5	<b>Pre –Requisite (if any):</b>	None		
6	<b>Co –Requisite (if any):</b>	None		
7	<b>Program (s) in which the Course is Offered:</b>	Biomedical Engineering Program		
8	<b>Language of Teaching the Course:</b>	English		
9	<b>Location of Teaching the Course:</b>	Faculty of Engineering		
10	<b>Prepared by:</b>	Dr. Hala Jameel Aeid Al Jobory		
11	<b>Reviewed by:</b>	Dr. Mohammed Al-Olofi		
12	<b>Date of Approval:</b>			

### II. Course Description:

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A coherent introductory course, that comes from different disciplines and brought together to provide the students with the fundamental concepts, principles, and theories of biology, so that the student acquires a comprehensive idea of life characteristics, macromolecules (carbohydrates, proteins, lipids, and nucleic acids), cell structure, cell membrane (transportation), as well as cell division (meiosis and mitosis), and cell signaling. Emphasizing anatomy and physiology biology from zoological perspectives, basic concepts of genetics are also included and finally, maintenance of homeostasis is discussed, all will allow the students to acquire knowledge of biological principles relevant to further studies.

### III. Course Intended Learning Outcomes (CILOs): (مخرجات تعلم المقرر)

**A. Knowledge and Understanding:** Upon successful completion of the course, students will be able to:

- |    |  |
|----|--|
| a1 | Describe the fundamental concepts, principles and theories of modern biology.  |
| a2 | Discuss the normal structure and function of the human body at the whole body, organs, cellular, and molecular levels. |

**B. Intellectual Skills:** Upon successful completion of the course, students will be able to:

- |    |  |
|----|--|
| b1 | Demonstrate understanding of the biological subjects' inputs to the development of knowledge about the origin, different levels, and complexity of life. |
| b2 | Compare <b>between and sketch</b> the phases of both meiosis and mitosis, prokaryotes and eukaryotes, DNA and RNA.                                       |
| b3 | Link between the suitability of the structure and the function at the organs, cellular and molecular levels.   |

**C. Professional and Practical Skills:** Upon successful completion of the course, students will be able to:

- |    |  |
|----|--|
| c1 | Tackle sufficient practical skills appropriate to the different biological topics understudy |
|----|--|

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III. Course Intended Learning Outcomes (CILOs): (مخرجات تعلم المقرر)	
	to ensure competence.
c2	Illustrate microscopic samples, anatomical and morphological features correctly and accurately and record observations and report the findings using the scientific methods.
<b>D. Transferable Skills:</b> Upon successful completion of the course, students will be able to:	
d1	Employ the internet and electronic databases as a source of information and a mean of communication.
d2	Show ability to act independently with minimal supervision or as a part of a team within standard guidelines.

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IV. Course Contents:				
A. Theoretical Aspect:				
No.	Units/Topics List	Sub Topics List	J. Number of Weeks	K. Contact Hours
1	<b>Introduction: The life characteristics</b>	<ul style="list-style-type: none"> <li>- Life characteristics.</li> <li>- The chemical context of life (atomic structure, chemical bonding...etc).</li> <li>- Water and life (hydrogen bonds, cohesion, adhesion, surface tension, specific heat, .... etc).</li> <li>- Solutions, acids and bases, buffers, and pH scale.</li> </ul>	1	2
2/3	<b>The structure and function of the biological macromolecules</b>	<ul style="list-style-type: none"> <li>- Carbon and the molecular diversity of life.</li> <li>- ATP molecules and polymers.</li> <li>- Carbohydrates (mono., di., and poly., structural and storage).</li> <li>- Lipids (structure, functions, types, phospholipids and steroids).</li> <li>- Proteins (structure, functions, types).</li> <li>- Nucleic acids (structure, functions, DNA and RNA).</li> </ul>	2	4
4/5	<b>The fundamental unit of life (the cell)</b>	<ul style="list-style-type: none"> <li>- The cell definition, and the cell theory.</li> <li>- Microscope (functions, types).</li> <li>- Eukaryotic and prokaryotic cells.</li> <li>- Structure and functions of animal and plant cells (cell membrane, cell wall, cytoplasm and its organelles....., nucleus).</li> </ul>	2	4
6	<b>Cell membrane structure and</b>	<ul style="list-style-type: none"> <li>- Cell membrane (structure, movements across membranes: diffusion, osmosis and tonicity,</li> </ul>	1	2

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IV. Course Contents:				
A. Theoretical Aspect:				
No.	Units/Topics List	Sub Topics List	J. Number of Weeks	K. Contact Hours
	<b>function</b>	passive transport, active transport, endocytosis and exocytosis).		
7	<b>The cell cycle</b>	<ul style="list-style-type: none"> <li>- Definition of the cell cycle (key roles of cell division).</li> <li>- Mitosis.</li> <li>- Meiosis and sexual life cycle.</li> <li>- Meiosis Vs Mitosis.</li> </ul>	1	2
8	<b>Mid-Term Theoretical Exam</b>		1	2
9	<b>Animal tissues</b>	<ul style="list-style-type: none"> <li>- Epithelial tissues.</li> <li>- Connective tissues.</li> <li>- Muscular tissues.</li> <li>- Nervous tissues.</li> </ul>	1	2
10	<b>Digestive system and nutrition</b>	<ul style="list-style-type: none"> <li>- Overview of digestion (ingestion, digestion, movement, absorption, elimination).</li> <li>- Parts of the digestive system and their functions and enzymes.</li> <li>- Classes of nutrients (carbohydrates, proteins, lipids and minerals).</li> </ul>	1	2
11	<b>Cardiovascular system</b>	<ul style="list-style-type: none"> <li>- Open and closed circulatory system.</li> <li>- Structure and functions of cardiovascular system (heart, blood vessels and blood).</li> <li>- Blood clotting.</li> <li>- The lymphatic system.</li> </ul>	1	2
12	<b>Genetics</b>	<ul style="list-style-type: none"> <li>- DNA and RNA.</li> <li>- The genetic code.</li> <li>- Transcription, processing and</li> </ul>	1	2

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IV. Course Contents:				
A. Theoretical Aspect:				
No.	Units/Topics List	Sub Topics List	J. Number of Weeks	K. Contact Hours
		translation.		
13	<b>Hormonal system and regulation</b>	<ul style="list-style-type: none"> <li>- Endocrine Vs exocrine glands.</li> <li>- Hormonal Vs nervous system.</li> <li>- Different forms of hormonal signals.</li> <li>- Classes of hormones.</li> <li>- Hormones (glands, target tissues and principal actions).</li> </ul>	1	2
14	<b>Nervous system and regulation</b>	<ul style="list-style-type: none"> <li>- Coordination and control (digestion regulation, maintaining the heart's rhythmic beat.)</li> <li>- Nervous system disorders (schizophrenia, drugs addiction, Alzheimer disease, Parkinson's disease).</li> </ul>	1	2
15	<b>Excretory system</b>	<ul style="list-style-type: none"> <li>- Different excretory organs and tissues.</li> <li>- Structure of urinary system (kidneys, ureters, urinary bladder and urethra).</li> <li>- Function of the urinary system (excretion of metabolic wastes, maintenance of water-salt balance-maintenance of acid-base balance-secretion of hormones).</li> <li>- Nephron in details.</li> </ul>	1	2
16	<b>Final Theoretical Exam</b>		1	2
<b>Number of Weeks /and Units Per Semester</b>			<b>16</b>	<b>32</b>

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<b>B. Case Studies and Practical Aspect:</b>			
No.	Tasks/ Experiments	L. Number of Weeks	M. Contact Hours
1	Biological safety and measurements I.	1	2
2	Biological safety and measurements II (lab equipment and measurements).	1	2
3	Acids, bases and pH scale (measuring the pH of different biological fluids).	1	2
4	Microscope structure and applications.	1	2
5	Cell structure and function.	1	2
6/7	Biological macromolecules I, II.	2	4
8	Permeability and osmosis.	1	2
9	<b>Mid-Term Practical Exam</b>	1	2
10/11	Mitosis and meiosis.	2	4
12/13	Animal tissues.	2	4
14	Dissecting a rabbit or hamster in order to identify the different organs, their locations and link them to the information obtained theoretically.	1	2
15	<b>Final Practical Exam</b>	1	2

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## Biomedical Engineering Program Specification

B. Case Studies and Practical Aspect:			
No.	Tasks/ Experiments	L. Number of Weeks	M. Contact Hours
Number of Weeks /and Units Per Semester		15	30

C. Tutorial Aspect:			
No.	Tutorial	N. Number of Weeks	O. Contact Hours
1	None		
Number of Weeks /and Units Per Semester			

V. Teaching Strategies of the Course:
<ul style="list-style-type: none"> <li>- Interactive lectures &amp; examples,</li> <li>- Presentation/seminar,</li> <li>- Interactive class discussions,</li> <li>- Exercises and home works,</li> <li>- Laboratory/Practical experiments based session,</li> <li>- Computer laboratory-based sessions,</li> <li>- Workshops practices,</li> <li>- Directed self- study,</li> <li>- Problem based learning,</li> <li>- Videos demonstrations,</li> <li>- Team work (cooperative learning).</li> </ul>

VI. Assessment Methods of the Course:
<ul style="list-style-type: none"> <li>• Written tests (mid and final terms and quizzes),</li> </ul>

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### VI. Assessment Methods of the Course:

- Lab\Project report,
- Practical lab performance assessment,
- Home works and assignments,
- Presentations,
- Short reports,
- Oral exam.

### VII. Assignments:

No.	Assignments	P. Week Due	Q. Mark
1	Homework (Search for answers to questions using the internet or the scientific references available in the library) .	3 <sup>rd</sup> , 7 <sup>th</sup> , 10 <sup>th</sup>	4.5
2	Oral presentation.	5 <sup>th</sup>	1.5
3	Self-learning (extracting information about the effect of minerals and the importance of excretory system).	9 <sup>th</sup> , 13 <sup>th</sup>	4
<b>Total</b>			<b>10</b>

### VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	Assignments	3 <sup>rd</sup> , 5 <sup>th</sup> , 7 <sup>th</sup> , 9 <sup>th</sup> , 10 <sup>th</sup> , 13 <sup>th</sup>	10	6.67%
2	Quizzes 1 & 2	6 <sup>th</sup> , 12 <sup>th</sup>	10	6.67%

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VIII. Schedule of Assessment Tasks for Students During the Semester:				
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
3	Mid-Term Theoretical Exam	8 <sup>th</sup>	20	13.33%
4	Mid-Term Practical Exam	9 <sup>th</sup>	20	13.33%
5	Final Practical Exam including Project Presentation & Evaluation	15 <sup>th</sup>	30	20%
6	Final Theoretical Exam	16 <sup>th</sup>	60	40%
<b>Total</b>			<b>150</b>	<b>100%</b>

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### IX. Learning Resources:

<http://openstax.org/details/books/biology-2e>

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<b>7</b>	<p><b>Other policies:</b></p> <ul style="list-style-type: none"><li>- Mobile phones are not allowed to use during a class lecture. It must be closed; <b>otherwise</b> the student will be asked to leave the lecture room.</li><li>- Mobile phones are not allowed in class during the examination.</li><li>- Lecture notes and assignments might be given directly to students using soft or hard copy.</li></ul>
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