Department of “Natural sciences”.

MODULE HANDBOOK

Msc in GENETİCS

MODULE HANDBOOK

Master program in Genetics, 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)	-
Practice (hour/week)	4
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	1
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. 1		Unit 1- Verb be – affirmative, negative, question. Pronouns. Countries and nationalities. Reading and discussion.	
2. 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. 3		Unit 2- Present simple – affirmative, negative, question. Cappuccino and chips. Reading and discussion.	
4. 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. 5		Unit 3-Adjectives. Telling the time. Pretty woman. Daily routine. Reading and discussion.	
6. 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. 7		Colloquium 1	
8. 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.	
17.		Unit 8 - Comparative and superlative adjectives. The highest city in the world. Reading and discussion.	
18.		Unit 8 - Would like to. Adverbs. They dress well but drive badly. Listening and discussion. Practical English: Going home.	
19.		Unit 9 - Present Perfect. Before we met. Reading and discussion.	
20.		Unit 9 - Present perfect or Past Simple. Past participle. Been to. Listening and discussion.	

21.		Colloquium 3	
22.		Grammar revision	

Recommended Sources 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

Master program in Genetics, 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	2
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
23. 1		The Subject, Concepts, and Scientific Research Methods of Pedagogy	
24. 2		Development and Education of Personality. Stages of Development by Age	
25. 3		The Education System and Its Principles	
26. 4		Characteristics of Pedagogical Activity	
27. 5		Didactics as the Theory of Education and Instruction	
28. 6		Principles of Instruction	
29. 7		Forms of Organizing Instruction	
30. 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

Master program in Genetics, 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	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
1		Introduction to Psychology.	
2		Scientific Research Methods of Psychology.	
3		Sensory-Perceptive Processes.	
4		Processes of Thinking and Imagination.	
5		Character and Temperament.	
6		Colloquium	
7		Colloquium	
8		Colloquium	

Recommended Sources

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

Master program in Genetics, 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	2
Semester when the course unit is delivered	1
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 helps 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;	
	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
-		Philosophical Worldview. The Historical Development of Philosophy	
-		Philosophical Teachings on Being	
-		The Problem of Consciousness in Philosophy. Theory of Cognition	
-		The Problem of Man in Philosophy	
-		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
Master program in Genetics, 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	2
Semester when the course unit is delivered	1
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
31.		opic 1: Economics and Its Fundamental Principles. Economic Concepts and Laws.	
32.		Topic 2: Factors of Production. Economic Systems.	
33.		Topic 3: Property Relations. Basic and Derived Forms of Property.	
34.		Topic 4: Commodity Circulation. The Nature and Functions of Money.	
35.		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

Master program in Genetics, 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	1
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)

- 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:
- Заварзин А.А., Харазова А.Д., Молитвин М.Н. Биология клетки: общая цитология. - СПб.: Изд-во СПб. Ун-та, 1992
- Сандригайло Л.И. Анатомо-клинический атлас по невропатологии. Баку, 1988.
- Винсент П. Большой атлас анатомии человека. Москва, 2015
- Əliyev A.X. Emosiya, motivasiya və ali sinir fəaliyyəti. Bakı- 2009
- 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

Master program in Genetics, 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)

- 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:
- Заварзин А.А., Харазова А.Д., Молитвин М.Н. Биология клетки: общая цитология. – СПб.: Изд-во СПб. Ун-та, 1992
- Сандригайло Л.И. Анатомо-клинический атлас по невропатологии. Баку, 1988.
- Винсент П. Большой атлас анатомии человека.Москва,2015
- Əliyev A.X. Emosiya,motivasiya və ali sinir fəaliyyəti. Bakı- 2009
- 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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Biotechnology and genetic engineering**
Course Unit Code	**MİF-B02**
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)	2
Year of Study	1
Semester when the course unit is delivered	2
Course Coordinator	Phd Gurbanova Ulduza

Name of Lecturer (s)	Phd Gurbanova Ulduza
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: This course covers the basic principles and technologies of biotechnology and genetic engineering and their applications in various fields. The course covers topics such as recombinant DNA technology, gene editing methods, cloning strategies, gene therapy, and the production of biotechnological products. The role of genetic engineering in the fields of industrial, medical, agricultural, and environmental biotechnology is discussed, as well as the ethical and legal aspects of biotechnological research. The course introduces students to the practical and theoretical foundations of biotechnology, as well as to innovative research and applications in this field.

Learning Outcomes By the end of the course, students will be able to explain the basic principles, methods, and applications of biotechnology and genetic engineering, analyze recombinant DNA technology, the creation of genetically modified organisms, and the production of biotechnological products. They will also evaluate the ethical and legal issues of biotechnology and discuss its applications in agriculture, industry, and medicine.

At the end of the course the student will be able to		Assessment
1	Explain the fundamental principles and techniques of biotechnology and genetic engineering.	
2	Describe the structure, function, and manipulation of genetic material (DNA/RNA) in living organisms.	
3	Demonstrate understanding of key molecular tools such as restriction enzymes, plasmids, vectors, PCR, and CRISPR-Cas systems.	
4	Analyze the steps involved in gene cloning, recombinant DNA technology, and genome editing.	
5	Apply biotechnological methods to solve problems in agriculture, medicine, industry, and environmental science.	

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 initial scientific foundations, historical essence and significance of the creation of genetic engineering or recombinant DNA methods.The goals and objectives of genetic engineering. Genes and genomes. Future prospects of biotechnology and genetic engineering	
2		General principles and methods of genetic engineering. Structure and properties of the DNA molecule.	
3		Methods used in genetic engineering. Gene editing methods (CRISPR-Cas9, ZFNs, TALENs)	
4		*Methods for constructing in vitro hybrid DNA molecules. Connector, restriction-ligase method. Insertion of vector DNA molecules into the cell.*	
5		Methods of chemical-enzymatic synthesis of double-stranded DNA fragments. Koran's method, construction of partially complementary DNA duplexes, construction of artificial genes from very long polynucleotides, Polymerase Chain Reaction (PCR) for gene synthesis.	
6		The production process of biotechnological products. Production of enzymes, vaccines and other biotechnological products	
7		Biotechnology and agriculture. Genetically modified organisms.	
8		Application of biotechnology in medicine. Gene therapy and personalized medicine	
9		Lab 1: Isolation and Purification of Genomic DNA from Plant or Bacterial Cells	
10		Lab 2: Gene Amplification Using the Polymerase Chain Reaction (PCR)	
11		Lab 3: Restriction Digestion and Ligation of DNA Fragments (In vitro Recombination)	
12		Lab 4: Gene Editing Simulation or Experiment	
13		Lab 5: Bacterial Transformation with Recombinant Plasmid DNA	
14		Lab 6: Enzyme Production by Microorganisms – Fermentation Experiment	
15		Lab 7: Screening and Identification of Genetically Modified Organisms (GMOs)	
16		Lab 8: Application of Molecular Techniques in Medical Biotechnology – DNA Fingerprinting or Gene Therapy Model	

Recommended
Sources
TEXTBOOK(S)

- Desmond S.T.Nicholl. An Introduction to Genetic Engineering. Third Edition,Cambridge University Press, 2008
- Protein Engineering. Edited By Pravin Kaumaya, 2012.
- 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
- Маниатис Т., Фрич Э., Сэмбрук Дж. Методы генетической инженерии. Молекулярное клонирование.-М.,"Мир",1984.
- J.Sambrook, E.F.Fritsch, T.Maniatis.Molecular cloning.A laboratory manual.Second edition.-Cold SpringHarbor Laboratory Press, 1989. 3Volumes.
- 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. - Пирузян Э.С. Основы генетической инженерии растений.-"Наука", 1988. - 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

Master program in Genetics, Department of "Natural sciences".

Course Unit Title	**Molecular biomethods**
Course Unit Code	**MİF - B04.01**
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
Course Coordinator	PhD Hasanova Saida
Name of Lecturer (s)	PhD Hasanova Saida
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: Understand the theoretical basis of key molecular biology techniques used in modern biological research. Identify and describe the principles and applications of methods such as DNA/RNA extraction, gel electrophoresis, PCR, qPCR, and DNA sequencing.

At the end of the course the student will be able to		Assessment
1	Perform standard molecular techniques in a laboratory setting with proper controls and safety procedures.	
2	Explain the use and purpose of restriction enzymes, ligases, and vectors in gene cloning.	
3	Apply molecular biomethods to analyze gene expression, detect mutations, or study genetic variation.	

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 of the development of molecular genetics, its subject and tasks; the interaction of molecular genetics with other sciences. A review of modern research: problems and achievements.	
22		The material basis of heredity - nucleic acids, the primary structure of DNA and RNA; alternative forms of DNA, types of RNA; gene	

		structure, structural and regulatory genes.	
3		Central tenet of molecular biology/genetics, deviations from the central tenet; similarities and differences of DNA replication in prokaryotes and eukaryotes; Stages of replication and key enzymes.	
4		Gene expression; main stages of transcription, mRNA processing, mechanisms of gene expression regulation in eukaryotic and prokaryotic organisms; operon model; positive and negative regulation.	
5		Stages of translation; concept of genetic code; characteristics of translation in pro- and eukaryotes, ribosomes and nRNA.	
6		Application of molecular genetic methods in biodiversity assessment, molecular marker technology; determination of genetic diversity and relatedness; genetic passporting, digital identification codes.	
7		Types of DNA markers; classification of markers: dominant and codominant, multi- and monolocus, random and specific, genic, linked and neutral markers. Research conducted with molecular markers in Azerbaijan and scientific achievements.	
8		Application of molecular genetic methods in agriculture; molecular selection (MS) and its types; screening of agricultural plants for economically important genes; Important scientific achievements in MS in our Republic.	
9		DNA sequencing methods; modern sequencing technologies; stages of sequencing; main areas of genomics; valuable contribution to global genetic resources - Azerbaijani guloshesi	
10		Application of molecular genetic methods in medicine; early diagnosis of genetic diseases; oncogenes; scientific research conducted in medical genetics in Azerbaijan and future prospects.	
11		Application of molecular genetic methods in forensics and human population studies; human genome project, basic features of the human genome; variable parts of the genome; STR markers; identification of identity; basic STR panels.	
12		History, achievements and methods of genetic engineering; main enzymes of genetic engineering: restriction enzymes, ligases, polymerases and terminal transferases.	
13		Construction of recombinant DNA; vectors; methods of transferring a foreign gene into a cell: physical and chemical methods.	
14		Genetically modified organisms (GMOs): problems and achievements; genome editing – CRISPR; legal regulatory mechanisms related to the acquisition and consumption of GM organisms; the concept of biosafety.	
15		Emerging trends and research directions in molecular genetics; epigenetics, biological age determination, xenotransplantation.	

Recommended Sources
TEXTBOOK(S)

1. Molecular Cloning: A Laboratory Manua Joseph Sambrook, David W. Russell Cold Spring Harbor Laboratory Press (4th Edition, 2012)
2. Molecular Biology of the Gene James D. Watson et al.
3. Principles of Gene Manipulation and Genomics Sandy Primrose, Richard Twyman

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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Molecular genetics**
Course Unit Code	**MİF - B04.02**
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	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.

1. Operations of the oil and gas industry across the value chain
2. Relationships and interactions between industry players
3. Importance of oil and gas in the economy
4. Likely future scenarios for the industry

Learning Outcomes:

Describe the structure and function of genetic material (DNA and RNA) and how it encodes biological information.
Explain the molecular mechanisms of DNA replication, transcription, and translation in both prokaryotes and eukaryotes.

At the end of the course the student will be able to		Assessment
1	Differentiate between prokaryotic and eukaryotic genetic systems, including the organization of chromosomes and genomes.	
2	Understand the processes of DNA repair, recombination, and mutation, and their implications for genetic stability and evolution.	
3	Apply molecular techniques such as PCR, gel electrophoresis, cloning, and sequencing to investigate genetic material.	
4	Explain the principles of genetic mapping and inheritance in model organisms, as well as the genetic basis of diseases.	
5	Interpret experimental data to evaluate gene function, gene interactions, and genetic variation.	

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 of the development of molecular genetics, its subject and tasks; the interaction of molecular genetics with other sciences. A review of modern research: problems and achievements.	
2		The material basis of heredity - nucleic acids, the primary structure of DNA and RNA; alternative forms of DNA, types of RNA; gene structure, structural and regulatory genes.	
3		Central tenet of molecular biology/genetics, deviations from the central tenet; similarities and differences of DNA replication in prokaryotes and eukaryotes; Stages of replication and key enzymes.	
4		Gene expression; main stages of transcription, mRNA processing, mechanisms of gene expression regulation in eukaryotic and prokaryotic organisms; operon model; positive and negative regulation.	
5		Stages of translation; concept of genetic code; characteristics of translation	

		in pro- and eukaryotes, ribosomes and nRNA.	
6		Application of molecular genetic methods in biodiversity assessment, molecular marker technology; determination of genetic diversity and relatedness; genetic passporting, digital identification codes.	
7		Types of DNA markers; classification of markers: dominant and codominant, multi- and monolocus, random and specific, genic, linked and neutral markers. Research conducted with molecular markers in Azerbaijan and scientific achievements.	
8		Application of molecular genetic methods in agriculture; molecular selection (MS) and its types; screening of agricultural plants for economically important genes; Important scientific achievements in MS in our Republic.	
9		DNA sequencing methods; modern sequencing technologies; stages of sequencing; main areas of genomics; valuable contribution to global genetic resources - Azerbaijani guloshesi	
10		Application of molecular genetic methods in medicine; early diagnosis of genetic diseases; oncogenes; scientific research conducted in medical genetics in Azerbaijan and future prospects.	
11		Application of molecular genetic methods in forensics and human population studies; human genome project, basic features of the human genome; variable parts of the genome; STR markers; identification of identity; basic STR panels.	
12		History, achievements and methods of genetic engineering; main enzymes of genetic engineering: restriction enzymes, ligases, polymerases and terminal transferases.	
13		Construction of recombinant DNA; vectors; methods of transferring a foreign gene into a cell: physical and chemical methods.	
14		Genetically modified organisms (GMOs): problems and achievements; genome editing – CRISPR; legal regulatory mechanisms related to the acquisition and consumption of GM organisms; the concept of biosafety.	
15		Emerging trends and research directions in molecular genetics; epigenetics, biological age determination, 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 (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 program in Genetics, 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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Cytogenetics**
Course Unit Code	**MİF - B05.01**
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 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	-

Objectives of the Course: The aim of the subject is to understand the classification of genetic diseases and their mechanisms of occurrence, diseases transmitted in autosomal recessive and dominant ways, chromosomal diseases, causes of occurrence, and the role of epigenetic factors in the occurrence of diseases.

Objectives of the Course: The main goal of the subject is to classify genetic changes in the number and structure of chromosomes, provide students with information about emerging diseases, diagnose diseases using effective methods, and teach knowledge about prenatal and postnatal diagnostic methods.

Learning Outcomes: 1. Chromosomes, karyotype analysis
2. Chromosome number diseases 3. Structural changes 4. Diagnostic method

At the end of the course the student will be able to		Assessment
1	Written method. Oral method. Mixed method. Open book method. Presentation method. Test method.	
2	Consultation hours are organized before the exam.	
3	Issues related to the admission of students to exams and midterm exams are resolved by the dean of the faculty.	

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 concept and relevance of studying biological diversity; the history of studying biodiversity.	
2		Levels of biodiversity: genetic, species and ecosystem diversity. Taxonomic and typological diversity of organisms. Factors determining biological diversity.	
3		Patterns of biodiversity formation and global distribution; mapping of ecosystem biodiversity. Vavilov's centers of origin of cultivated plants.	
4		Factors influencing biodiversity loss: The role of anthropogenic factors in biodiversity change. Habitat destruction. Habitat degradation and pollution	
5		Biological diversity and methods of its conservation: in-situ/ex-situ and on-farm conservation. The role of international and local Genebanks in biodiversity conservation. Svalbard Global Seed Vault, tissue culture and cryopreservation.	
6		Red Book. Principles of creation and maintenance of Red Books. Specially protected natural areas.	
7		Diversity of fauna and flora of Azerbaijan, specially protected areas: reserves, national parks, botanical gardens. Protection of biodiversity of the Caspian Sea and the Caspian region	
8		The role of biodiversity in food and nutrition security	
9		Agrobiodiversity and wild ancestors of cultivated plants. Use of	

		agrobiodiversity in breeding. Modern breeding methods	
10		Conservation of plant genetic diversity: assessment and characterization descriptors. Modern approaches in the assessment and passporting of biological diversity, DNA barcoding.	
11		The role of grain and legume biodiversity in global food security. Research conducted in our republic towards the collection and protection of grain and legume resources.	
12		Genetic engineering and biodiversity issues: direct and indirect impact.	
13		Conservation of biodiversity in the genomic and postgenomic era, World BioGenome Project, GWAS (genome-wide association analysis) method in the study of endangered species.	
14		Biodiversity and biotourism. Types of conservation-related tourism and their predicted impact on biodiversity conservation, positive and negative impacts of ecotourism	
15		National and Global Biodiversity Strategies; Cooperation between international organizations and countries. Convention on Biological Diversity.	

Recommended Sources
TEXTBOOK(S)

1. Thompson and Thompson Genetics in Medicine 7th Edition
2. Genes VIII. 2004 by Benjamin Lewin. Published by Pearson Prentice Hall. Pearson Education, Inc. Upper Saddle River, NT 07458 Lewin

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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Bioinformatics**
Course Unit Code	**MİF - B04.05**
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, 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: Bioinformatics is a multidisciplinary field at the intersection of biology and computer science that studies the application of computational and statistical methods to the collection, storage, analysis, and interpretation of biological data. The subject provides students with knowledge of the basic bioinformatics concepts, tools, methodologies, and databases designed to process big data (genome, transcriptome, proteome, etc.) generated in the fields of molecular biology and genetics.

Objectives of the Course: To teach students the basic principles and application areas of bioinformatics · To introduce them to the tools and methods used for the management and analysis of biological data · To form analytical thinking and practical skills in students regarding genetic and molecular data · To prepare them for their future scientific activities by introducing them to modern research methodologies.

Learning Outcomes: At the end of the course, the bachelor will have general knowledge of the application of information technologies in Biology, and the skills to use a number of bioinformatics analysis methods and resources.

At the end of the course the student will be able to		Assessment
1	- Will be able to explain the basic concepts and application areas of bioinformatics	
2	- Will be able to recognize and interpret genetic sequence formats (FASTA, GenBank)	
3	- Will master the basic methods of gene annotation, phylogenetic analysis and gene expression analysis	
4	- Will be able to effectively use bioinformatics databases (NCBI, UniProt, Ensembl)	
5	- Will be able to analyze genetic similarities using tools such as BLAST, ClustalW	

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 to Bioinformatics	
2		Types and databases of biological data – Genome, transcriptome, proteome data – databases such as NCBI, EMBL, DDBJ, UniProt, Ensembl	
3		FASTA and other sequence formats – Sequence file formats and structure – Input files for bioinformatic analyses	
4		BLAST and homology search algorithms – BLAST types: blastn, blastp, blastx, etc. – Interpretation and application of the obtained results	
5		Phylogenetic analyses – Construction of phylogenetic trees (NJ, ML, Bayesian) – Evolutionary distances and cladistic methods	
6		Molecular markers and bioinformatic analysis – SNP, SSR and other markers – Marker-based association analyses	
7		Transcriptome analyses and RNA-Seq – Analysis of RNA-Seq data – Differential gene expression analysis (DEG)	
8		Bioinformatics tools and programming basics – Bioinformatics packages in R and Python (Bioconductor, Biopython) – Bash scripts and high-performance computing	

Recommended Sources

TEXTBOOK(S)

Muhammed Şakiroğlu. Genomik analizler için Biyoinformatik yöntemler. Ankara 2021. – Böckenhauer H.J., B. Dirk. 2007.

Algorithmic aspects of bioinformatics. Springer-Verlag, Berlin, Heidelberg. – . Benjamin Lewin, Genes, 2000. – . David W. Mount,

"Bioinformatics: Sequence and genome analysis" Cold Spring Harbor Laboratory Press, New York, 2004. – Baxevanis D., B.F. Francis Ouellette. 2005.

Bioinformatics: A Practical Guide to the Analysis of Genes & Proteins (third editon), John Wiley & Sons.

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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Methodology of scientific research**
Course Unit Code	**MİF - B04.06**
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 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 aim of the course is to provide undergraduates with broad and comprehensive scientific knowledge about the methodology of scientific research, to understand the philosophy of science and its role in society, as well as to provide information on the formation of skills for designing dissertations at the appropriate level, and acquiring skills for the efficient and operational implementation of scientific research. Another main goal of teaching the subject "methodology of scientific research" to undergraduates is to help students acquire more empirical and theoretical knowledge about the methods of conducting scientific research in the relevant field if they continue their education at the doctoral level in the future.

Objectives of the Course:
Understand the fundamental principles and philosophy of scientific research, including the nature of scientific knowledge and the scientific method.
Familiarize themselves with the various research methodologies and approaches used in scientific inquiry, including qualitative and quantitative methods.

Learning Outcomes: Prepare students to write comprehensive and well-structured research proposals, including literature reviews, methodologies, and ethical considerations.
Communicate research findings effectively in both written and oral formats, including presentations and scientific papers. Understand the process of publishing research, from manuscript preparation to peer review, and the importance of dissemination in advancing scientific knowledge.

At the end of the course the student will be able to		Assessment
1	Gain skills in designing, planning, and conducting scientific research, including choosing appropriate research methods and data collection techniques.	
2	Analyze different types of research designs (e.g., experimental, observational, cross-sectional, longitudinal) and their applications in various scientific disciplines.	
3	Understand the ethical considerations involved in scientific research, including issues of plagiarism, authorship, and research integrity.	

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.		Relevance, justification, and purpose of teaching the subject of scientific research methodology;	
2.		General concepts of the composition of scientific works, the essence of methodology and its levels, scientific methods of research, fundamental and practical research;	
3.		Research methodology, logical structure of the scientific research process, collection of facts, formulation of a scientific problem and substantiation of a hypothesis, the role of theory in scientific research;	
4.		Basic principles of scientific research, main features of exploratory and applied research, structure and stages of scientific research methods;	
5.		Selection of a scientific topic, formulation of the problem and the main factors taken into account in conducting scientific research, planning of scientific research; determination of the object and subject of research; purpose of research;	
6.		Organization of scientific work (research) and collection and evaluation of the results obtained, application and effectiveness of the results;	
7.		Ethical rules, scientific ethics, compliance with ethical rules in conducting scientific research; Inadmissibility of plagiarism in conducting scientific research;	
8.		Inadmissibility of plagiarism in conducting scientific research	
9.		Literature search, information search sites, information search strategy; Literature sources, library, types of literature, literature selection, working with literature, systematization of literature information;	
10.		Rules for compiling scientific articles; structure of articles and preparation in the appropriate format; rules for identifying and citing necessary information from other scientific articles; rules for compiling a bibliography of sources used;	
11.		Organization of scientific work (research) and collection and evaluation of the results obtained, application and effectiveness of the results	
12.		Presentation of the results of scientific work; Requirements for oral presentation; Elements of oral presentation; Use of auxiliary tools; Design of scientific posters;	
13.		Rules for conducting a master's thesis in accordance with the methodology, composition of dissertations;	
14.		Stages of highly qualified personnel training, preparation for doctors of philosophy and sciences, requirements for dissertations, Scientific	

		names;	
15.		Science management; Criteria for scientometric evaluation of scientists and specialists, the impact of faculty performance on the rating of universities and research centers;	

Recommended Sources
TEXTBOOK(S)

- Elm haqqında Azərbaycan Respublikasının Qanunu, 2016;
- Təhsil haqqında Azərbaycan Respublikasının Qanunu, 2009
- Никифоров А. Л. Философия науки: история и методология. — М.: Дом интеллектуальной книги, 1998. — 280 с;

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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Immunogenetics**
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
Semester when the course unit is delivered	1, 2
Course Coordinator	PhD Sevinj Nuriyeva
Name of Lecturer (s)	PhD Sevinj Nuriyeva
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Objectives of the Course: To classify genetic diseases in humans, provide students with information about the genetic mechanisms of these diseases, make diagnoses using effective methods in the diagnosis of diseases, and instill prenatal and postnatal diagnostic methods.

Objectives of the Course: The aim of the subject is to understand the classification of genetic diseases and their mechanisms of occurrence, diseases transmitted in autosomal recessive and dominant ways, chromosomal diseases, causes of occurrence, and the role of epigenetic factors in the occurrence of diseases.

Learning Outcomes: Demonstrate an understanding of advanced technologies used in immunogenetics, such as next-generation sequencing (NGS), genotyping, and genome-wide association studies (GWAS).
Critically assess current research in immunogenetics and discuss its implications for developing new diagnostic tools and therapeutic strategies.

At the end of the course the student will be able to		Assessment
1	Understand the fundamental principles of immunogenetics, including the relationship between the immune system and genetic factors.	
2	Explain the genetic basis of immune responses, including the roles of major histocompatibility complex (MHC) molecules, immune receptors, and antibodies.	
3	Describe the process of antigen presentation and how genetic variation influences immune recognition and response.	
4	Identify the key genetic loci involved in immune system function, including the MHC and immune-related genes.	
5	Analyze the molecular mechanisms underlying immune responses and the genetic factors that contribute to susceptibility to infectious diseases, autoimmune disorders, and cancer.	

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
36. 1		Introduction, basic concepts, genetic basis	
37. 2		Introduction, basic concepts, genetic basis	
38. 3		Antigen, antibody, immune response, antigenic properties, organs of the immune system	
39. 4		Antigen, antibody, immune response, antigenic properties, organs of the immune system	
40. 5		Immunocomponent cells: B and T lymphocytes	
41. 6		Immunocomponent cells: B and T lymphocytes	
42. 7		Types and forms of immunity: Innate and acquired immunity	
43. 8		Types and forms of immunity: Innate and acquired immunity	
44.		Non-specific defense factors of the organism	
45.		Non-specific defense factors of the organism	
46.		Nonspecific humoral defense factors: secretory, immunoglobulins, complement system proteins, lysozyme, C-reactive protein, transferrin, interferon (IFN)	
47.		Nonspecific humoral defense factors: secretory, immunoglobulins, complement system proteins, lysozyme, C-reactive protein, transferrin, interferon (IFN)	
48.		Cellular factors of non-specific defense	
49.		Cellular factors of non-specific defense	
50.		Specific immunity	

Recommended Sources

TEXTBOOK(S)

- A.A.Əyyubova, G.M.Nəsrullayeva “Klinik immunologiya” 2007-ci il.
- Zeynalova S.Q., Ağayeva N.A., Bayramov A.Q., Əhmədov İ.B. Tibbi mikrobiologiya və immunologiya
- Thompson and Thompson Genetics in Medicine 7th Edition
- Genes VIII. 2004 by Benjamin Lewin. Published by Pearson Prentice Hall. Pearson Education, Inc. Upper Saddle River, NT 07458 Lewin

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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Biological diversity**
Course Unit Code	**MİF - B05.01**
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
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	-

Objectives of the Course: The aim of the course is to provide master's students with scientific knowledge on biological diversity, methods of studying and protecting biodiversity, international conventions, assessment of genetic diversity, genetic resources, populations, cultivated plants and their wild ancestors, and efficient use of biodiversity, using modern achievements in genetics, molecular biology, ecology, breeding, and seed science.

Objectives of the Course: the concept of biological diversity and its importance for ecosystem stability, human well-being, and ecological balance. The major levels of biological diversity, including genetic diversity, species diversity, and ecosystem diversity.

Learning Outcomes: Providing comprehensive information about biological diversity;
Master's students' acquisition of scientific knowledge on the organization of biodiversity conservation;

At the end of the course the student will be able to		Assessment
1	Explaining modern methods for assessing biodiversity;	
2	Providing knowledge on the use of biological diversity in food and nutrition security of the population	

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 concept and relevance of studying biological diversity; the history of studying biodiversity.	

2.		Levels of biodiversity: genetic, species and ecosystem diversity. Taxonomic and typological diversity of organisms. Factors determining biological diversity.	
3.		Patterns of biodiversity formation and global distribution; mapping of ecosystem biodiversity. Vavilov's centers of origin of cultivated plants.	
4.		Factors influencing biodiversity loss: The role of anthropogenic factors in biodiversity change. Habitat destruction. Habitat degradation and pollution	
5.		Biological diversity and methods of its conservation: in-situ/ex-situ and on-farm conservation. The role of international and local Genebanks in biodiversity conservation. Svalbard Global Seed Vault, tissue culture and cryopreservation.	
6.		Red Book. Principles of creation and maintenance of Red Books. Specially protected natural areas.	
7.		Diversity of fauna and flora of Azerbaijan, specially protected areas: reserves, national parks, botanical gardens. Protection of biodiversity of the Caspian Sea and the Caspian region	
8.		The role of biodiversity in food and nutrition security	
9.		Agrobiodiversity and wild ancestors of cultivated plants. Use of agrobiodiversity in breeding. Modern breeding methods	
10.		Conservation of plant genetic diversity: assessment and characterization descriptors. Modern approaches in the assessment and passporting of biological diversity, DNA barcoding.	
11.		The role of grain and legume biodiversity in global food security. Research conducted in our republic towards the collection and protection of grain and legume resources.	
12.		Genetic engineering and biodiversity issues: direct and indirect impact.	
13.		Conservation of biodiversity in the genomic and postgenomic era, World BioGenome Project, GWAS (genome-wide association analysis) method in the study of endangered species.	
14.		Biodiversity and biotourism. Types of conservation-related tourism and their predicted impact on biodiversity conservation, positive and negative impacts of ecotourism	
15.		National and Global Biodiversity Strategies; Cooperation between international organizations and countries. Convention on Biological Diversity.	

Recommended Sources
TEXTBOOK(S)

- Biodiversity in Managed Landscapes: Theory and Practice / Azaro R.C., Jonston D.W (Eds). New York (USA): Oxford Univ. Press, 1996, 778 p.
- Evolution of Biological Diversity / Magurran A.E., May R.M. (Eds). New York (USA) Oxford Univ. Press, 1999. 329 p.
- Williams P., Humphrics C., Araujo M. Mapping Europe Biodiversity. London: Nat. Hist. Museum, 1999, 129 p.
- C. Neal Steward JR. Plant Biotechnology and Genetics. A John Wiley & Sons, Inc., Publication, 2008, 416 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 (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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Molecular biology of the cell**
Course Unit Code	**MİF - B05.01**
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
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	-

Objectives of the Course: Welcome to the course Molecular Biology of the Cell, one of the important and fundamental fields of biological science. The study of molecular biology of the cell is considered the most important field of biological sciences. By studying this science, it is possible to study the molecular structure of cells and compare their different properties with each other. It also studies the factors affecting them, the molecular basis of

the processes occurring in the cell, the function, structure, metabolism, proliferation of various cells, and a number of important processes specific to cells and tissues.

Objectives of the Course: Welcome to the course Molecular Biology of the Cell, one of the important and fundamental fields of biological science. The study of molecular biology of the cell is considered the most important field of biological sciences. By studying this science, it is possible to study the molecular structure of cells and compare their different properties with each other. It also studies the factors affecting them, the molecular basis of the processes occurring in the cell, the function, structure, metabolism, proliferation of various cells, and a number of important processes specific to cells and tissues.

Learning Outcomes: Investigate the molecular mechanisms of cellular responses to external signals such as hormones, growth factors, and stress.
Apply knowledge of molecular biology techniques, such as PCR, gel electrophoresis, and microscopy, to study cellular processes.
Interpret experimental data from studies on cell biology and molecular genetics, including gene expression analysis and protein assays.

At the end of the course the student will be able to		Assessment
1	Describe the structure and function of cellular components, including organelles, membranes, and the cytoskeleton.	
2	Understand the molecular mechanisms that regulate cellular processes such as cell division, signaling, and metabolism.	
3	Explain the molecular basis of gene expression, including the processes of transcription, translation, and post-translational modifications.	
4	Identify the key enzymes and proteins involved in cellular processes such as DNA replication, repair, and recombination.	
5	Analyze the molecular and biochemical pathways that control the cell cycle, apoptosis, and cellular differentiation.	

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 of the development of the molecular structure of the cell.	
2		Chemical composition of cells. Inorganic and organic composition of cells	
3		Smooth and rough endoplasmic reticulum. Ribosomes	
4		Cell organelles - Holci complex. Lysosomes	
5		Double-membrane organelles. Mitochondria and plastids	
6		Nucleus and chromosomes	
7		Types of cell division. Mitosis. Meiosis	
8		Epithelial cells (Textus conjunctivus). Characteristics and types of epithelial tissue	

9		Connective tissue cells (Textus epithelialis). Characteristics. Blood and lymph	
10		Characteristics of cellular elements and intercellular substances of connective tissues	
11		Cartilage tissue cells (Textus Cartilage secans) Structure, types and functions of cartilage tissue	
12		Bone Tissue Cells (Textus Osteal) Structure, Types and Topographical Features of Bone Tissue	
13		Characteristics of muscle tissue cells (Textus muscularis)	
14		Cells of nervous tissue (Textus nervosus) Histological structure of nervous tissue	
15		Reproductive tissue cells	

Recommended Sources

TEXTBOOK(S)

Molecular Biology of the Cell, Alberts, Bruce; Johnson, Alexander; Lewis, Julian; Raff, Martin; Roberts, Keith; Walter, Peter. Garland Science (6th Edition, 2014)

Essential Cell Biology, Alberts, Bruce; Bray, Dennis; Lewis, Julian; Raff, Martin; Roberts, Keith; Walter, Peter, Garland Science (5th Edition, 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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Population genetics**
Course Unit Code	**MİF - B05.02**
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
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	-

Objectives of the Course: The aim of this course is to provide knowledge about the changes occurring in the internal structure of populations, the genetic regularities to which they are subject, and the changes occurring within and between populations. The theoretical knowledge provided will be reinforced by calculations (allele frequencies, gene drift rates, mutation rates, etc.) on different population examples.

Objectives of the Course: Biological sciences study living organisms not only "internally", but also the features of their interaction with each other and with the environment. Genetics is no exception. One of its most interesting areas is population genetics. As the name implies, this branch of genetics studies the features of heredity and variability at the population level. Population is a term that comes from the Latin - populatio, that is, population. It denotes a collection of organisms belonging to the same species, living in a certain area for a long time (having a common habitat) and completely or partially isolated from individuals of other similar groups of the same species. The interest in studying genetics at the population level lies in the fact that through the population level, the genetic continuity of generations is realized, as well as the regulation of biologically important traits such as number, productivity, resistance to diseases, etc. is explained.

Learning Outcomes: This, population genetics is a branch of genetics that studies the distribution of allele frequencies (different forms of the same gene located in the same regions of chromosomes), as well as their changes under the influence of the driving forces of evolution.

At the end of the course the student will be able to		Assessment
1	Explore the genetic basis of quantitative traits, including the use of quantitative trait loci (QTL) mapping and heritability studies.	
2	Interpret population genetic data from molecular markers, such as microsatellites, SNPs, and other genomic tools, to understand population structure and diversity.	
3	Evaluate the role of genetic drift in small populations, including concepts like bottlenecks, founder effects, and their implications for genetic diversity.	
4	Discuss the application of population genetics to conservation biology, including the management of endangered species and the preservation of genetic diversity.	
5	Examine the implications of population genetics for human health, including the study of genetic predispositions to diseases, evolution of pathogens, and human migration.	

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 of population genetics. Hardy-Weinberg law	
2		Population genetics and the genetic basis of evolution	
3		Variability, its causes and methods of study.	
4		Interchromosomal mutations.	
5		Cytoplasmic mutations	
6		Genetic basis of individual development	
7		Genetics of sex. Sex chromatin	
8		Regulation of gene activity	
9		Interaction of non-allelic genes	
10		Genetic basis of population variation.	
11		Methods for determining the genetic structure of a population	
12		Polymorphism at the DNA level within and between populations	
13		Human genetics and some problems of medical genetics	
14		Human genetics. Population method	
15		Homozygosity in a population. Heritability coefficient	

Recommended Sources

TEXTBOOK(S)

- Li C.C. Population genetics. Chicago: Univ. Chicago Press, 1955. 346 p.
- Nei M. Molecular evolutionary genetics. N.Y.: Columbia Univ. Press, 1987. 512 p.
- Nei M. Genetic distances between populations // Amer. Nat., 1972. V.106. No 949. P.283-292.

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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Transcriptomics and proteomics**
Course Unit Code	**MİF - B05.02**
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
Semester when the course unit is delivered	1, 2
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	-

Objectives of the Course: The aim of the Transcriptomics and Proteomics course is to provide students with fundamental knowledge about the structure, function and methods of studying the transcriptome and proteome. The course will discuss gene expression regulation at the transcriptome and proteome levels, omics technologies, bioinformatic analyses and applications of these approaches in biomedicine, agriculture and biotechnology. At the same time, students will become familiar with the main experimental and computational methods used in transcriptomics and proteomics studies, and will acquire skills in the analysis and interpretation of large volumes of data.

Objectives of the Course: This course studies the regulation of gene expression at the transcriptome and proteome levels and their functional significance in living systems. Within the course, students will be introduced to the concepts of transcriptomics and proteomics, their role in molecular biology and biomedicine, as well as modern technologies and analysis methods used in these fields. The transcriptomics section will cover topics such as the study of RNA composition, RNA-seq technology, microarrays and other expression analysis methods, as well as the regulation of

gene expression and alternative splicing. The proteomics section will discuss areas such as protein identification and quantitative analysis, mass spectrometry, posttranslational modifications, protein-protein interactions, and functional proteomics.

Learning Outcomes: Explain the fundamental concepts of transcriptomics and proteomics, including the biological significance of RNA and proteins in cellular processes.
Describe the experimental techniques and technologies used in transcriptomic (e.g., RNA-Seq, microarrays) and proteomic (e.g., mass spectrometry, 2D gel electrophoresis) analyses.

At the end of the course the student will be able to		Assessment
1	Perform basic data analysis and interpretation of transcriptomic and proteomic datasets using bioinformatics tools and software.	
2	Compare and contrast the information obtained from transcriptomic and proteomic studies, and understand their complementary roles in systems biology.	
3	Design experiments to study gene expression and protein profiles under different biological conditions or disease states.	
4	Evaluate the strengths and limitations of different transcriptomic and proteomic methodologies in research applications.	
5	Integrate transcriptomic and proteomic data to gain insights into molecular mechanisms and regulatory networks.	

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		History and scope of development of transcriptomics and proteomics	
2		Regulation of gene expression. Gene regulation in prokaryotes and eukaryotes	
3		Analysis of gene expression - Real-time PCR and other quantitative analysis methods.	
4		Single-cell and spatial transcriptomics	
5		Non-coding RNAs in transcriptomics. miRNA, lncRNA, and siRNAs	
6		Functional transcriptomics	
7		Introduction to proteomics. Structure and functions of proteins. Difficulties in studying the proteome	
8		Methods used in proteomics 1. Methods for protein separation	
9		Methods used in proteomics 2. Mass spectrometry	
10		Quantitative proteomics	
11		Interaction proteomics. Protein-protein interactions (PPIs) and complexes	
12		Post-translational modifications of proteins.	
13		Functional and clinical proteomics	
14		Multi-Omics integration. Systems biology approaches	
15		Emerging trends in transcriptomics and proteomics	

Recommended Sources

TEXTBOOK(S)

4. Richard Twyman. Principles of Proteomics, Second Edition, Garland Science: 260 p. 2013.
5. Gregory A. Petsko, Petsko, Dagmar Ringe Protein Structure and Function. New Science Press, 2004, 195 pages
6. 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			**240**
Total Workload/30(h)			**240\30**
ECTS Credit of the Course			**8**

MODULE HANDBOOK

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

Course Unit Title	**Biostatistical programs**
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

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	Azerbaijan
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	

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	**240**
Total Workload/30(h)	**240\30**
ECTS Credit of the Course	**8**

MODULE HANDBOOK

Master program in Genetics, Department of "Natural sciences".

Course Unit Title	**Human Genetics**
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
Semester when the course unit is delivered	1, 2
Course Coordinator	PhD Sevinc Nuriyeva
Name of Lecturer (s)	PhD Sevinc Nuriyeva
Name of Assistant (s)	-
Mode of Delivery	Full time
Language of Instruction	Azerbaijan
Prerequisites	-
Recommended Optional Program Components	-

Objectives of the Course: To classify genetic diseases in humans, provide students with information about the genetic mechanisms of these diseases, make diagnoses using effective methods in the diagnosis of diseases, and instill prenatal and postnatal diagnostic methods.

Objectives of the Course: The aim of the subject is to understand the classification of genetic diseases and their mechanisms of occurrence, diseases transmitted in autosomal recessive and dominant ways, chromosomal diseases, causes of occurrence, and the role of epigenetic factors in the occurrence of diseases.

Learning Outcomes: Explain the basic principles of human genetics, including Mendelian and non-Mendelian inheritance patterns. Describe the structure and function of DNA, genes, and chromosomes and their roles in heredity and genetic variation.

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		Introduction to Human Genetics, Basic Concepts	
2		Classification of Human Genetic Diseases	
3		Single-Gene Diseases	
4		Hemoglobinopathies	
5		Alpha-Thalassemia, Sickle Cell Anemia	
6		Autosomal Dominant Diseases	
7		Chromosomal Diseases	
8		Trisomies	
9		Multifactorial Diseases	
10		General Information on Cancer Development	
11		Cancer Stem Cells	
12		Epigenetics, Epigenetic Mechanisms	
13		Epigenetic Modifications	
14		Histone Modifications	
15		Non-coding RNAs	

Recommended Sources

TEXTBOOK(S)

1. .Ə.Nəcəfov, R.Ə.Əliyev, Ə.P.Əzizov.Tibbi biologiya və genetika.Bakı Müəllim nəşriyyatı, 2008, 839 s., şəkilli.
2. Berrin Ayaz Tüylü, Hülya Sivas, Zerrin İncesu, Emel Ergene. Genetik. Anadolu Üniversitesi Yayını No: 1953. 1. Bakı . 2009.

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

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Course Policies

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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 program in Genetics, Department of "Natural sciences".

Course Unit Title	**Genetics of microorganisms**
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
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	-

Objectives of the Course: The main objectives of the *Genetics of Microorganisms* course are:**To provide a deep understanding** of the genetic structure, function, and regulation of microorganisms including bacteria, viruses, fungi, and archaea. **To explore molecular mechanisms** of gene expression, mutation, and horizontal gene transfer in microbial systems. **To introduce genetic tools and techniques** used in microbial research, including gene cloning, PCR, sequencing, and genetic engineering.**To develop the ability to analyze** microbial genomes and interpret genetic data in the context of biotechnology, medicine, and environmental science.

Objectives of the Course: Teach the structural and functional organization of microbial genomes, including chromosomes, plasmids, and transposable elements.
Explain mechanisms of gene transfer such as transformation, conjugation, and transduction. Demonstrate the processes of mutation and recombination and their role in microbial evolution. Familiarize students with molecular biology tools used in microbial genetics (e.g., electrophoresis, PCR, blotting techniques, gene editing).

Learning Outcomes
Describe the genetic architecture of different types of microorganisms.
Explain and compare genetic processes such as replication, transcription, translation, mutation, and regulation in microorganisms.

Analyze the mechanisms of horizontal gene transfer and their implications for microbial diversity and adaptation.
Apply molecular techniques to study microbial genetics in both theoretical and practical contexts.
Design and interpret experiments related to microbial gene expression, mutagenesis, and genetic manipulation.

At the end of the course the student will be able to		Assessment
1	Critically evaluate scientific literature in the field of microbial genetics and apply knowledge to research or industry scenarios.	
2	Understand biosafety and ethical considerations in microbial genetic research.	

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

Course's Contribution to Program

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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 to Microbial Genetics	
2		Structure and Organization of Microbial Genomes	
3		Plasmids and Episomes	
4		DNA Replication in Microorganisms	
5		RNA Transcription and RNA Types	
6		Protein Synthesis (Translation)	
7		Regulation of Gene Expression	
8		Mutations and DNA Repair Mechanisms	
9		Genetic Recombination in Microorganisms	
10		Horizontal Gene Transfer	
11		Transposons and Mobile Genetic Elements	
12		Viral Genetics	
13		Fungal and Yeast Genetics	
14		Tools and Techniques in Microbial Genetics	
15		Applications of Microbial Genetics	

RecommendedSources
TEXTBOOK(S)
1. Snyder & Champness Molecular Genetics of Bacteria Larry Snyder, Wendy Champness
ASM Press (5th Edition, 2019)
2. Molecular Biology of the Gene James D. Watson et al. Pearson (7th Edition, 2013)

Assessment

Attendance	10%	At least 75% class attendance is compulsory
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Total Workload/30(h)			**240\30**
ECTS Credit of the Course			**8**