Department of “Natural sciences”.

MODULE HANDBOOK

MSc in MOLECULAR BIOLOGY

MODULE HANDBOOK

Magistr program in Molecular biology, Department of "Psychology and social work".

Course Unit Title	**Higher education pedagogy**
Course Unit Code	**MHF - B02**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	-
Number of ECTS Credits Allocated	4
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	1, 2
Course Coordinator	PhD Reyhan Ahmadova
Name of Lecturer (s)	PhD Reyhan Ahmadova
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Objectives of the Course: One of the goals of the course is to clarify pedagogical laws and regularities, to express them precisely and specifically. One of the goals of the course is to create conditions for the development of creative pedagogical thinking in students.

Objectives of the Course: The course begins with the concept of the pedagogical process. The essence of the system is schematically as follows: areas, sources, methods of pedagogical science, pedagogical process (education, training, upbringing, development and their interaction, regularities), education (essence, content, types, system, principles), training (essence, tasks, regularities, stages, forms, methods, means), upbringing (goal, tasks, areas, principles, methods, forms), management of the pedagogical process (management and leadership, methodological work, joint work of the school, family, community and collectives)

Learning Outcomes

- Formation of ideas about the goals and objectives of pedagogical science, scientific research methods, and its relationship with other sciences;
- Formation of ideas about the forms of organizing training;
- Formation of ideas about the means of training;

At the end of the course the student will be able to		Assessment
1	- Formation of ideas about pedagogical principles, teaching methods;	
2	- Formation of ideas about the goals and objectives of teaching in students;	
3	- Formation of ideas about the content and features of the pedagogical course in students;	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	

5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1. 1		The Subject, Concepts, and Scientific Research Methods of Pedagogy	
2. 2		Development and Education of Personality. Stages of Development by Age	
3. 3		The Education System and Its Principles	
4. 4		Characteristics of Pedagogical Activity	
5. 5		Didactics as the Theory of Education and Instruction	
6. 6		Principles of Instruction	
7. 7		Forms of Organizing Instruction	
8. 8		Service to the Pedagogical Process in Higher Education	

RecommendedSources

TEXTBOOK(S)

1. Nurəddin Kazımov. Ali məktəb pedaqogikası. Bakı. 2006.
2. H.H. Əhmədov. Pedaqogika. Bakı. Mütərcim. 2015
3. L. Qasımova, R. Mahmudova. Pedaqogika. Bakı, 2003

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria

Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			

Total Workload	**120**
Total Workload/30(h)	**120\30**
ECTS Credit of the Course	**4**

MODULE HANDBOOK

Magistr program in Molecular biology, Department of "Philosophy".

Course Unit Title	**Philosophy**
Course Unit Code	**MHF - B04**
Type of Course Unit	Elective
Level of Course Unit	
National Credits	-
Number of ECTS Credits Allocated	2
Theoretical (hour/week)	1
Practice (hour/week)	1
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	1, 2
Course Coordinator	PhD Bilal Alizadeh
Name of Lecturer (s)	PhD Bilal Alizadeh
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Objectives of the Course: Philosophy helps to form a scientific-theoretical worldview in a person. Philosophy helps to create a generalized worldview about nature and society, clarifies a person's understanding of the world and philosophy. It forms a worldview about society in a person.

Objectives of the Course: Philosophy enriches people with theoretical knowledge about nature, society, and man. Philosophy helps people understand the world, provides them with a broad knowledge of philosophical analysis of nature and society, and he lps develop logical thinking in people.

Learning Outcomes

Formation of knowledge about modern approaches to the study of social phenomena, skills in collecting and processing empirical data, rules for compiling scientific work, the ability to generalize and analyze research results, and its interpretation

At the end of the course the student will be able to		Assessment
1	Understand the historical development of philosophy: Describe the key philosophical movements and thinkers from ancient to modern times.	
2	Analyze philosophical concepts: Critically evaluate ideas related to existence, consciousness, and knowledge.	
3	Engage with philosophical debates: Develop arguments on topics such as the nature of reality, the human condition, and society	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	

9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Philosophical Worldview. The Historical Development of Philosophy	
2		Philosophical Teachings on Being	
3		The Problem of Consciousness in Philosophy. Theory of Cognition	
4		The Problem of Man in Philosophy	
5		Philosophical Analysis of Society	

RecommendedSources

TEXTBOOK(S)

1. Z.C.Hacıyev.Fəlsəfə.Bakı.2012
2. Q.Abbasova,Z.Hacıyev.Sosial fəlsəfə. 2012
3. K.Yaspers.Tarixin mənası və məqsədi.Bakı.2008
4. H.Q.Məmmədova. A.İ.Tağıyeva.Antropologiya.Bakı.2014

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria

Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**60**
Total Workload/30(h)			**60\30**
ECTS Credit of the Course			**2**

MODULE HANDBOOK

Magistr program in Molecular biology, Department of "Foreign language".

Course Unit Title	**Foreign language**
Course Unit Code	**MHF - B01**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	-
Number of ECTS Credits Allocated	6
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	1, 2
Course Coordinator	Jala Asgarova
Name of Lecturer (s)	Jala Asgarova
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Engilsh
Prerequisites	-
Recommended Optional Program Components	-

Objectives of the Course: Suggested program on the course of Foreign language (English) is designed for the Department of MBA and other departments of Master's degree.
The course is designed for students who need to achieve accurate and fluent communicative confidence through reading, writing and speaking. Students build and reinforce reading and speaking skills, vocabulary and concepts they will encounter in mainstream textbooks. The course is also designed to teach students fundament of the language so that they can be able to grasp general meaning of the texts minimum while they study other subjects in English language

Objectives of the Course: Describe in writing details about a variety of topics using more complex and diverse sentence constructions with extended vocabulary.
•Demonstrate the skill of story writing using more complex sentence structures and transforming sentences and completing the work independently.
•Develop reading skills through guessing the vocabulary from one context and transferring it to a new context.
•Read advanced texts, summarizing and giving opinion orally and in writing.
•Demonstrate the correct use of the dictionary by differentiating the derivatives and using them as part of a sentence.

Learning Outcomes
Familiarity with established knowledge, awareness of the evidence that bears upon established as well as controversial ideas; appreciation of the interconnectedness of knowledge;

At the end of the course the student will be able to		Assessment
1	Application: ability to apply the knowledge in familiar and new situations for academic and practical purposes in Internship courses;	
2	Thinking: capacity for critical thinking; creativity; capacity to make informed decisions and on the basis of available knowledge and information;	
3	Communication: ability to read and understand a wide range of academic writing with high level understanding of words in spoken language.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in	

	the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Unit 1- Verb be – affirmative, negative, question. Pronouns. Countries and nationalities. Reading and discussion.	
2		Unit 1- Possessive adjectives. Articles: a/an. Plural nouns. Demonstrative pronouns. Listening comprehension. Practical English: On a plane (listening and speaking). Writing: completing a form.	
3		Unit 2- Present simple – affirmative, negative, question. Cappuccino and chips. Reading and discussion.	
4		Unit 2- A/an + jobs. Possessives. Relatively famous. Listening comprehension. Discussion. Practical English: At a hotel (listening and speaking). Writing: An informal letter.	
5		Unit 3-Adjectives. Telling the time. Pretty woman. Daily routine. Reading and discussion.	
6		Unit 3-Adverbs of frequency. Prepositions of time. The island with a secret. The date. Listening comprehension. Discussion. Practical English: In a coffee shop. (listening and speaking) Writing: A magazine article.	
7		Colloquium 1	
8		Unit 4 - Can/can't. Like +(verb+ing). I can't dance. Free time activities. Reading and discussion.	
9		Unit 4 - Object pronouns. Possessive pronouns. The island with a secret. The date. Listening comprehension. Discussion. Practical English:In a clothes shop. (listening and speaking) Writing: Describing a friend.	
10		Unit 5- Past simple of be. Past simple regular and irregular verbs. Word formation. Sydney, here we come. Reading and discussion.	
11		Unit 5-Past time expressions. Irregular verbs. Murder in a country house. Listening comprehension. Discussion.Practical English: In a gift shop. (listening and speaking) Writing: A holiday report.	
12		Unit 6 -There is/there are. There was/there were. A night in a haunted hotel. Reading and discussion.	
13		Unit 6 - Present Continuous. Verb phrases. Neighbours from hell. Listening comprehension. Discussion. Practical English: In the street.	
14		Colloquium 2	
15		Unit 7 - A/an, some/any. How much/how many, quantifiers. Countable/uncountable nouns. How much water do we really need? Reading and discussion	
16		Unit 7 - Be going to. Changing holidays. Practical English: At a restaurant.Listening comprehension.	
18		Unit 8 - Comparative and superlative adjectives. The highest city in the world. Reading and discussion.	
19		Unit 8 - Would like to. Adverbs. They dress well but drive badly. Listening and discussion. Practical English: Going home.	
20		Unit 9 - Present Perfect. Before we met. Reading and discussion.	
21		Unit 9 - Present perfect or Past Simple. Past participle. Been to. Listening and discussion.	

22		Colloquium 3	
23		Grammar revision	

RecommendedSources
TEXTBOOK(S)
1. Oxenden, Clive; Christina Latham-Koenig.Paul Seligson. New English File. Elementary.Student`s book. Oxford University Press, 2009.
2. Oxenden, Clive; Christina Latham-Koenig.Paul Seligson. New English File. Elementary.Workbook. Oxford University Press, 2009.
3. Betty S. Azar, Stacy A. Hagen. Basic English Grammar. Fourth Edition. Pearson, 2014
4. https://learnenglish.britishcouncil.org

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**180**
Total Workload/30(h)			**180\30**
ECTS Credit of the Course			**6**

MODULE HANDBOOK

Magistr program in Molecular biology, Department of “Economy”.

Course Unit Title	**Economy**
Course Unit Code	**MHF - B04**
Type of Course Unit	Elective
Level of Course Unit	
National Credits	-
Number of ECTS Credits Allocated	2
Theoretical (hour/week)	1
Practice (hour/week)	1
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	1, 2
Course Coordinator	PhD Elchin Abbasov

Name of Lecturer (s)	PhD Elchin Abbasov
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Objectives of the Course: The "Economics" course, based on economic concepts, examines the problems emerging in international economic relations at a deep scientific level through scientific theories, analyzes a series of issues that are important for each state and each economic model, and creates the opportunity to make predictions about them.

Objectives of the Course: The aim of the course is to explain the following topics to students, to instill in them the basic tools of economic analysis, and to form an independent economic mindset. After completing the course, students should be able to independently acquire the most important and necessary economic knowledge and be able to analyze any economic problem that may arise in real life and draw correct conclusions.

Learning Outcomes

1. Explains the goals and objectives of economic theories, scientific research methods, and their relationship with other sciences.
2. Distinguishes the forms of organizing the teaching of economic theories, determines and applies the form appropriate to the topic.
3. Explains and explains the means of teaching economic theories, determines and selects visual aids for a specific lesson.
4. Explains and explains the principles of teaching economic theories, teaching methods (technologies).
5. Explains the goals and objectives of teaching economic theories.

At the end of the course the student will be able to		Assessment
1	- Formation of ideas about the goals and objectives of economic theories, scientific research methods, and their relationship with other sciences;	
2	- Formation of ideas about the forms of organization of economic theories;	
3	- Formation of ideas about the various tools of economic theories;	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		opic 1: Economics and Its Fundamental Principles. Economic Concepts and Laws.	
2		Topic 2: Factors of Production. Economic Systems.	
3		Topic 3: Property Relations. Basic and Derived Forms of Property.	
4		Topic 4: Commodity Circulation. The Nature and Functions of Money.	
5		Topic 5: The Concept of Demand. The Law of Demand. Non-price Determinants of Demand.	

RecommendedSources
TEXTBOOK(S)

1. T.S.Vəliyev,Ə.P.Babayev,M.X.Meybullayev“İqtisadi nəzəriyyə“,2011, Bakı.
2. Q.Y.Əbdülsəlimzadə ”İqtisadi nəzəriyyə-Ekonomiks”,2012,Bakı.
3. А.С.Булатов “Экономика”, 2012, Москва.
4. Менкью Н. Грегори “Принципы Экономикс”, 2018, Питербург.
5. Karl E.Case, Ray C.Fair “Principles of Economics”,2018,Prentice Hall, Upper Saddle River, New Jersey.

Assessment		
Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload			
Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**60**
Total Workload/30(h)			**60\30**
ECTS Credit of the Course			**2**

MODULE HANDBOOK

Magistr program in Molecular biology, Department of “Psychology and social work”.

Course Unit Title	**Psychology**
Course Unit Code	**MHF - B03**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	-
Number of ECTS Credits Allocated	2
Theoretical (hour/week)	1
Practice (hour/week)	1
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	1, 2
Course Coordinator	PhD Reyhan Ahmadova
Name of Lecturer (s)	PhD Reyhan Ahmadova

Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Objectives of the Course: Society cannot develop without scientific, that is, objective and correct knowledge about human psychology. The scientific and practical need for knowledge about humans in various areas of social practice necessitates the teaching of scientific psychology.

Objectives of the Course: The Psychology course covers the main topics and tasks of psychology, human personality, cognitive processes and their regulation, individual characteristics of a person, and human-human relations, and is intended to teach students important concepts and basic knowledge. The course consists of theoretical and seminar lessons. It includes a description of each psychological concept, an explanation of the laws and mechanisms of the psyche and their application, and all sections of classical and modern psychology.

Learning Outcomes

1. Explains the goals and objectives of psychology, scientific research methods, and its relationship with other sciences.
2. Distinguishes mental phenomena, identifies and expresses problems relevant to the topic.
3. Interprets and explains the means of mental development.

At the end of the course the student will be able to		Assessment
1	Interprets and explains the principles and training objectives of psychology.	
2	Interprets the goals and objectives of psychology.	
3	Distinguishes the content lines of the psychology course, explains the features of its construction, and lists the standards to be formed for each section.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
9. 1		Introduction to Psychology.	
10. 2		Scientific Research Methods of Psychology.	
11. 3		Sensory-Perceptive Processes.	
12. 4		Processes of Thinking and Imagination.	
13. 5		Character and Temperament.	
14. 6		Colloquium	
15. 7		Colloquium	
16. 8		Colloquium	

RecommendedSources
TEXTBOOK(S)

1. Bayramov Ə.S.Əlizadə Ə.Ə. Psixologiya. Bakı: 2012 2. Psixologiya. S. Seyidovun redaktorluğu ilə. Bakı, 2014		
Assessment		
Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	
Assessment Criteria Final grades are determined according to the Academic Regulations of WCU		
Course Policies • Attendance of the course is mandatory. • Late assignments will not be accepted unless an agreement is reached with the lecturer. • Students cannot use calculators during the exam. • Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations		

ECTS allocated based on Student Workload			
Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**60**
Total Workload/30(h)			**60\30**
ECTS Credit of the Course			**2**

MODULE HANDBOOK

Magistr program in Molecular biology, Department of "Natural sciences".

Course Unit Title	**Modern problems of biology**
Course Unit Code	**MİF-B01**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	-
Number of ECTS Credits Allocated	4
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	2
Course Coordinator	Phd Humbatov Mahmud
Name of Lecturer (s)	Phd Humbatov Mahmud
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-
Course description: The contemporary challenges of biology are to encourage the discipline to seek solutions by	

drawing attention to a number of global problems, to focus on a number of important issues, and to form ideas and concepts for solutions.

Objectives of the Course:

To study more closely the current problems that exist and may arise in Azerbaijan and the world, and to inform students about the measures taken to prevent these problems.

Learning Outcomes

Formation of ideas about the goals and objectives of the subject "Modern Problems of Biology", scientific research methods, and its relationship with other sciences

At the end of the course the student will be able to		Assessment
1	Identify and describe current global and scientific challenges in major biological fields such as genetics, ecology, molecular biology, biotechnology, and medicine.	
2	Analyze contemporary issues such as climate change impacts on biodiversity, antibiotic resistance, emerging infectious diseases, and genetic engineering.	
3	Critically evaluate scientific literature and research related to modern biological problems.	
4	Discuss ethical, legal, and social implications (ELSI) of modern biological advancements, including gene editing (CRISPR), cloning, and synthetic biology.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Subject, purpose and main objectives of the subject Modern Problems of Biology	
2		Individual development of the organism	
3		Biological aging	
4		The origin of life. Modern approaches and problems	
5		The formation of man. Modern approach and problems.	
6		Study of complex physiological and genetic functions of the organism (genetics of photosynthesis, nitrogen fixation for plants; behavior, response to stress factors for animals)	
7		Genetic engineering	
8		Solutions to food problems arising from the rapid growth of human population	

Recommended Sources

TEXTBOOK(S)

1. Tseng C.C. Human chromosome analysis // Tested studies for laboratory teaching. Proc. Of the 16th Workshop/Conf. Of the association for biology laboratory education (ABLE). 1995. Vol. 16. P. 33-56 p. Wyandt H. E., Tonk V. S. Human chromosome variation:
2. Заварзин А.А., Харазова А.Д., Молитвин М.Н. Биология клетки: общая цитология. - СПб.: Изд-во СПб. Ун-та, 1992

3. Сандригайло Л.И. Анатомо-клинический атлас по невропатологии. Баку, 1988.
4. Винсент П. Большой атлас анатомии человека. Москва, 2015
5. Əliyev A.X. Emosiya, motivasiya və ali sinir fəaliyyəti. Bakı- 2009
6. Ahmet Yıldırım, Fevzi Bardakçı, Mehmet Karataş, Bahattin Tanyolaç. Moleküler bioloji. İstanbul, Nobel Bilim ve Araştırma Merkezi, 2010.686 s.

Assessment		
Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**120**
Total Workload/30(h)			**120\30**
ECTS Credit of the Course			**4**

MODULE HANDBOOK

Magistr program in Molecular biology, Department of "Natural sciences".

Course Unit Title	**History and methodology of biology**
Course Unit Code	**MİF-B02**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	-
Number of ECTS Credits Allocated	2
Theoretical (hour/week)	1
Practice (hour/week)	1
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	2
Course Coordinator	Phd Humbatov Mahmud
Name of Lecturer (s)	Phd Humbatov Mahmud
Name of Assistant (s)	-
Mode of Delivery	Full time

Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: The contemporary challenges of biology are to encourage the discipline to seek solutions by drawing attention to a number of global problems, to focus on a number of important issues, and to form ideas and concepts for solutions.

Objectives of the Course: Mastering the history of the development of biological science fields, applying methods and techniques used in methodology

Learning Outcomes

-Formation of ideas about the goals and objectives of the subject “History and methodology of biology”, scientific research methods, and its relationship with other sciences;

-Formation of ideas about the means of teaching;

At the end of the course the student will be able to		Assessment
1	Describe the historical development of biology as a scientific discipline from ancient times to the modern era.	
2	Identify major scientific discoveries, experiments, and figures that shaped the evolution of biological thought.	
3	Analyze how philosophical, technological, and cultural factors influenced biological research across different time periods.	
4	Explain the development and significance of key biological theories (e.g., cell theory, evolution, genetics, molecular biology).	
5	Understand the transition from descriptive to experimental and molecular approaches in biology.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course’s Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Content, goals and objectives of the subject "Historical development and methodology of biology".	
2		Historical development of the sciences of Botany, Zoology and Cytology	
3		Historical development of the science of human anatomy and	

		physiology	
4		Genetics, Evolutionary Theory, and Historical Development of Ecology	
5		Biology teaching methodology, concept of methodology, teaching methods. Traditional and modern teaching. Active teaching methods	
6		Historical development of the sciences of Botany, Zoology and Cytology	
7		Historical development of genetics, evolutionary theory, and ecological sciences	
8		Biology teaching methodology, concept of methodology, teaching methods. Traditional and modern teaching. Active teaching methods	

Recommended
Sources
TEXTBOOK(S)

1.Tseng C. C. Human chromosome analysis // Tested studies for laboratory teaching. Proc. of the 16th Workshop/Conf. of the association for biology laboratory education (ABLE). 1995. Vol. 16. P. 33-56 p. Wyandt H. E., Tonk V. S. Human chromosome variation:
2. Заварзин А.А., Харазова А.Д., Молитвин М.Н. Биология клетки: общая цитология. – СПб.: Изд-во СПб. Ун-та, 1992
3. Сандригайло Л.И. Анатомо-клинический атлас по невропатологии. Баку, 1988.
4. Винсент П. Большой атлас анатомии человека.Москва,2015
5. Əliyev A.X. Emosiya,motivasiya və ali sinir fəaliyyəti. Bakı- 2009
6. Ahmet Yıldırım, Fevzi Bardakçı, Mehmet Karataş, Bahattin Tanyolaç. Moleküler bioloji. İstanbul, Nobel Bilim ve Araştırma Merkezi, 2010.686 s.

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			

Total Workload	**60**
Total Workload/30(h)	**60\30**
ECTS Credit of the Course	**2**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Methods of structural biology**
Course Unit Code	**MİF-B03**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	4
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	
Year of Study	1,2
Semester when the course unit is delivered	1
Course Coordinator	PhD Ulduza Qurbanova
Name of Lecturer (s)	PhD Ulduza Qurbanova
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: The subject "Methods of Structural Biology" that will be taught studies the structure-function relationship of macromolecules, interactions at the molecular level, and how proteins interact with other molecules - using techniques such as X-ray crystallography, cryo-electron microscopy, and NMR spectroscopy.

Objectives of the Course: The main goal of teaching the subject is to form in students the ability to acquire basic knowledge about structural studies of complex biomolecules. To create a unified understanding of the basic principles in students and to form information about the technologies of modern structural biology, existing methods of obtaining information about the relationship between the structure, dynamics and function of biomacromolecules.

Learning Outcomes: To be knowledgeable about molecular biology and biochemistry

At the end of the course the student will be able to		Assessment
1	Protein structure and function – Mechanisms of protein folding, molecular basis of enzyme activity.	
2	Structure of nucleic acids – the structure of DNA and RNA and their role in gene regulation.	
3	Protein-ligand interactions – Mechanisms of drug binding to target proteins.	
4	Cell signaling systems – Receptor proteins and their pathways of action within the cell.	
5	Structural biology is widely applied in the fields of medicine, pharmacology, and biotechnology, especially in the areas of drug design and the study of the molecular basis of diseases.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	

3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction. The role of structural biology in medicine and biotechnology	
2		Structure-function relationships of biomolecules. Protein structures: general principles	
3		Protein Data Bank Examples of protein structures	
4		Methods for solving and verifying crystal structures	
5		Electron microscope, electron tomography	
6		Nuclear Magnetic Resonance (NMR) Spectroscopy. Basic principles of NMR and magnetic resonance theory. Structural analysis of biomolecules by NMR. Interpretation and modeling of NMR data. Study of the dynamics of biomolecules in solution.	
7		Classification of proteins	
8		Application of Machine Learning Methods: Homology Modeling and Structure Prediction. Bioinformatic Tools for Protein Structural Modeling. Homology Modeling and Ab Initio Methods. Alphafold and Application of Artificial Intelligence to Structural Biology	

Recommended
Sources
TEXTBOOK(S)

1. Девид Нельсон, Майкл Кокс. Основы биохимии Ленинджера. В 3 томах. М:, Лаборатория знаний, 2020.
2. Лебедев А. Т. Масс-спектрометрия в органической химии. Москва. 2003.
3. Mass spectrometry basics. Eds. C.G. Herbert, R.A.W. Johnstone. 2003. CRC Press.
4. New and emerging proteomic techniques. Eds. D. Nedelkov, R.W. Nelson, Methods in molecular biology, 328. 2006, Humana Press.
5. "Proteomics of human body fluids: principles, methods, and applications" Ed: Visith Thongboonkerd. 2007, Humana Press.

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.

• Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations			
ECTS allocated based on Student Workload			
Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**120**
Total Workload/30(h)			**120\30**
ECTS Credit of the Course			**4**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Molecular evolution**
Course Unit Code	**MİF-B04.01**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	6
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	
Year of Study	1
Semester when the course unit is delivered	1
Course Coordinator	PhD Saida Hasanova
Name of Lecturer (s)	PhD Saida Hasanova
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-

Recommended Optional Program Components	-

Course description: The subject "Molecular Genetics" that will be taught focuses on understanding the molecular basis of how genes function at the cellular and organismal levels, as well as understanding the processes that modulate molecular and phenotypic variation in different organisms. Molecular genetic similarities indicate a common ancestor of life. Comparison of DNA sequences, which are the basis of heredity, can show how different species on Earth are related.

Objectives of the Course: The aim of the course is to provide undergraduates with detailed information on fundamental topics such as the history of molecular genetics, genome organization in prokaryotes and eukaryotes, DNA replication, transcription, translation, RNA synthesis and processing in eukaryotes, cytoplasmic inheritance, gene mutations and their repair, and regulation of gene expression, as well as general theoretical information on genetic engineering, the human genome, molecular marker technology and their use in various directions.

Learning Outcomes

	At the end of the course the student will be able to Mastering knowledge about the basic concepts of molecular genetics, the molecular nature of the gene, and the mechanisms of genetic processes;	Assessment
1	To have an idea about modern molecular genetic methods and the application directions of these genetic methods;	
2	A clear understanding of the molecular mechanisms of genetic engineering and genetic recombination processes.	
3	Obtaining complete information about new trends and research directions in molecular genetics that have emerged in recent years.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		The History, Subject, and Objectives of Molecular Genetics; The Interaction of Molecular Genetics with Other Sciences. Overview of Modern Research: Issues and Achievements.	
2		Material Basis of Heredity – Nucleic acids, the primary structure of DNA and RNA; alternative forms of DNA, RNA types; gene structure, structural and regulatory genes.	
3		Central Dogma of Molecular Biology/Genetics, Deviations from the Central Dogma; Similarities and Differences in DNA Replication in Prokaryotes and Eukaryotes; Stages and Key Enzymes of Replication.	
4		Gene Expression – The main stages of transcription, mRNA processing, mechanisms of gene expression regulation in eukaryotic and prokaryotic organisms; the operon model; positive and negative	

		regulation.	
5		Stages of Translation – The concept of the genetic code; characteristic features of translation in prokaryotes and eukaryotes, ribosomes, and tRNA.	
6		Application of Molecular Genetic Methods in Assessing Biodiversity – Molecular marker technology; determining genetic diversity and relatedness; genetic passporting, digital identification codes.	
7		Types of DNA Markers – Marker classification: dominant and co-dominant, multi- and monolocus, random and specific, genetic, linked, and neutral markers. Research on molecular markers in Azerbaijan and achieved scientific achievements.	
8		Application of Molecular Genetic Methods in Agriculture – Molecular selection (MS) and its types; screening for agriculturally important genes in crops; important scientific achievements in MS in our country.	
9		Methods for Determining DNA Sequences – Modern sequencing technologies; stages of sequencing; main areas of genomics; a valuable contribution to global genetic resources – Azerbaijani rose.	
10		Application of Molecular Genetic Methods in Medicine – Early diagnosis of genetic diseases; oncogenes; scientific research on medical genetics conducted in Azerbaijan and future prospects.	
11		Application of Molecular Genetic Methods in Forensic Science and Human Population Research – The Human Genome Project, main characteristics of the human genome; variable parts of the genome; STR markers; identification of individuals; key STR panels.	
12		History, Achievements, and Methods of Genetic Engineering – Key enzymes of genetic engineering: restriction endonucleases, ligases, polymerases, and terminal transferases.	
13		Construction of Recombinant DNA – Vectors; methods of transferring foreign genes into cells: physical and chemical methods.	
14		Genetically Modified Organisms (GMOs) – Issues and achievements; genome editing – CRISPR; legal regulation mechanisms regarding the production and consumption of GM organisms; biosafety concept.	
15		Emerging Trends and Research Directions in Molecular Genetics – Epigenetics, determination of biological age, xenotransplantation.	

Recommended Sources

TEXTBOOK(S)

1. Əliyev R.T., Abbasov M.Ə, Rəhimli V.R. Molekulyar Genetika. Bakı, Müəllim nəşriyyatı, 2020, 195 s.
2. Weaver, Robert Franklin. Molecular Biology. 5th edition. 2011. 915 pp.
3. Robert Schleif Department of Biology The Johns Hopkins University Baltimore, Maryland. Genetics and Molecular biology. 1993. 715 p.

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria

Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration	Total Workload(hour)

		(hour)	
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**180**
Total Workload/30(h)			**180\30**
ECTS Credit of the Course			**6**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Genetic and protein engineering**
Course Unit Code	**MİF-B04.02**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	4
Theoretical (hour/week)	1
Practice (hour/week)	1
Laboratory (hour/week)	
Year of Study	1
Semester when the course unit is delivered	1
Course Coordinator	PhD Ulduza Qurbanova
Name of Lecturer (s)	PhD Ulduza Qurbanova
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: The main goal of teaching the subject is to form in students the ability to acquire basic knowledge about structural studies of complex biomolecules. To create a unified understanding of the basic principles in students and to form information about the technologies of modern structural biology, existing methods of obtaining information about the relationship between the structure, dynamics and function of biomacromolecules.

Objectives of the Course: The subject "Gene and Protein Engineering" to be taught includes knowledge about the structure of nucleic acids, endo-, exonuclease, polymerase enzymes used, identification of certain genes, various vector systems, genetic cloning technology, hybridization methods, synthesis and cloning of fusion genes, determination of protein synthesis, principles of DNA sequence methods, Polymerase Chain Reaction, production of transgenic animals and plants and vaccines, deletions and additions in DNA by directed mutagenesis, and production of new proteins.

Learning Outcomes: Referring to the latest achievements of science in this field, students are asked questions such as "What are the subjects of genetic and protein engineering? How are these methods applied in which theoretical and practical fields of science? How are these methods used in biotechnology, agriculture, medicine and pharmacology, and what global problems in human society have been solved and will be solved?" etc., and the aim is to deeply master the course of study and to arouse interest in the current course of study by conveying the most up-to-date knowledge to students.

At the end of the course the student will be able to	Assessment

1	Describe the structure and function of nucleic acids: Detail the primary structures of DNA and RNA, as well as the roles they play in gene regulation and expression.	
2	Explain molecular genetic techniques: Understand and apply methods such as PCR, DNA sequencing, and genetic marker technologies in research and practical applications.	
3	Analyze molecular genetics in different biological contexts: Compare molecular genetics in prokaryotes and eukaryotes, including DNA replication, transcription, and translation processes.	
4	Explore the applications of molecular genetics: Understand the use of molecular genetics in medicine, agriculture, and biotechnology, including gene editing, genetic modification, and molecular diagnostics.	
5	Interpret the ethical implications of genetic engineering and biotechnology: Critically evaluate the ethical, legal, and social aspects of genetic modification, including GMOs and CRISPR technologies."	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
8	Ability to identify and select additional information resources for problem-solving;	
9	Ability to analyze, generalize, and apply relevant information for professional purposes;	
10	Ability to work in a team and achieve a joint approach to problem-solving;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		The Initial Scientific Foundations, Historical Significance, and Importance of Genetic Engineering and Recombinant DNA Methods	
2		Objectives and Tasks of Genetic Engineering. Genes and Genomes	
3		General Principles and Methods of Genetic Engineering. The Structure and Properties of DNA Molecules.	
4		Methods Used in Genetic Engineering	
5		In vitro Hybrid DNA Molecule Construction Methods. Connector, Restrictase-Ligase Method. Vector DNA Molecules and the Introduction of DNA Molecules into Cells.	
6		Enzymes Used in Genetic Engineering – Restrictases, DNA Ligase, DNA Polymerase I, Reverse Transcriptase, Poly(A)-Polymerase in E. coli.	
7		In vitro Hybrid DNA Molecule Construction Methods. Connector, Restrictase-Ligase Method. Introduction of Vector DNA Molecules into Cells.	
8		Chemical-Enzymatic Synthesis Methods of Double-Stranded DNA Fragments. The Koran Method, Construction of Partially Complementary DNA Duplexes, Synthesis of Artificial Genes from Overly Long Polynucleotides, Polymerase Chain Reaction (PCR) for Gene Synthesis.	
9		Lab 1: Isolation of Genomic DNA from Bacterial or Plant Cells	
10		Lab 2: Restriction Enzyme Digestion of DNA	
11		Lab 3: Ligation of DNA Fragments and Vector Construction	

12		Lab 4: Preparation and Transformation of Competent E. coli Cells	
13		Lab 5: Polymerase Chain Reaction (PCR) – Amplification of a Target Gene	
14		Lab 6: Agarose Gel Electrophoresis for DNA Analysis	
15		Lab 7: Reverse Transcription and cDNA Synthesis from mRNA	
16		Lab 8: Blue-White Screening for Recombinant Plasmid Identification	

Recommended Sources

TEXTBOOK(S)

1.Desmond S.T.Nicholl. An Introduction to Genetic Engineering. Third Edition,Cambridge University Press, 2008

2.Protein Engineering. Edited By Pravin Kaumaya, 2012.

3.Protein Engineering and Design Edited by Sheldon J. Park,Jennifer R. Cochran,2010 by Taylor and Francis Group, LLC, CRC Press is an imprint of Taylor & Francis Group, an Informa business

4. Маниатис Т., Фрич Э., Сэмбрук Дж. Методы генетической инженерии. Молекулярное клонирование.-М.,"Мир",1984.

5. J.Sambrook, E.F.Fritsch, T.Maniatis.Molecular cloning.A laboratory manual.Second edition.-Cold SpringHarbor Laboratory Press, 1989. 3Volumes.

6.Дрейпер Дж., Скотт Р., Армитиджа Ф., Уолден Р. Генная инженерия растений.Пер.с анг.Г.И.Эйснер., В.М. Андрианов, под.ред.Колчинского А.М. М., "Мир" 1991.

7. Пирузян Э.С. Основы генетической инженерии растений.-"Наука", 1988.

8.Щелкунов С.Н. Генетическая инженерия. "Наука" Сибирское Университетское издательство. Новосибирск 2004.

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria

Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**120**
Total Workload/30(h)			**120\30**
ECTS Credit of the Course			**4**

MODULE HANDBOOK

Magistr program in Molecular biology, Department of “Natural sciences”.

Course Unit Title	**Genomics**
Course Unit Code	**MİF - B04.03**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	-
Number of ECTS Credits Allocated	6
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	2
Course Coordinator	PhD Hasanova Saida
Name of Lecturer (s)	PhD Hasanova Saida
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: Genomics, a field of science that studies genomes, emerged in the 1970s and 1980s, but gained momentum with the launch of genome projects in the 1990s. Genomics allows us to determine the genome sequence of various organisms, the position and function of genes, changes in the gene expression profiles of cells under different conditions, the history of organisms, as well as to solve problems in the genome using biotechnological and molecular biological methods, and thus improve the health of various organisms, and most importantly, humans (drugs, diagnostics, prognostics, personalized healthcare).

Objectives of the Course: The aim of the course is to provide masters with detailed information about the organization of the genome in pro- and eukaryotes, various areas of genomics, and functional genomics approaches, as well as to instill theoretical and certain practical skills in Next Generation Sequencers and their working principles, advantages, and disadvantages.

Learning Outcomes

Define the field of genomics and explain its significance in modern biological research. **Describe** the structure and organization of genomes in prokaryotes, eukaryotes, and viruses.

At the end of the course the student will be able to		Assessment
1	Explain the methods used in genome sequencing, including next-generation sequencing (NGS), and their applications in genomic studies.	
2	Analyze the principles and processes of genome assembly, annotation, and functional genomics.	
3	Understand how genomic data is generated, stored, and analyzed using bioinformatics tools and databases.	
4	Interpret the results of genome-wide studies, including gene expression profiling, comparative genomics, and population genomics	
5	Evaluate the role of genomics in understanding genetic variation, evolutionary processes, and the genetic basis of diseases.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course’s Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	

10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Genome and genomics. History of genomics. Genome projects	
2		The main features of the human genome. The human genome project	
3		The structure of the eukaryotic genome. Repetitive elements in the genome	
4		Structure of the prokaryotic genome, operon system, repetitive elements in bacteria	
5		Viral genome, Baltimore classification of viruses	
6		Functional genomics, individualized approaches, and gene inactivation methods	
7		Functional genomics, total approach method, transcriptomics, RNA-seq	
8		Evolutionary genomics, acquisition of new genes	
9		Metagenomics, research object, methods	
10		Other areas of genomics: comparative genomics, medical genomics, pharmacogenomics, paleogenomics	
11		Genome reading methods: Sanger method (enzymatic, chain termination)	
12		First generation sequencing methods: automated Sanger, pyrosequencing, SBS	
13		Next Generation Sequencing methods, generation II sequencing: Illumina sequencer, bridge amplification, emulsion PCR method	
14		Non-optical semiconductor sequencing: Ion Proton and Ion PGM sequencers	
15		Generation III and IV sequencing methods: Single molecule real-time sequencing, sequencing with Nanopore technology.	

Recommended Sources

TEXTBOOK(S)

1. Richard Twyman. Principles of Proteomics, Second Edition, Garland Science: 260 p. 2013.
2. Gregory A. Petsko, Petsko, Dagmar Ringe Protein Structure and Function. New Science Press, 2004, 195 pages
3. Josip Lovric. Introducing Proteomics: From Concepts to Sample Separation, Mass Spectrometry and Data Analysis. Willey: 296 p. 2011.

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria

Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			

Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**180**
Total Workload/30(h)			**180\30**
ECTS Credit of the Course			**6**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Molecular biology of photosynthesis**
Course Unit Code	**MİF-B04.04**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	6
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	
Year of Study	1,2
Semester when the course unit is delivered	1
Course Coordinator	PhD Ulduz Qurbanova
Name of Lecturer (s)	PhD Ulduz Qurbanova
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: The course "Molecular Biology of Photosynthesis" includes general and modern knowledge about the genetic apparatus of chloroplasts, its properties, the molecular organization of the photosynthetic apparatus, and the principles of regulation of plastid genome expression.

Objectives of the Course: Referring to the latest achievements of science in this field, students are taught: What is Photosynthesis?; Study of the light reactions of photosynthesis and the complexes involved in them; Structure of chloroplasts, Main research methods used in the study of photosynthesis; Interaction between the light reactions of photosynthesis and the photosynthetic assimilation of carbon and ways of their regulation; Study of the dark reactions of photosynthesis and the enzymes involved in them; Features of the photosynthetic assimilation of carbon in bacteria and algae; Carbon concentrating mechanisms.

Learning Outcomes: The role of the carbonic anhydrase enzyme in increasing the concentration of CO2 gas in the carboxylation center; Photosynthetic assimilation pathways of carbon, their evolution and their physiological role in the adaptation of plants to the environment; The C3 pathway of photosynthesis and its regulation. The limiting properties of the Rubisco enzyme in the regulation of CO2 gas assimilation in C3 plants; The photorespiration cycle, compartmentalization of its biochemical reactions and features of regulation in various pathways of photosynthesis; Subtypes of C4 photosynthesis, characteristics of reactions occurring in these subtypes, the importance of C4 photosynthesis in increasing the biological productivity of plants; Phases of photosynthesis in CAM plants and their regulation depending on environmental parameters. Biosynthesis of sucrose and starch and their regulation pathways; The role of the stomatal apparatus in the transport of CO2 gas from the atmosphere to photosynthetic cells; The main directions of modern scientific research conducted in the field of studying the biochemistry of photosynthesis; The importance of these studies in eliminating food and energy security, etc. It consists of deeply mastering the curriculum around questions such as: and by conveying the most up-to-date knowledge to students, arousing their interest in the current curriculum.

At the end of the course the student will be able to		Assessment
1	Theoretical Foundations and Key Principles of the Structure and Functional Organization of the Chloroplast Genome	
2	Similarities and Differences in the Structure of the Chloroplast Genome between	

	Prokaryotes and Eukaryotes	
3	Genes Encoded in the Chloroplast and Nucleus	
4	Molecular Organization of the Photosynthetic Apparatus	
5	Regulation Mechanisms of Chloroplast Gene Expression at Various Levels	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Photosynthesis is the basis of the existence of the living world. History of the study of the molecular biology of photosynthesis, subject and tasks of the science of the molecular biology of photosynthesis.	
2		The light reactions of photosynthesis and the structure and functions of the complexes involved in them	
3		Study of the dark reactions of photosynthesis and the molecular structure of the complexes involved in them.	
4		The interaction between the light reactions of photosynthesis and the photosynthetic assimilation of carbon and the ways in which they are regulated	
5		Interaction between the light reactions of photosynthesis and photosynthetic assimilation of carbon and carbon concentrating mechanisms	
6		Evolution of photosynthetic carbon assimilation pathways and their physiological role in plant adaptation to the environment	
7		The C3 pathway of photosynthesis and its regulation.	
8		Photorespiration cycle, compartmentalization of its biochemical reactions, and regulatory features in various pathways of photosynthesis. Glycine decarboxylase is the main regulatory enzyme of the photorespiration pathway.	
9		The C4 pathway of photosynthesis and its ecophysiological role, the importance of C4 photosynthesis in increasing the biological productivity of plants	
10		Photorespiration cycle and compartmentalization of its biochemical reactions. Subtypes of C4 photosynthesis, characteristics of reactions occurring in these subtypes	
11		Characteristic features of spatial and temporal differentiation of carboxylation and decarboxylation reactions in CAM plants. Mechanisms of influence of unfavorable environmental factors (drought, temperature, salt stresses) on photosynthesis processes	

12		Characteristic features of spatial and temporal differentiation of carboxylation and decarboxylation reactions in CAM plants.	
13		Mechanisms of influence of unfavorable environmental factors (drought, temperature, salt stresses) on photosynthesis processes	
14		The effect of abiotic stress factors on photosynthesis and the interaction of photosynthesis with other major metabolic pathways in plants	
15		The main directions of modern scientific research in the field of photosynthesis. The importance of this research in overcoming food and energy security	

Recommended
Sources
TEXTBOOK(S)

1. Cell and Molecular Biology: Concepts and Experiments. 6th edition, Gerald Karp, John Willey & Sons Inc., 2010.
2. Biochemistry & Molecular Biology of Plants. Bob B. Buchanan, W. Gruissem, Russell L. Jones, American Society of Plant Physiologists, Rockville, Maryland, 2009.
3. Molecular Biology of the Gene. 6th edition, J. Watson, Baker, Bell, Gann, Levine, Losick, 2008.

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**180**
Total Workload/30(h)			**180\30**
ECTS Credit of the Course			**6**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Proteomics**
Course Unit Code	**MİF-B04.05**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	6
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	
Year of Study	1,2
Semester when the course unit is delivered	1
Course Coordinator	PhD Aynura Pashayeva
Name of Lecturer (s)	PhD Aynura Pashayeva
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: Proteomics is a discipline that provides modern technologies and methods for studying proteomes (all proteins in a cell, tissue, or organism). Techniques such as mass spectrometry, 2D-gel electrophoresis, protein identification and quantification, and analysis of post-translational modifications will be taught throughout the course. The role of proteomics in protein-protein interactions in biological systems, the discovery of disease biomarkers, and the identification of drug targets will be in the spotlight.

Objectives of the Course: The aim of the course Proteomics is to teach students the basic principles and technologies of proteomics. Students will understand the structure, function and regulation of proteins in biological systems, and learn the methods used in the mass analysis of the proteome. This course also provides an introduction to the use of proteomic approaches in biotechnology.

Learning Outcomes: The role of proteomics in protein-protein interactions in biological systems, the discovery of disease biomarkers, and the identification of drug targets will be in the spotlight.

At the end of the course the student will be able to		Assessment
1	Students will acquire both theoretical and practical knowledge and acquire basic skills in conducting and analyzing proteomics research.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	

9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Topic № 1. General Principles of Proteomics	
2		Topic № 2. Structure of Proteins	
3		Topic № 3. Functions of Proteins	
4		Topic № 4. Protein Separation Strategies. Gel Electrophoresis Principles. Two-dimensional (2D) Gel Electrophoresis	
5		Topic № 5. Principles of Multidimensional Liquid Chromatography; Application of Multidimensional Liquid Chromatography in Proteomics	
6		Topic № 6. Strategies for Protein Identification. Western Blotting Method	
7		Topic № 7. Basics of Mass Spectrometry. Protein Identification Using Mass Spectral Data	
8		Topic № 8. Quantitative Proteomics. 2D Electrophoresis-based Quantitative Proteomics. Quantitative Mass Spectrometry	
9		Topic № 9. Interaction Proteomics. Protein-Protein Interactions (PPI) and Complexes	
10		Topic № 10. Post-Translational Modifications of Proteins. Phosphoproteomics. Glycoproteomics	
11		Topic № 11. Application of Bioinformatics Tools in Proteomics. Principles of Protein Sequence Identification	
12		Topic № 12. Large-Scale Biology and the “Omics” Era. Multi-Omics Integration	
13		Topic № 13. Clinical and Pharmacological Proteomics. Discovery of Biomarkers, Disease Diagnostics, and Personalized Medicine	
14		Topic № 14. Protein Structure (Structural) Analysis. Structural Genomics and Structural Space	
15		Topic № 15. Application of Emerging Technologies in Proteomics. “Single-Cell”, “Next-Gen” Proteomics Technologies	

Recommended
Sources
TEXTBOOK(S)

- Richard Twyman. Principles of Proteomics, Second Edition, Garland Science: 260 p. 2013.
- Gregory A. Petsko, Petsko, Dagmar Ringe Protein Structure and Function. New Science Press, 2004, 195 pages
- Josip Lovric. Introducing Proteomics: From Concepts to Sample Separation, Mass Spectrometry and Data Analysis. Willey: 296 p. 2011.

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration	Total

		(hour)	Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**180**
Total Workload/30(h)			**180\30**
ECTS Credit of the Course			**6**

MODULE HANDBOOK

Master's program in Moleculyar biology, Department of "Natural sciences".

Course Unit Title	**Biostatistic**
Course Unit Code	**MİF-B05.03**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	6
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	
Year of Study	1
Semester when the course unit is delivered	1
Course Coordinator	PhD Ayaz Mammadov
Name of Lecturer (s)	PhD Ayaz Mammadov
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azərbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: Biostatistics is a fundamental discipline that teaches statistical methods and approaches for planning scientific research, collecting, processing, analyzing data, and interpreting results in the natural and medical sciences. The discipline is important for the correct and reliable analysis of data obtained in experiments and observations on living organisms.

Objectives of the Course: The aim of the Biostatistics course is to provide students with the theoretical knowledge and practical skills necessary for the statistical analysis of data in biological and medical research. Through the course, students learn to process, analyze, and interpret biological data using descriptive and inferential statistical methods. Using methods such as statistical hypothesis testing, analysis of variance and variance, correlation, and regression, students are able to correctly interpret scientific results and rely on statistical evidence in decision-making.

Learning Outcomes A student who successfully completes the course will be able to:– Explain the purpose and application areas of biostatistics;– Calculate descriptive statistical indicators (mean, median, mode, coefficient of variation, standard deviation, etc.) on biological data;– Present the frequency distribution of data in graphical and tabular form;– Formulate statistical hypotheses and select and apply appropriate test methods (T-test, Z-test, χ^2 test, etc.);– Perform variance (ANOVA) and covariance analyses and interpret the results;– Determine and model the relationship between variables using correlation and regression analyses;– Perform statistical classification of biological objects using discriminant analysis;– Acquire the ability to perform statistical calculations and data analysis in MS Excel, SPSS and BIOSTAT programs;– Interpret the analysis results and present them

in the form of a written report or presentation.		
At the end of the course the student will be able to		Assessment
1	Understand the principles of genetics: Explain key concepts such as inheritance patterns, gene expression, and mutations.	
2	Analyze genetic data: Use tools and techniques for analyzing genetic sequences and interpreting results.	
3	Apply genetic concepts: Solve problems related to genetic crosses, pedigree analysis, and gene mapping.	
4	Conduct genetic experiments: Design and carry out basic genetic experiments, including the use of model organisms.	
5	Understand genetic disorders: Recognize the genetic basis of various diseases and disorders, and explain their inheritance patterns.	
Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz		

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)		

Course Contents

Week	Chapter	Topics	Exam
1		Subject and Objectives of Biostatistics	
2		Basic Concepts of Biostatistics	
3		Measures of Central Tendency	
4		Frequency Distributions	
5		Analysis of Variance (ANOVA)	
6		Variance Analysis	
7		Covariance	
8		Correlation Analysis	
9		Regression Analysis	
10		Statistical Hypotheses	
11		T-test Analysis	
12		Z-test Analysis	
13		Calculation of Chi-Square	
14		Discriminant Analysis	
15		Biostatistical Software: MS EXCEL, SPSS, BIOSTAT	
		Lab 1: Statistical hypotheses, probability testing, parametric and nonparametric criteria.	
		Lab 2: Statistical inference: Populations and samples	
		Lab 3: Computation of biostatistical data.	
		Lab 4: Correlation and prediction.	
		Lab 5: Multiple comparisons.	
		Lab 6: Principal component analysis and factor analysis.	
		Lab 7: Time-to-event analysis: Survival analysis.	
		Lab 8: Analysis of longitudinal data.	
Recommended Sources			

TEXTBOOK(S)

- İ.A Qafarov. Biostatistika. Bakı 2021
- Natavan Soltan qızı Əyyubova. Statistika ümumi nəzəriyyə.Dərlik. Bakı 2014.
- Əlisa Zeynallı Zakir Zeynallı. STATİSTİKA: ÜMUMİ NƏZƏRİ MƏSƏLƏLƏR. Bakı 2011. https://anl.az/el/kitab2022/04/cd/Azf-265147.pdf
- Bernard Rosner. Fundamentals of Biostatistics. 8th edition. Harvard University. 2015

Assessment		
Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria

Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**180**
Total Workload/30(h)			**180\30**
ECTS Credit of the Course			**6**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Molecular biology research methods**
Course Unit Code	**MİF-B04.07**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	8
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	
Year of Study	1,2
Semester when the course unit is delivered	1
Course Coordinator	PhD Aynura Pashayeva
Name of Lecturer (s)	PhD Aynura Pashayeva

Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: The course "Research Methods in Molecular Biology" is aimed at introducing students to modern molecular biology methods used in the study of biological systems. Students will be introduced to the basic methods of DNA, RNA and protein analysis, including technologies such as PCR, electrophoresis, cloning, gel analysis, sequencing and global gene expression analyses. Analysis of results and writing scientific articles will also be taught as important components of this course.

Objectives of the Course: The main objective of the subject is to study molecular biomethods, the techniques necessary for the implementation of these methods, to develop protocols and learn the rules for their application in the laboratory.

Learning Outcomes. The course will provide students with an opportunity to understand the experimental approaches of molecular biology, analyze the results and learn the correct interpretation of scientific data.

At the end of the course the student will be able to		Assessment
1	As a result of mastering the subject, students should know molecular biology, its laboratory biomethods, the general characteristics of biomarkers, methods, and mechanisms of their application, and be able to perform DNA extraction using these methods.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Topic № 1. Introduction to Research Methods in Molecular Biology	
2		Topic № 2. Methods for Nucleic Acid Extraction	
3		Topic № 3. Nucleic Acid Manipulation	
4		Topic № 4. DNA Amplification Methods. Polymerase Chain Reaction (PCR)	
5		Topic № 5. Recombinant DNA Technologies. Molecular Cloning	
6		Topic № 6. Electrophoresis Methods. Separation of DNA and RNA by Electrophoresis	
7		Topic № 7. Electrophoresis Methods. Separation of Proteins by Electrophoresis	

8		Topic № 8. DNA Sequencing Technologies
9		Topic № 9. RNA Extraction and cDNA Synthesis
10		Topic № 10. CRISPR-Cas and Genome Editing Techniques
11		Topic № 11. Regulation of Gene Expression
12		Topic № 12. Protein Expression and Purification Systems
13		Topic № 13. Western Blotting and Immunodetection Techniques
14		Topic № 14. RNA Interference (RNAi) and Gene Knockdown Techniques
15		Topic № 15. Bioinformatics and Computational Biology in Molecular Research

Recommended
Sources
TEXTBOOK(S)

1. Brown, T. A. (2020). *Gene cloning and DNA analysis: an introduction*. John Wiley & Sons.
2. Khalid Z. Masoodi, Sameena Maqbool Lone, Rovidha Saba Rasool .Advanced Methods in Molecular Biology and Biotechnology. A Practical Lab Manual. 2020
3. Alberts, B. et al. *Molecular Biology of the Cell* (6th Edition). Chapter 6: DNA, Chromosomes, and Genomes. 2017
4. Current Protocols in Molecular Biology" by Frederick M. Ausubel et al., 2003

Assessment		
Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**240**
Total Workload/30(h)			**240\30**
ECTS Credit of the Course			**8**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Molecular mechanisms of biological macromolecule transport**
Course Unit Code	**MİF-B05.01**
Type of Course Unit	Compulsory

Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	8
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	-
Year of Study	2
Semester when the course unit is delivered	2
Course Coordinator	PhD Ulduza Qurbanova
Name of Lecturer (s)	PhD Ulduza Qurbanova
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: The subject "Molecular mechanisms of biological macromolecule transport" that will be taught includes modern information about the transport of macromolecules to various organelles of the cell. The main goal of the master's degree program in the subject "Molecular mechanisms of biological macromolecule transport" is to form a scientific worldview in the master's student about the structure of membranes in the cell, their main types and role, the functions and molecular composition of biological membranes, the transport of ions and organic compounds through membranes, and the transmission of information between cells with the participation of membranes.

Objectives of the Course: The main goal of teaching the subject is to form the ability of students to acquire basic knowledge about the molecular mechanisms of transport of biological macromolecules. To form a unified understanding of the basic principles in students and to form information about the relationship between the structure, dynamics and function of biomacromolecules, about the technologies of modern structural biology, existing methods of obtaining them. The subject of transport of biological macromolecules studies the mechanisms of transport of large biomolecules (for example, proteins, lipids, nucleic acids and carbohydrates) in cells and organisms. The main focus of this subject is intracellular transport - the transport of macromolecules between various organelles within the cell (for example, the endoplasmic reticulum, Golgi apparatus, lysosomes) and their orientation.

Learning Outcomes: Membrane transport – The movement of macromolecules into and out of the cell through the plasma membrane (endocytosis, exocytosis, active and passive transport mechanisms). Blood and lymphatic transport – The transport of proteins (e.g., hemoglobin, albumin), lipids, and other macromolecules in the body through the blood and lymphatic systems.

At the end of the course the student will be able to		Assessment
1	-To have an understanding of the structural properties and organization of biomembranes, the molecular structure of biological membranes and their role in transport processes;	
2	- To know the molecular mechanisms of passive and active transport of substances through biological membranes, transit peptides and molecular chaperones involved in this process, their types, structure and functions, translocation of biological macromolecules from the outer and inner membranes of chloroplasts and mitochondria, mechanisms of transport of molecules between the nucleus and cytoplasm, import and export processes, mechanisms of transport of proteins to the endoplasmic reticulum, Holci cisternae, vacuoles and microtubules;	
3	- To acquire modern scientific knowledge in the field of membrane science and be able to apply it in their future scientific activities.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	

7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Topic 1: Introduction. Chemical Properties and Structural Features of Biological Membranes.	
2		Topic 2: General Information on the Transport of Macromolecules to Various Organelles in the Cell.	
3		Topic 3: Mechanisms of Protein Transport to the Endoplasmic Reticulum.	
4		Topic 4: Molecular Chaperones, Their Classification, and Their Role in Transport.	
5		Topic 5: Nuclear Pore Complex, Its Structure, and Its Role in Transport.	
6		Topic 6: Mechanisms of Molecular Transport Between the Nucleus and Cytoplasm. Import and Export Processes.	
7		Topic 7: Translocation of Proteins Across the Outer and Inner Membranes of the Chloroplast.	
8		Topic 8: The Role of TOM and TIM Complexes in the Transport of Proteins into Mitochondria.	
9		Topic 9: Molecular Mechanisms of Vesicular Transport.	
10		Topic 10: Mechanisms of Protein Transport to Golgi Cisternae.	
11		Topic 11: Biological Functions and Molecular Composition of Membranes. Modern Approaches to the Study of Biological Membranes.	
12		Topic 12: Transport of Ions and Organic Compounds Across Membranes. Characterization of Membrane Transport Processes.	
13		Topic 13: Mechanisms of Protein Transport to the Endoplasmic Reticulum and Nucleus.	
14		Topic 14: Protein Import Mechanisms in Chloroplasts. Organization of Toc and Tic Complexes.	
15		Topic 15: Protein Import Mechanisms in Mitochondria. Organization of Tom and Tim Complexes.	

Recommended Sources

TEXTBOOK(S)

1. *Nelson, D. L.,* & *Cox, M. M.* (2017). *Lehninger principles of biochemistry* (7th ed.). WH Freeman. Chicago (notes-bibliography), 17th ed.
2. Введение в биомембранологию. (Под ред. А.А. Болдырева) М. 1990.
3. Геннис Р. Биомембраны, молекулярная структура и функции. М. 1999.

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria

Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			

Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**240**
Total Workload/30(h)			**240\30**
ECTS Credit of the Course			**8**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Mechanisms of regulation of the expression of genetic information**
Course Unit Code	**MİF-B05.02**
Type of Course Unit	Compulsory
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	8
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	
Year of Study	2
Semester when the course unit is delivered	1
Course Coordinator	PhD Ulduza Qurbanova
Name of Lecturer (s)	PhD Ulduza Qurbanova
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: The course Molecular Mechanisms of Regulation of the Expression of Genetic Information combines general and modern knowledge about the concept of genetic information, the ways of its storage, transmission and realization, and the mechanisms of regulation of the expression of genetic information at the molecular level.

Objectives of the Course: Referring to the latest scientific achievements in this field, it is necessary to provide students with a deep understanding of the course, focusing on questions such as: What is genetic information? How is this information stored and in what ways can it be transmitted, etc., and to arouse their interest in the current course by conveying the most up-to-date knowledge to students.

Learning Outcomes Molekulyar motorlar və sitoskelet – Molecular motor proteins (kinases, dyneins, and myosins) involved in the transport of macromolecules within the cell and their interactions with microtubules and actin filaments. Cell signaling and transport regulation – How the transport of macromolecules is controlled according to the needs of the cell. This subject is closely related to fields such as biochemistry, cell biology, and molecular biology, and is important for medicine, biotechnology, pharmacology, and other scientific fields.

At the end of the course the student will be able to		Assessment
1	The concept of genetic information, the rules for writing genetic information. Translation in prokaryotes and eukaryotes, common and different aspects	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Topic 1: Concept of genetic information, rules of encoding genetic information	
2		Topic 2: General overview of macromolecule transport to various cell organelles	
3		Topic 3: Mechanisms of protein transport into the endoplasmic reticulum	
4		Topic 4: Molecular chaperones, their classification, and role in transport	
5		Topic 5: Nuclear pore complex, its structure and role in transport	
6		Topic 6: Mechanisms of molecular transport between nucleus and cytoplasm; import and export processes	
7		Topic 7: Translocation of proteins across outer and inner chloroplast membranes	
8		Topic 8: Role of TOM and TIM complexes in mitochondrial protein transport	
9		Topic 9: Molecular mechanisms of vesicular transport	
10		Topic 10: Mechanisms of protein transport to Golgi cisternae	
11		Topic 11: Biological functions and molecular composition of membranes; modern approaches in the study of biological membranes	
12		Topic 12: Transport of ions and organic compounds across membranes; characteristics of membrane transport processes	
13		Topic 13: Mechanisms of protein transport to the endoplasmic reticulum and nucleus	
14		Topic 14: Mechanisms of protein import into chloroplasts; organization of Toc and Tic complexes	
15		Topic 15: Mechanisms of protein import into mitochondria; organization of Tom and Tim complexes	

Recommended
Sources
TEXTBOOK(S)

1. Коничев, А. С. Молекулярная биология : учебник для вузов / А. С. Коничев, Г. А. Севастьянова, И. Л. Цветков. — 5-е изд. — Москва : Издательство Юрайт, 2024. — 422 с. —
2. Cell and Molecular Biology: Concepts and Experiments John Wiley & Sons, Oct 19, 2009 - Science - 832 pages
3.Lewin's GENES XII, 12/e (*12th Edition*). by *Jocelyn* E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick. Hardcover, 838 Pages, Published 2017

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	

Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**240**
Total Workload/30(h)			**240\30**
ECTS Credit of the Course			**8**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Molecular mechanisms of biological signal transduction**
Course Unit Code	**MİF-B05.03**
Type of Course Unit	Elective
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	8
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	
Year of Study	2
Semester when the course unit is delivered	1
Course Coordinator	PhD Nigar Huseynova
Name of Lecturer (s)	PhD Nigar Huseynova
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Course description: Our daily activities depend on communication between various components. Similarly, in the body, various internal or external signals regulate important functions in cells such as division, growth, metabolism, and even death through step-by-step coordination. Signal transduction has been developed through evolution to maintain cellular homeostasis. Accordingly, aberrations in signal transduction disrupt homeostasis and lead to various diseases such as cancer, diabetes, obesity, and neurodegeneration. Thus, signaling pathways are widely targeted for disease treatment. Knowledge about the mechanism and regulation of signaling pathways is essential.

Objectives of the Course: The aim of this course is to provide in-depth knowledge of the

physiological functions and aberrations of disease-related signaling pathways. Therefore, each lecture will discuss the basics of a specific signaling pathway and its effects in the relevant diseases. Additional topics covered in traditional courses, including the neuroendocrine system, hormones, and neurotransmitters, will also be optimally covered to demonstrate their disease relevance.

Learning Outcomes: Acquire basic concepts of signal transduction.
Evaluate the impact of signal transduction on physiology and pathology.

At the end of the course the student will be able to		Assessment
1	Develop a basic understanding of the emerging scientific fields related to signal transduction in order to be able to critically evaluate the literature in this field.	
2	Understand the strengths and limitations of different experimental approaches to studying signal transduction.	
3	Acquire knowledge of animal models, cell culture, and molecular methods used to study various signaling processes in healthy and diseased states. Prepare manuscript discussion lectures to meet these criteria.	
4	Identify specific experimental findings; formulate them into important new questions; design experiments to answer these questions, and develop alternative approaches to arrive at definitive conclusions.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed;	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Topic 1: General principles of signal transduction	
2		Topic 2: Signal transduction mechanisms: signals and sensors	
3		Topic 3: Signal transduction mechanisms: second messengers and protein modifications	
4		Topic 4: G protein-coupled receptor signaling	
5		Topic 5: Receptor and non-receptor tyrosine kinases	
6		Topic 6: Serine/Threonine kinase-linked receptors	
7		Topic 7: Mitogen-activated protein kinases (MAPKs)	
8		Topic 8: Phospholipid-mediated signaling	
9		Topic 9: Nuclear receptors	
10		Topic 10: Redox signaling	
11		Topic 11: Gene transcription and regulation	
12		Topic 12: Signal transduction in plants	
13		Topic 13: Metabolism and signal transduction	
14		Topic 14: Signal transduction in health and disease	
15		Topic 15: Sensing and communication in bacteria (Greg Somerville, SVMBS)	

Recommended
Sources
TEXTBOOK(S)

- Anna Raffaello, Denis Vecellio Reane Calcium Signalling: Methods and Protocols. 2019
- Harvey Lodish, Arnold Berk, Chris A. Kaiser. Molecular Cell Biology. 2016
- John S. Willis. Cell Volume and Signaling. 2005

- Wendell Lim, Bruce Mayer, Tony Pawson. Cell Signaling. 2014		
Assessment		
Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	
Assessment Criteria Final grades are determined according to the Academic Regulations of WCU		
Course Policies • Attendance of the course is mandatory. • Late assignments will not be accepted unless an agreement is reached with the lecturer. • Students cannot use calculators during the exam. • Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations		

ECTS allocated based on Student Workload			
Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**240**
Total Workload/30(h)			**240\30**
ECTS Credit of the Course			**8**

MODULE HANDBOOK

Master's program in Molecular Biology, Department of "Natural sciences".

Course Unit Title	**Molecular phytopathology**
Course Unit Code	**MİF-B05.03**
Type of Course Unit	Elective
Level of Course Unit	
National Credits	
Number of ECTS Credits Allocated	8
Theoretical (hour/week)	2
Practice (hour/week)	2
Laboratory (hour/week)	
Year of Study	1, 2
Semester when the course unit is delivered	1,2
Course Coordinator	phD Ayaz Mammadov
Name of Lecturer (s)	phD Ayaz Mammadov
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-
Course description: The main goal of the discipline is to study how plants respond to diseases at the molecular	

and genetic level.
To understand how pathogens (viruses, bacteria, fungi, etc.) affect plants and the molecular mechanisms of this effect.

Objectives of the Course:
To study the process of pathogen entry into plants and disease development at the cellular level.
To study the molecular defense mechanisms employed by plants against diseases.

Learning Outcomes
Students can develop more effective defense mechanisms against diseases in plants based on the knowledge they gain in the field of molecular phytopathology.
By understanding and applying molecular defense mechanisms, effective approaches to disease prevention and treatment can be developed.

At the end of the course the student will be able to		Assessment
1	Understand the molecular basis of plant-pathogen interactions, including the mechanisms of infection and defense.	
2	Identify the roles of pathogen effectors and plant resistance (R) genes in disease development and immunity.	
3	Explain how molecular tools are used to diagnose plant diseases and monitor pathogen populations.	
4	Apply knowledge of gene expression, signaling pathways, and host-pathogen co-evolution in the context of phytopathology.	
5	Utilize molecular techniques such as PCR, gene silencing, and genome editing to investigate plant diseases.	

Assessment Methods: 1. Final Exam, 2. Presentation 3. Midterm 4. Quiz

Course's Contribution to Program

		CL
1	Oral and written communication skills in Azerbaijani relevant to the specialty;	
2	Communication skills in at least one foreign language relevant to the specialty;	
3	Systematic and comprehensive knowledge of the historical, legal, political, cultural, and ideological foundations of Azerbaijani statehood, as well as its place and role in the modern world; the ability to forecast the future development of our national state;	
4	Ability to identify the threats and challenges facing our national state;	
5	Ability to use information technologies in the workplace;	
6	Knowledge of methods for collecting and storing data; ability to create a database;	
7	Ability to work in a team and achieve a joint approach to problem-solving;	
8	Ability to adapt to new situations, take initiative, and demonstrate the will to succeed	
9	Ability to identify and select additional information resources for problem-solving;	
10	Ability to analyze, generalize, and apply relevant information for professional purposes;	

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction: Overview of Molecular Phytopathology	
2		Plant-Pathogen Interactions	
3		Plant Defense Mechanisms: Innate and Immune Responses	
4		Plant Immunity and Autocrine Signaling Pathways	
5		Molecular Pathogen Entry and Invasion	
6		Genetic Defense and Antimicrobial Compounds	
7		Genetic Evolution and Adaptation of Pathogens	
8		Molecular Processes and Signaling Pathways Between Pathogens	
9		Molecular Markers and Genetic Disease Diagnosis	
10		Role of Biotechnology in Phytopathology	
11		Plant Selection and Improvement Against Diseases	
12		Molecular Relationships Between Viruses and Plants	
13		Bacterial Diseases and Molecular Analysis	
14		Fungal Diseases and Molecular Mechanisms	
15		Future Molecular Phytopathology: New Approaches and Research Areas	

Recommended
Sources
TEXTBOOK(S)

1. Molecular Biology of the Cell" Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. Garland Science (6th Edition, 2014)
2. "Molecular Cell Biology" Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D., & Darnell, J. W. H. Freeman & Company (8th Edition, 2016)

Assessment

Attendance	10%	At least 75% class attendance is compulsory
Presentation	10%	
Quiz	0%	
Seminars	30%	
Midterm Exam	0%	
Final Exam	50%	
Total	100%	

Assessment Criteria
Final grades are determined according to the Academic Regulations of WCU

Course Policies

- Attendance of the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Western Caspian University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class			
Presentation			
Self-study			
Tutorials			
Midterm Examination			
Preparation for midterm exam			
Final Examination			
Preparation for final exam			
Total Workload			**240**
Total Workload/30(h)			**240\30**
ECTS Credit of the Course			**8**