

## Program Records

<b>About the Program</b>	<p>As one of the main disciplines among modern natural sciences, Molecular Biology and Genetics (MBG) aims to understand the life at molecular level both under normal and disease conditions. MBG offers a strong background in molecular biology, genetics, microbiology, cell biology, biochemistry and bioinformatics using modern technologies and working interdisciplinary. This interdisciplinary approach enables connection between important fields such as basic biology, medicine, food industry and pharmaceuticals.</p> <p>Our approach to education is not limited to formal lectures and laboratory courses as described in curriculum but, for volunteer students, also includes informal teachings about theory and cutting-edge techniques in our research laboratories about gene regulation, cancer biology, rare diseases, glycol-immunology, therapeutics, glycomics and proteomics.</p> <p>Our target for our graduates, in addition to understanding the current knowledge and techniques in molecular life sciences, is to be able to identify current problems in this field and general, and generate solutions for them. This will enable them to contribute to defining and providing solution to the problems in different levels from conceptualization and producing solutions.</p> <p>Our department was established in 2012 under Faculty of Life and Natural Sciences. Since then, our department has grown very fast including the number faculty, students and a well-equipped teaching and research laboratories.</p>
<b>Program Objectives</b>	<p>PO1. To understand basic concepts and techniques in molecular biology, genetics and biochemistry.</p> <p>PO2. To contribute to community in life sciences related areas as technician in medical laboratories and researcher in university or industry settings</p>
<b>Qualification Awarded</b>	Graduate / Molecular Biologist
<b>Length of Program &amp; Credits</b>	4 years (excluding one year of English Preparatory Program) 240 ECTS
<b>Level of Qualification</b>	Undergraduate, Level 6
<b>Mode of Study</b>	Full Time
<b>Field of Study</b>	Molecular Biology, Biochemistry and Genetics
<b>Admission Requirements</b>	<p>1- High school and equivalent school diploma, 2- It is necessary to obtain the required score of MF-3 type which is one of the related exams of Student Selection and Placement Center (ÖSYM) and not be registered in another formal higher education program. The language of instruction of the program is in English and the registration of the undergraduate students to the programs is done after the English proficiency is documented. Students who do not certify their English proficiency will learn the language. Determination of English proficiency of these students and teaching in English preparatory program of the University are made in accordance with the provisions of Abdullah Gul University English Preparatory Class Education and Examination Regulations published in the Official Gazette dated on 7/8/2013 and numbered as 28731. Admission of national students to the Molecular Biology and Genetics program is contingent on success on the nationally centralized "Entrance to Higher Education (YGS)" and "First Cycle Placement (LYS)" examinations conducted by the Student Selection and Placement Centre (OSYM). For further information please visit General Admission Requirements and Registration Procedures in the menu items of the Information on the Institution and The Examination, Selection &amp; Placement Centre (OSYM). The principles regarding the application, acceptance and registration of the students who are foreigner and foreign students that apply from abroad are determined by the Senate. For further and detailed information please visit General Admission</p>

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<b>Recognition of Credit Mobility</b>	Regulations related to transition between undergraduate level programs in higher education institutes (horizontal transfer), exchange programs, issues regarding interacademic credits transfer and procedures and principles of double major, minor programs and the maximum study period has been regulated on the basis of provisions of the regulations of Associate Degree and Bachelor Degree Programs in Higher Education Institutions and is determined according to the provisions of the Regulation on the Transfer of Double Major Branch, Sub-Branch and the transfer of credits between institutes regulations which was published in Official Gazette dated on 24/4/2010 and numbered as 27561 related to transfer between associate degree programme to undergraduate programme, major programme, minor programme, and credit transfer interacademically. Detailed information and special conditions are explained in AGU Undergraduate Education and Training Regulations.																																																												
<b>Graduation Requirements &amp; Regulations</b>	Graduated students must successfully complete all courses (240 ECTS) in the departmental curriculum in 8 semesters and must achieve at least 2.00 out of 4.00 of weighted GPA (grade point average). All courses in the curriculum must be completed with a minimum grade of D or S (AGU Undergraduate Education-Training and Examination Regulation). In addition, they must complete at least one internship and complete their dissertation project.																																																												
<b>Occupational Profiles of Graduates</b>	<p>This interdisciplinary approach enables our graduate to work in the following fields; basic biology, medicine, food industry and pharmaceuticals. They can also pursue a master and PhD degrees.</p> <p>The graduates of the program will be employed in public and private sector. Among these institutions and institutions, pharmaceutical companies and institutions engaged in biotechnological research and production, Ministry of Environment and Forestry, Ministry of Agriculture, IVF (In vitro fertilization) Centers, Hospitals and Diagnostic Laboratories, Hygiene Schools, Forensic Medicine, TUBITAK, Special research centers, Technoparks and sectors like these are included. A significant number of students who have graduated from the Department of Molecular Biology and Genetics continue their academic and post-doctoral studies and choose academic career and work as a faculty member in both national and international universities. As the language of instruction is English, our graduates will be able to work abroad, in companies in the USA and European Union countries. They will be able to work in various sectors such as research-development (R&amp;D) and project design depending on the institution and expertise of our graduates.</p>																																																												
<b>Access to Further Studies</b>	Graduates may apply to second cycle (Level 7 or Level 8) degree programs.																																																												
<b>Assessment &amp; Grading Policy</b>	<p>Written exams are performed to assess students' success and in addition to classical tests and multiple-choice tests some questions related to practices are used for assessment. Courses are given in semester terms and at least one midterm and one final are held in each academic year. In addition, depending on the content of the courses that the students should take during their 4-year training period, a variety of assessment methods such as homework, practices, projects, experiments, presentations and reports are implemented in the program. In order to graduate from the program, cumulative GPA must be minimum 2.00. A course grade is constituted by evaluating the above stated elements and based on Abdullah Gul University Undergraduate Education and Examination Regulation rules;</p> <table border="1"> <thead> <tr> <th><u>Letter Grade</u></th> <th><u>Coefficient</u></th> <th><u>Score</u></th> <th><u>Status</u></th> <th><u>Letter Grade</u></th> <th><u>Status</u></th> </tr> </thead> <tbody> <tr> <td>A</td> <td>4,00</td> <td>90-100</td> <td>Pass</td> <td>NA</td> <td>Not Attended</td> </tr> <tr> <td>A-</td> <td>3,67</td> <td>87-89</td> <td>Pass</td> <td>W</td> <td>Withdrawn</td> </tr> <tr> <td>B+</td> <td>3,33</td> <td>83-86</td> <td>Pass</td> <td>I</td> <td>Incomplete</td> </tr> <tr> <td>B</td> <td>3,00</td> <td>80-82</td> <td>Pass</td> <td>T</td> <td>Transferred</td> </tr> <tr> <td>B-</td> <td>2,67</td> <td>77-79</td> <td>Pass</td> <td>S</td> <td>Satisfactory</td> </tr> <tr> <td>C+</td> <td>2,33</td> <td>73-76</td> <td>Pass</td> <td>U</td> <td>Unsatisfactory</td> </tr> <tr> <td>C</td> <td>2,00</td> <td>70-72</td> <td>Pass</td> <td>P</td> <td>In Progress</td> </tr> <tr> <td>C-</td> <td>1,67</td> <td>64-69</td> <td>Conditional Pass</td> <td>EX</td> <td>Exempt</td> </tr> <tr> <td>D+</td> <td>1,33</td> <td>56-63</td> <td>Conditional Pass</td> <td></td> <td></td> </tr> </tbody> </table>	<u>Letter Grade</u>	<u>Coefficient</u>	<u>Score</u>	<u>Status</u>	<u>Letter Grade</u>	<u>Status</u>	A	4,00	90-100	Pass	NA	Not Attended	A-	3,67	87-89	Pass	W	Withdrawn	B+	3,33	83-86	Pass	I	Incomplete	B	3,00	80-82	Pass	T	Transferred	B-	2,67	77-79	Pass	S	Satisfactory	C+	2,33	73-76	Pass	U	Unsatisfactory	C	2,00	70-72	Pass	P	In Progress	C-	1,67	64-69	Conditional Pass	EX	Exempt	D+	1,33	56-63	Conditional Pass		
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	D	1,00	50-55	Conditional Pass
	F	0,00	0-49	Failed

**Program Outcomes**

PO1. To demonstrate a core knowledge base in the theory and practice of modern molecular Biology, Biochemistry and Genetics.

PO2. To critically evaluate data and draw an objective conclusions on subjects relevant to modern Molecular Biology, Biochemistry and Genetics.

PO3. To function successfully in collaborative projects.

PO4. To effectively communicate scientific data and ideas, using various formats appropriate for different target audiences in English.

PO5. To use databases, computational tools and other online resources effectively.

PO6. To demonstrate awareness of ethical issues in the practice of biological sciences and general.

PO7. To be open and adapt fast to the new ideas.

PO8. To have critical thinking.

PO9. To take responsibility for global and local issues in Molecular Biology, by means of independent and collaborative action.

PO10. To act as a global citizen by understanding diversity of multiple cultures.

PO11. To design and perform experiments that point to scientific questions, collect data, analyze collected data and interpret critically.

TQF-HE & Program Outcomes Coverage	Knowledge Theoretical Conceptual	Skills Cognitive Practical	Competences			
			Work Independently and Take Responsibility	Learning	Communication and Social	Field Specific
PO1	X			X		X
PO2	X	X	X			X
PO3	X	X	X		X	
PO4	X	X			X	
PO5	X	X	X			X
PO6		X	X			X
PO7	X	X		X		
PO8	X	X		X		
PO9	X	X	X		X	X
PO10		X	X		X	
PO11		X	X	X		X

Institutional & Program Outcomes Coverage	IO						
	IO1	IO2	IO3	IO4	IO5	IO6	IO7
PO1	X						
PO2	X	X					
PO3	X				X	X	X
PO4	X		X		X	X	
PO5	X	X	X			X	
PO6	X			X			X
PO7	X	X	X		X		
PO8	X	X		X	X		
PO9	X	X	X	X		X	X
PO10	X		X			X	
PO11	X	X			X		X

**Course & Program Outcomes Coverage**

**Curriculum**

	Code	Course	T	P	C	ECTS	Prerequisite	
1st YEAR	FALL	MATH 181	Calculus for Life Sciences I	5	0	5	6	
		MBG 111	General Biology I	3	4	5	7	
		GLB 101	AGU Ways	3	0	3	4	
		MBG 105	Chemistry for Life Sciences I	4	2	5	6	
		ENG 101	English I	4	0	4	4	
		semester credits		<b>22</b>	19	6	<b>22</b>	<b>27</b>
	SPRING	MATH 182	Calculus for Life Sciences II	5	0	5	6	MATH 181
		MBG 112	General Biology II	3	4	5	7	
		GLB XXX	Global Issues Elective I	3	0	3	4	
		ENG 102	English II	4	0	4	4	
		MBG 106	Chemistry for Life Sciences II	4	2	5	6	
		MBG 108	Computing for Life Sciences	3	2	4	6	
	semester credits		<b>26</b>	22	8	<b>26</b>	<b>33</b>	
<b>Total in Year</b>			<b>48</b>	<b>41</b>	<b>14</b>	<b>48</b>	<b>60</b>	
2nd YEAR	FALL	MBG 205	Cell Biology	3	4	5	7	MBG 111
		MBG 207	Organic Chemistry	3	2	4	5	MBG 105, MBG106
		MBG 209	Fundamentals of Genetics	3	4	5	7	
		GLB XXX	Global Issues Elective II	3	0	3	4	
		PHYS 101	Physics I	3	2	4	5	
	TURK101	Turkish I	2	0	2	2		
		semester credits		<b>29</b>	17	12	<b>23</b>	<b>30</b>
	SPRING	MBG 204	Biostatistics	3	2	4	6	
		MBG 206	Microbiology	3	4	5	7	MBG 112
		MBG 208	Molecular Biology	3	4	5	7	MBG 112
		MBG 210	Science and Ethics	2	0	2	4	
		GLB XXX	Global Issues Elective III	3	0	3	4	
TURK 102		Turkish II	2	0	2	2		
	total		<b>26</b>	16	10	<b>21</b>	<b>30</b>	
+	Professional Practice on Site		0	0	0	0		
<b>Total in Year</b>			<b>55</b>	<b>33</b>	<b>22</b>	<b>44</b>	<b>60</b>	
3rd YEAR	FALL	MBG 301	General Biochemistry I	3	4	5	8	MBG 111
		GLB XXX	Global Issues Elective IV	3	0	3	4	
		MBG 305	Special Techniques and Applications in Molecular Biology	3	2	4	6	MBG 208
		MBG 309	Human Genetics	3	0	3	5	MBG 209
		HIST 201	History of Modern Turkey I	2	0	2	2	
		MBG XXX	Concentration Area Elective	3	0	3	5	
		semester credits		<b>23</b>	17	6	<b>20</b>	<b>30</b>
	SPRING	MBG 302	General Biochemistry II	3	4	5	8	MBG 301
		MBG 304	Bioinformatics	3	2	4	6	
		MBG 306	Gene Regulation	3	0	3	6	MBG 209
		HIST 202	History of Modern Turkey II	2	0	2	2	
		MBG XXX	Concentration Area Elective	3	0	3	5	
	Nontechnical Elective Course					3		
	semester credits		<b>23</b>	14	6	<b>17</b>	<b>30</b>	
+	Professional Practice in Offices		0	0	0	0		
<b>Total in Year</b>			<b>46</b>	<b>31</b>	<b>12</b>	<b>40</b>	<b>60</b>	
4rd YEAR	FALL	MBG 451	Capstone Projects I	0	4	4	7	
		MBG XXX	Concentration Area Elective	3	0	3	5	
		MBG XXX	Concentration Area Elective	3	0	3	5	
		MBG XXX	Concentration Area Elective	3	0	3	5	
		OHS 401	Occupational Health and Safety I	2	0	2	1	
			Nontechnical Elective Course					3
	Summer internship		0	0	0	6		
	semester credits		<b>15</b>	11	4	<b>15</b>	<b>32</b>	

	MBG 452	Capstone Projects II	0	6	6	7	MBG 451
	MBG 404	Current Topics in Molecular Biology	3	0	3	7	
SPRING	MBG XXX	Concentration Area Elective	3	0	3	5	
	MBG XXX	Concentration Area Elective	3	0	3	5	
	OHS 402	Occupational Health and Safety II	1	0	1	1	
		Nontechnical Elective Course					3
		semester credits	<b>16</b>	10	6	<b>16</b>	<b>28</b>
+			0	0	<b>0</b>		
	<b>Total in Year</b>		<b>31</b>	21	10	<b>31</b>	<b>60</b>

\*\* 1st and 2nd year core courses must be completed (passed). From 3rd year courses 4 out of 6 core courses and MBG451 Capstone Projects I should be passed.

\*\*\* The course will be given by the all faculty members.

### Concentration Area Electives

Code	Course Name	Lec.	Lab	Credits	ECTS
MBG 402	Computational Biology	3	0	3	5
MBG 403	Human Genetic Disorders	3	0	3	5
MBG 405	Molecular Evolution	3	0	3	5
MBG 406	Molecular Medicine	3	0	3	5
MBG 407	Stem Cells	3	0	3	5
MBG 409	Cancer Biology	3	0	3	5
MBG 408	Biomolecules	3	0	3	5
MBG 410	Micro Array Data Analysis	3	0	3	5
MBG 411	Model Organisms	3	0	3	5
MBG 412	Immunology	3	0	3	5
MBG 413	Biotechnology	3	0	3	5
MBG 414	Biomaterials	3	0	3	5
MBG 415	Cell and Tissue Engineering	3	0	3	5
MBG 416	Developmental Biology	3	0	3	5
MBG 417	Basics of Neuroscience	3	0	3	5
MBG 418	Neural system	3	0	3	5
MBG 419	Functional Genomics	3	0	3	5
MBG 421	RNA biology	3	0	3	5
MBG 425	Population Genetics	3	0	3	5
MBG 426	Histology of tumors	3	0	3	5
MBG 428	Epigenetics	3	0	3	5
MBG 430	Virology	3	0	3	5
MBG 431	Human Physiology	3	0	3	5
MBG 435	Disease and Genetics	3	0	3	5

### GLB Electives

(4 out of 4 GLB courses must be taken / 4 GLB kodlu dersin 4'si alınmak zorundadır)

GLB 102	Innovation and Entrepreneurship	3	0	3	4
GLB 201	Food and Health	3	0	3	4
GLB 202	Immigration and Population	3	0	3	4
GLB 301	Sustainability	3	0	3	4

**Program Course Code Descriptions**

<b>Code</b>	<b>MBG 105</b>
<b>Name</b>	<b>Chemistry for Life Sciences I</b>
Hour per week	6 (4 + 2)
Credit	5
ECTS	6
Level/Year	Undergraduate / 1
Semester	Fall
Type	Compulsory
Prerequisites	none
Content	<p>This course provides fundamental knowledge and principles of chemistry. This course allows the students to understand the interaction between chemistry and world around us. This course will provide students with the necessary background knowledge that allows them more advanced chemistry related courses. The course will cover multiple areas of chemistry. Students will learn the basics of analytical chemistry, physical chemistry and organic chemistry. Students will discover chemical processes, cycles and properties that are key to the study of life.</p> <p>The course covers the following topics: Matter and Its properties and Measurements, Atoms and Atomic Theory, Chemical Compounds, Chemical Reactions, Introduction to Reactions in Aqueous Solutions, Gases, Thermochemistry, Electrons in Atoms, The Periodic Table and Some atomic Properties, Chemical Bonding: Basic concepts and Additional Aspects, Intermolecular Forces, Solutions and Their Properties.</p>

<b>Code</b>	<b>MBG 106</b>
<b>Name</b>	<b>Chemistry for Life Sciences II</b>
Hour per week	6 (4 + 2)
Credit	5
ECTS	6
Level/Year	Undergraduate / 1
Semester	Spring
Type	Compulsory
Prerequisites	none
Content	<p>This course provides fundamental knowledge and principles of chemistry. This course allows the students to understand the interaction between chemistry and world around us. This course will provide students with the necessary background knowledge that allows them to be ready more advanced chemistry related courses. The course will cover multiple areas of chemistry. Students will learn the basics of analytical chemistry, physical chemistry, organic chemistry and organometallic chemistry. Students will discover chemical processes, cycles and properties that are key to the study of life.</p> <p>The course covers the following topics: Chemical Kinetics, Principles of Chemical Equilibrium, Acids and Bases, Additional Aspects of Acid Base Equilibria, Solubility and Complex Ion Equilibria, Spontaneous Change: Entropy and Gibbs Energy, Electrochemistry, Chemistry of the Main Group Elements, Complex Ion and Coordination Compounds, Nuclear Chemistry, Structure of Organic Compounds, Reaction of Organic Compounds, Chemistry of the Living State.</p>

<b>Code</b>	<b>MBG 108</b>
<b>Name</b>	<b>Computing for Life Sciences</b>
Hour per week	5 (3 + 2)
Credit	4

ECTS	6
Level/Year	Undergraduate / 1
Semester	Spring
Type	Compulsory
Prerequisites	none
Content	The aim of this course is to introduce freshmen to the fundamentals of computing with specific emphasis on its applications in life sciences. Topics include programming principles, command-line operations, program control and logic, functions, files, object orientation, mathematics coding, biological sequence analyses, and graphs. Upon completion of the course, the students should be comfortable with basic coding in a popular scripting language on common platforms, in order to perform simple analyses of life sciences-related data.

Code	<b>MBG 111</b>
Name	<b>General Biology I</b>
Hour per week	7 (3 + 4)
Credit	5
ECTS	7
Level/Year	Undergraduate / 1
Semester	Fall
Type	Compulsory
Prerequisites	none
Content	This is an introductory course in biology together with the practical laboratory section. This course will provide students the background knowledge to take more advanced biology courses but will also be useful to understand biological principles for everyday life. The course will cover multiple areas of biological organization, from tiny atoms to biological molecules. Students in this course will discover biological processes, cycles and properties that are key to the study of life. The students will learn the process of scientific thinking and basic biological experimentation techniques required to test the biological concepts that involves topics such as; molecules, enzymes, basic biological processes, and cell structure and division.

Code	<b>MBG 112</b>
Name	<b>General Biology II</b>
Hour per week	7 (3 + 4)
Credit	5
ECTS	7
Level/Year	Undergraduate / 1
Semester	Spring
Type	Compulsory
Prerequisites	none
Content	This course will introduce the fundamental concepts in biology, including prokaryotes; protists; fungi; plant and animals. Students will take a journey to discover the anatomy and physiology of plants and animals. They will learn structure, growth, nutrition, transport, reproduction, development, and control systems of plants and animals. This course will also focus on relationships between structure and function with respect to evolutionary adaptation and changes in different systems of plants and animals. Also, the differences between invertebrates and vertebrates in the animal kingdom will be covered. This course is ideal to cover basic biological concepts of plants and animals.

Organization of cells into tissues to organs and organ systems in plants and animals will be studied experimentally in the practical course hours. Moreover, structural and functional relationships between digestive, reproductive and transport systems in selected systems will be examined during this lab.

Code	<b>MBG 205</b>
Name	<b>Cell Biology</b>
Hour per week	7 (3 + 4)
Credit	5
ECTS	7
Level/Year	Undergraduate /2
Semester	Fall
Type	Compulsory
Prerequisites	MBG 111
Content	This course tackles the cellular biology of higher organisms. Knowledge of the structure, function, and formation of cellular membranes and organelles, in addition to cellular growth and oncogenic transformation will be covered throughout the course. Also, this course will cover transport, receptors, and cell signaling; the cytoskeleton, the extracellular matrix, and cell movements; chromatin structure and RNA synthesis. The course focuses on the interaction of the cells its social context that includes its neighboring cells, the extracellular matrix (ECM) and the soluble mediators.

Code	<b>MBG 204</b>
Name	<b>Biostatistics</b>
Hour per week	5 (3 + 2)
Credit	4
ECTS	6
Level/Year	Undergraduate / 2
Semester	Spring
Type	Compulsory
Prerequisites	none
Content	The aim of this course is to introduce students the fundamentals of biostatistics and biostatistics methods with specific applications and examples in life sciences and to make them understand and evaluate the literature in their field. The course content includes the following topics: introduction to biostatistics and basic concepts; descriptive statistics; probability and probability distributions; sampling methods and parameter estimation; introduction to hypothesis testing and testing statistical assumptions; one-sample, two-sample and multi-sample inference with hypothesis testing; nonparametric tests; categorical data analysis; correlation and regression analysis.

Code	<b>MBG 207</b>
Name	<b>Organic Chemistry</b>
Hour per week	5 (3 + 2)
Credit	4
ECTS	5
Level/Year	Undergraduate / 2
Semester	Fall
Type	Compulsory
Prerequisites	MBG105, MBG106

Content	<p>This course provides knowledge of organic chemistry. This course allows the students to understand the interaction between carbon compounds and other related areas such as biochemistry, Students will discover synthesis processes of different compounds, especially amino acids, lipids and protein synthesis which will be helpful for their future perspectives.</p> <p>The course covers the following topics: Families of Carbon compounds, Acids and Bases, Nomenclature and Conformations of Alkanes and Cycloalkanes, Stereochemistry, Ionic Reactions, Alkenes and Alkynes, Radical Reactions, Alcohols and Ethers, Alcohol from Carbonyl Compounds, Conjugated Unsaturated Systems, Aromatic Compounds and Reactions of Aromatic Compounds, Carbonyl Compounds and their Reactions, Carbohydrates, Lipids, Amino Acids and Proteins, Nucleic acids and Protein Synthesis</p>
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Code	<b>MBG 206</b>
Name	<b>Microbiology</b>
Hour per week	7 (3+4)
Credit	5
ECTS	7
Level/Year	Undergraduate / 2
Semester	Spring
Type	Compulsory
Prerequisites	MBG112
Content	The course aims to introduce students to the microbial world. Through the course the following topics will be covered: basic concepts in microbiology, history of microbiology, the emergence of life, microbial diversity, human-microbe interactions and microbial genetics. Concepts will be familiarized by using real-life examples in the classrooms and laboratory experiments throughout the course.

Code	<b>MBG 208</b>
Name	<b>Molecular Biology</b>
Hour per week	7 (3+4)
Credit	5
ECTS	7
Level/Year	Undergraduate / 2
Semester	Spring
Type	Compulsory
Prerequisites	MBG112
Content	The aim of this course is to introduce the major processes in the central dogma of molecular biology and help students to develop the knowledge and practical skills to pursue further studies in the molecular biology. The course includes chromosome and nucleosome structures, mechanisms of DNA replication and repair, transcription, mechanisms of transcription regulation, description of the translation process in prokaryotes and eukaryotes. Laboratory course is dedicated to develop students' skills of experiential learning, the students will design and conduct and report basic molecular biology experiments.

Code	<b>MBG 209</b>
Name	<b>Fundamentals of Genetics</b>
Hour per week	7 (3 + 4)
Credit	5
ECTS	7
Level/Year	Undergraduate / 2

Semester	Spring
Type	Compulsory
Prerequisites	none
Description	This course will focus on teaching the structure of DNA, prokaryotic and eukaryotic gene expression, the molecular process of gene expression, a genetic regulatory system, Meiosis, mitosis, Mendelian and non-Mendelian genetics, translation and Proteins, Gene Mutation, DND repair and Transposition, Epigenetics, Emerging Roles of RNA and Gene Therapy

Code	<b>MBG 210</b>
Name	<b>Science and Ethics</b>
Hour per week	2 (2 + 0)
Credit	2
ECTS	4
Level/Year	Undergraduate / 2
Semester	Spring
Type	Compulsory
Prerequisites	none
Content	The course focuses on the introduction to the ethics of science and research, the rules and contents of the ethics of science and research, the aim and the importance of making ethical decisions regarding the scientific research and studying ethical issues concerning human based research. In addition to that, ethics for the usage of stem cells, genetically modified organism, cloning, ethics for drug developing and the scientific publications will be covered throughout the course.

Code	<b>MBG 301</b>
Name	<b>General Biochemistry I</b>
Hour per week	7 (3 + 4)
Credit	5
ECTS	8
Level/Year	Undergraduate / 3
Semester	Fall
Type	Compulsory
Prerequisites	MBG 111
Content	General Biochemistry-I is a lecture that teaches the chemistry of life. Biochemistry is a combination of different fields such as biology, medicine and chemistry. In this course, the scope of biochemistry, molecular interactions in biological environment, chemical bonds, energy and thermodynamics, nucleic acids, peptides, proteins and three-dimensional structure, carbohydrates, lipids, enzymes, enzyme kinetics, and ligand binding will be taught. In general biochemistry-I laboratory, experiments are designed to explore some of the following concepts; molecular interactions in biological environment, chemical bonds, energy and thermodynamics, nucleic acids, peptides, proteins and three dimensional structures, carbohydrates, lipids, enzymes, enzyme kinetics, and ligand binding.

Code	<b>MBG 302</b>
Name	<b>General Biochemistry II</b>
Hour per week	7 (3 + 4)
Credit	5
ECTS	8

Level/Year	Undergraduate / 3
Semester	Spring
Type	Compulsory
Prerequisites	MBG 301
Content	General biochemistry-II is a follow up course of General biochemistry-I (MBG 301). The focus of this course is the metabolic pathways such as glycolysis, glycogen metabolism, signal transduction, transport through membranes, citric acid cycle, electron transport and oxidative phosphorylation, photosynthesis, lipid metabolism, amino acid metabolism, energy metabolism and nucleic acid metabolism. In addition to this, expression and transmission of genetic information such as nucleic acid structure, DNA replication, repair, and recombination, transcription, translation, viruses, eukaryotic gene expression and molecular physiology will be covered.

Code	<b>MBG 304</b>
Name	<b>Bioinformatics</b>
Hour per week	5 (3 + 2)
Credit	4
ECTS	6
Level/Year	Undergraduate / 3
Semester	Spring
Type	Compulsory
Prerequisites	none
Content	This course is designed to introduce students to bioinformatics tools and analysis methods and therefore is a hands-on type. Most weeks will include both classroom lecture and computer lab time. Upon completion of the course, the students should be comfortable with handling biological data and online tools that are relevant to their research. The topics include databases, sequence alignment, homology search, phylogenetic trees, and structure prediction.

Code	<b>MBG 305</b>
Name	<b>Special Techniques and Applications in Molecular Biology</b>
Hour per week	5 (3 + 2)
Credit	4
ECTS	6
Level/Year	Undergraduate / 3
Semester	Fall
Type	Compulsory
Prerequisites	MBG 208
Content	The aim of this course is to explain the applications and principles of techniques used in molecular biology. The course includes cloning, PCR, microarray, RNAseq, cell culture and techniques used to diagnose hereditary diseases. Moreover, the course will also cover the Crispr / cas-9, one of the most recent gene editing techniques of our time. In addition, the application of the learned techniques and the evaluation of the results will be carried out in this course. Learning both theoretical and practical knowledge of the methodology of molecular biology and genetics will enable students to acquire the ability to understand and design their projects.

Code	<b>MBG 306</b>
Name	<b>Gene Regulation</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	6

Level	Undergraduate/3
Semester	Spring
Type	Compulsory
Prerequisites	MBG 209
Content	This course will focus on the basics and mechanisms of eucaryotic gene regulation with a specific focus on newly emerging topics. This course will be using current literature together with a main textbook. Topics will include transcriptional regulation of eukaryotic gene expression including cis elements (promoters, enhancers and insulators) and trans elements (transcription factors), key modules of differential gene expression, methods to identify interactions between cis and trans elements, chromatin remodeling, the posttranscriptional regulation of gene expression including RNA interference and control of gene expression at the level of translation.

Code	<b>MBG 309</b>
Name	<b>Human Genetics</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3
Semester	Fall
Type	Compulsory
Prerequisites	MBG 209
Content	Mendelian diseases (diseases caused by single gene defects), molecular development, chromosomal abnormalities and diversity, principles of genetic disease analysis, gene mapping and mapping methods, various genetic diseases and their inheritance, mitochondrial DNA, hereditary diseases, cytogenetic, genetic diagnosis, cancer and genetics of carcinogens, mutagens, evolutionary genetic and common diseases will be covered. With this course students will be able to understand the basis of human genetic diseases.

<b>Code</b>	<b>MBG 451</b>
<b>Name</b>	<b>Capstone Projects I</b>
Hour per week	4 (0 + 4)
Credit	4
ECTS	7
Level	Undergraduate/4
Semester	Fall
Type	Compulsory
Prerequisites	1st and 2nd year core courses must be completed (passed). From 3rd year courses 4 out of 6 core courses should be passed.
Content	This lecture will aim to integrate a range of knowledge and skills learned during molecular biology and genetics (MBG) education. The capstone project in MBG consists of a mentored research project on a related topic, which can be performed in the same department or any other research laboratories in other universities or centers. The capstone project must be designed or chosen by the student in consultation with a faculty mentor. The project must include evaluation of data, methods, results, interpretation, and conclusion in a report written by the student.

Code	<b>MBG 452</b>
Name	<b>Capstone Projects II</b>
Hour per week	6 (0 + 6)

Credit	6
ECTS	7
Level/Year	Undergraduate / 4
Semester	Spring
Type	Compulsory
Prerequisites	1st and 2nd year core courses must be completed (passed). From 3rd year courses 4 out of 6 core courses and MBG451 Capstone Projects I should be passed.
Content	This lecture will aim to integrate a range of knowledge and skills learned during molecular biology and genetics (MBG) education. The capstone project in MBG consists of a mentored research project that can be an independent project or a continuation of capstone I, which can be performed in the same department or any other research laboratories in other universities or centers. The capstone project must be designed or chosen by the student in consultation with a faculty mentor. The project must include evaluation of data, methods, results, interpretation, and conclusion in a report written by the student.

Code	<b>MBG 404</b>
Name	<b>Current Topics in Molecular Biology</b>
Hour per week	3 (3+0)
Credit	3
ECTS	7
Level/Year	Undergraduate / 4
Semester	Spring
Type	Compulsory
Prerequisites	None
Content	This course will highlight the recent development in molecular biology and genetics. Each faculty contributing to this course will give the general perspective of their area, the most recent exiting research papers and future perspectives in his/her field. The course will be given by the all faculty members.

Code	<b>MBG 402</b>
Name	<b>Computational Biology</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	None
Content	This course will provide up-to-date theories and methodologies in computational biology with emphasis on structural and dynamical aspects of biological systems at atomic scale. The classes consist of both classroom lectures and computer labs. Upon completion of the course, the students should be able to perform various computational analyses on biological systems. The topics include Linux basics, molecular modelling and visualization, molecular dynamics, search algorithms, statistical analysis of biological data.

Code	<b>MBG 403</b>
Name	<b>Human Genetic Disorders</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5

Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	None
Content	There are at least 7000 diseases around the world, affecting 350 million people worldwide. Of these diseases, 80% are of genetic origin. In the lectures series, a range of topics including whether the diseases are caused by mutations in a single gene, mutations in multiple genes, defects in chromosome or mitochondrial DNA will be discussed. A number of genetic diseases such as Parkinson's and anemia will be covered in the lectures. Information on the causes, mechanisms and history of diseases will be given.

Code	<b>MBG 405</b>
Name	<b>Molecular Evolution</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	Molecular Evolution class is offered at undergraduate level to MBG students at Abdullah Gul University. In this course, the principles of evolution, molecular evolution and phylogenetic issues will be taught. The lecture also covers specific topics including DNA polymorphisms, molecular evolutionary trees, molecular clocks, gene count and genome size, organelle and nuclear genetic markers, genetic mutations and selection, evolution of multiple gene families, gene duplications, transpositions and gene transpositions.

Code	<b>MBG 406</b>
Name	<b>Molecular Medicine</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	This course will introduce new interdisciplinary area of study named "molecular medicine" that explores revolutionary developments in disease diagnosis, therapy and prevention, which is allowed by bio-molecular research. It shows how basic science is translated from 'theory to the clinic.' It covers advances in genomics that allowed the understanding of the disease mechanisms at cellular level, opening up new ways to treat major illnesses. The course's main focus includes cancer, neuroscience, genetics, microbiology and immunology. This course allows students to have a perspective on the advances of science and importance of basic and clinical research in future drug discoveries.

Code	<b>MBG 407</b>
Name	<b>Stem Cells</b>
Hour per week	3 (3 + 0)

Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	MBG101, MBG102
Content	This course will introduce a broad range of topics related to stem cell biology. It will present stem cells in relation to many aspects of basic and applied biology and medicine including development, regeneration/repair, and cancer. The course will cover the following concepts and themes: pluripotency and reprogramming, pluripotent cell types, organ systems, stem cells and cancer, therapeutics and ethics.

Code	<b>MBG 408</b>
Name	<b>Biomolecules</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 2,3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	The aim of this course is to teach students about biomolecules having unique properties that determine how they contribute to the structure and function of cells, and how they participate in the processes necessary to maintain life. The scope of the course contains physicochemical and the structural properties of proteins, nucleic acids, membranes and carbohydrates. Basic physics and biochemistry knowledge is recommended.

<b>Code</b>	<b>MBG 409</b>
<b>Name</b>	<b>Cancer Biology</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	This course will provide a general background of the cancer development process at the cellular and molecular level. Various genetic and molecular changes during carcinogenesis process will be introduced to students. These changes include dysregulated cell proliferation, escape from cell death, angiogenesis, metastasis and invasion. Moreover, this course will discuss the factors involved in cancer development, interactions between tumor and its environment, cancer prevention and treatment approaches.

Code	<b>MBG 410</b>
Name	<b>Data Analysis</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective

Prerequisites	none
Content	This course will provide the theories and applications in data analyses. Topics include general concepts including data preprocessing, feature selection, sampling, using different statistical and machine learning techniques and visualization.

Code	<b>MBG 411</b>
Name	<b>Model Organisms</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	In this course, model organisms will be discussed extensively in molecular and biological studies. Mice, frogs, zebrafish, <i>drosophila</i> and <i>Caenorhabditis elegans</i> are the main model organisms that are focused on throughout the course. Model organisms have advantages and disadvantages according to different studies, which will be also covered in the course. The course will discuss the appropriate usage of right type of model organisms to the right studies and techniques.

Code	<b>MBG 412</b>
Name	<b>Immunology</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	This course will introduce the basic principles of immunology. Lectures on fundamental immunological processes will be presented. The goal of lectures will be to provide students with the fundamental knowledge of the immune system. This will include innate and adaptive immunity and their components such as antibody production, antigen-antibody reactions, structure of antibody, the major histocompatibility complex reactions and antigen presentation. In addition to that, immune responses to infectious organisms and tumors, autoimmunity, allergies, and immune deficiencies will be covered throughout the course.

Code	<b>MBG 413</b>
Name	<b>Biotechnology</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none

Content	The course deals with the major elements of biotechnology and its global significance, the categories of biotechnological processes and products, and a comparison between "traditional" vs "modern" biotechnology processes. Also, the key developments in the history of biotechnology specifically - fermentation, downstream processing; recombinant methods, monoclonal antibody, analysis and automation, genomics, proteomics and metabolomics.
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Code	<b>MBG 414</b>
Name	<b>Biomaterials</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none

Content	The aim of this course is to gain knowledge about design, selection, development and characterization of natural or synthetic materials to change, augment or correct a function, a tissue or an organ in the body. Different types of materials such as metals, ceramics, polymers, biopolymers for the use as biomaterials; blood or tissue response, biocompatibility and improvement strategies; coagulation, inflammation, wound healing mechanism; biomaterials in soft tissue applications; biomaterials in hard tissue applications; blood interfacing materials will be discussed throughout the lecture.
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Code	<b>MBG 415</b>
Name	<b>Cell and Tissue Engineering</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none

Content	The course introduces students to the fundamentals of tissue Engineering and biomaterials. It also covers cells and growth factors used in tissue Engineering, extracellular matrix, synthetic and natural polymers as support materials. The cell/biomaterial interaction will also be studied while taking into consideration the application of engineering principles combined with molecular cell biology. Throughout the course, specific applications including skin, nerve, bone, and soft tissue regeneration and links between the topic of study and clinically relevant situations are addressed.
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Code	<b>MBG 416</b>
Name	<b>Developmental Biology</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	MBG101, MBG102

Content	The developmental biology explores how living things are shaped, how their lives are formed, how this complex structure develops and differentiates. The course covers topics such as the stages of development in different organisms in the early period, how fertilization, meiosis, organogenesis and environmental factors affect the organism's development. It also links the content of the course to the context of modern and old experiments used in the study of developmental biology.
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Code	<b>MBG 417</b>
Name	<b>Basics of Neuroscience</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Spring
Type	Elective
Prerequisites	none

Content	This undergraduate-level course will teach how the nervous system functions at the molecular and cellular level. The main purpose of this course is to introduce types of nervous cells, structures of nervous cell, nerve impulse, connection between nervous cells, nerve cell formation in the brain and spinal cord; sensory systems such as vision, hearing, smell, transformation and processing of physical energy into neural signals, neurochemical basis of brain diseases, emotional, mobility, learning and memory control systems.
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Code	<b>MBG 418</b>
Name	<b>Neural System</b>
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none

Content	Highly specialised cells called neurons possess a tremendous capacity to detect and respond to different stimuli. In this course, the topics of nervous system organization, synaptic transmission, muscle contraction, spinal cord and brain motor mechanisms, autonomic nervous system, somatic neural control, hearing and chemical senses, nerve development, synaptic plasticity, language and learning organization will be covered.
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Code	<b>MBG 419</b>
Name	<b>Functional Genomics</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none

Content	In this course, genomic transition from genetics, genomic sequence acquisition and analysis, evolution of genomes, genome description, genomic variations, gene and homology, basic and applied genomic methods; the principles of DNA
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microarrays and other intermediate technologies, cloning and expression strategies, in vivo gene expression techniques, proteomics principles and techniques will be covered. Current examples of the application and development of functional genomic technology and its use in biotechnological industry are also included in the course.

Code	<b>MBG 421</b>
Name	<b>RNA Biology</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate /3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	The course covers types and roles of RNAs, RNA structure and non-coding RNAs in post-transcriptional gene regulation. The main topics of the course include RNA splicing, editing, localization, regulation and translation.

Code	<b>MBG 425</b>
Name	<b>Population Genetics</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	This course will cover the topics of genetic and phenotypic variations, organization of genetic variation, genetic drift, mutations, recombinations, darwinian selection, inbreeding, migration, molecular population genetics, quantitative genetics, population genomics. This course also comprises methods of measuring genetic variation and frequency using mathematical approach in theory of population genetics. The aim of the course is to introduce students knowledge at the advanced level which give students fundamental principle of population genetics.

Code	<b>MBG 426</b>
Name	<b>Histology of Tumors</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	The course will cover the histopathology of tumors, classification of tumors, introduction to histological methods, cytohistological features of malignant tumors, markers used in immunohistochemistry of tumors.

Code	<b>MBG 428</b>
Name	<b>Epigenetics</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	Epigenetic mechanisms alter gene expression which results in short and long-term functional consequences. The course covers epigenetic mechanisms; (1) histone modifications, (2) DNA methylation, and (3) expression of small RNAs. The role of epigenetics in stem cell differentiation, aging and cancer with emphasis on the most common research tools used to dissect epigenetic changes.

Code	<b>MBG 430</b>
Name	<b>Virology</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate /3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	The course covers the topics of virus taxonomy, virus structure, epidemiology, molecular basis of the viral replication and infection in the host cells, immune response of the host cell against the viruses and host cell growth control, virus vaccines, antiviral drugs, prions, and virus vectors for gene therapy.

Code	<b>MBG 431</b>
Name	<b>Human Physiology</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4
Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	This course provides knowledge on functional systems of the human body along with the physiological mechanisms taking role in the regulation/maintenance of the body. It covers the topics of the skeletal system, endocrine system, circulatory system, respiratory system, nervous system, immune system, reproductive organs, kidney and urinary system, and the muscle function from the level of the cell to the level of the organism.

Code	<b>MBG 435</b>
Name	<b>Disease and Genetics</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 3,4

Semester	Fall, Spring
Type	Elective
Prerequisites	none
Content	This course will introduce number of diseases to students. Students will learn diseases and their molecular mechanism in details. Diseases that we will touch are cancer, diabetes, obesity, neurodegenerative diseases including Prion and Creutzfeldt–Jakob disease, autoimmune diseases, Muscle Diseases, Lysosomal diseases, Mitochondrial Diseases. Student will also learn gene editing technics and gene therapy that are important and very new technics for untreatable disorders. Most importantly ,this course will focus on reletionships between diseases and its genetic background which will help to understand molecular mechanism of those diseases. In this course, students will present an article about a disease which are explained in the lecture or a presentation about a disease. In this way, the students will strengthen what they have learned in lecture. In addition, students will be able to improve their ability to present papers.

Code	<b>MBG 499</b>
Name	<b>Summer Internship</b>
Hour per week	0
Credit	0
ECTS	6
Level/Year	Undergraduate / starting from 2 <sup>nd</sup> year
Semester	Fall
Type	Compulsory
Prerequisites	none
Content	This course covers summer internship program that provides experience in an industrial or research setting. This internship program cannot be less than 20 working days. During internship, students will gain an understanding of the molecular biology and genetics workplace in industry or academia. They will discover their own interests, better clarified their professional goals and develop practical skills and judgment.