

MINISTRY OF SCIENCE AND EDUCATION OF THE REPUBLIC OF AZERBAIJAN
SUMGAI STATE UNIVERSITY

WORKING TEACHING PROGRAM ON CLIMATE CHANGE AND GLOBAL WARMING

S Y L L A B U S

Specialization: 050606-Environmental engineering

Faculty: Chemistry and Biology

Department: Ecology

It was approved at the meeting of Scientific Council of Sumgayit State University

“ _____ ” _____ dated 2023(protocol No._____).

Chairman of the Scientific Council _____ prof. E. B. Huseynov

The working curriculum - syllabus was prepared by senior lecturer PhD on agricultural sciences T.M.Babayeva.

It was discussed at the meeting of the department of Ecology on September 12, 2022 (protocol No. 01).

Head of the department: assoc.prof. R.R. Ahmadova

“ ____ ” _____ 2022

It was discussed and approved at the meeting of the Scientific Council of the Faculty of Chemistry and Biology on September 13, 2022 (protocol No. 01).

Chairman of the meeting: assoc.prof. M. M. Muradov

“ ____ ” _____ 2022

It was recommended to be approved by the Teaching Methodological Council of SSU (protocol No.

Chairman of TMC: assoc.prof. M.M. Mustafayev

“ ____ ” _____ 2022

Information about the teacher and department

Tunzale Mammad gizi Babayeva - doctor of philosophy in agricultural sciences, senior lecturer

The department of Ecology is located in room No. 1314 in the II educational building (43-district) of SSU.

Contact phone number 64-2-15-06 extension 1-49

Volume of the subject

| Semestr | Quantity of Credit | Types of lessons | | | | STIW Hour | STW Hour | General hours | Attestation form |
|---------|--------------------|--------------------|------------------|------------|-------------|-----------|----------|---------------|------------------|
| | | Auditorium lessons | | | Total hours | | | | |
| | | Lecturer | Practical lesson | Laboratory | | | | | |
| 6 | 5 | 30 | 30 | - | 60 | 24 | 36 | 150 | exam |

Characterization of the subject

The subject of climate changes and global warming is included in the approved Educational Program of the specialty 050606-Ecological engineering by the Ministry of Education and belongs to the department of specialized subjects (IF-B18, 5 credits).

The purpose of the subject

The purpose of the subject of climate change and global warming is to study in detail the history of the formation of the climate change framework, the cause of climate change, the sources of greenhouse gases and their impact on global warming, the carbon footprint, the impact of climate change on human development, and international cooperation in the fight against climate change.

Tasks of the subject

The main task of the subject of climate change and global warming is to teach students studying environmental engineering the driving forces of recent temperature increases, greenhouse gases, future warming and the carbon budget, the basics of international climate agreements, and use their environmental knowledge to formulate and solve problems. is to inculcate the skills of conducting.

Professional competencies acquired by the student mastering the subject:

- Knows the subject of the subject, the principles and essence of climate change and global warming, their negative impact;
- has theoretical knowledge about the share of countries in global carbon emissions, transmission mechanisms, the necessity of switching from traditional energy to alternative energy, the role of the anthropogenic factor in causing global warming;
- climate change, observed temperature increase, aerosols, climate changes and human development, able to implement Environmental policy of environmental protection;
- acquired the skills to determine the methods of protection of the atmosphere, its structure, sources of atmospheric air pollution, protection of the ozone layer, protection of wastes thrown into the atmosphere, and methods of waste treatment.

Learning outcomes of the subject:

FTN1. Greenhouse gases, carbon footprint, interprets the basics of the International climate agreement;

FTN2. Explains the causes, consequences, climate change policy and strategy of global warming;

FTN3. Activities at the national level on climate change in Azerbaijan, explains climate change mitigation, sensitivity, adaptation, the United Nations Framework Convention on Climate Change and the Kyoto Protocol;

FTN4. Interprets the information of the Intergovernmental Panel on Climate Change and the Paris Confederation;

FTN5. Explains the importance of the atmospheric layer, the impact of global warming on biodiversity, the nature of ecological shelters;

FTN6. It explains the driving forces of recent temperature increases and the impact of climate change on the ecosystem.

Preliminary subjects

To study climate change and global warming, the following subjects should be mastered.

| Subject | The sections of subject |
|---|---|
| General ecology | History of the development of ecology Environmental factors Ecosystem |
| 2. Integrated management of water resources | Construction and main elements of fishing devices Types and sources of pollution of water resources Planning and principles of integrated management of water resources |

Further subjects

The knowledge gained in the subject of climate changes and global warming is used in mastering the following subjects:

- Radioecology.
- Ecology of the biosphere
- Basics of environmental expertise and design

-THEMATIC PLAN OF THE SUBJECT

| Topics | The volume of the types of lessons, hours | | | | |
|--|---|-----------|------|------|-----|
| | Lect. | Les. Sem. | Lab. | STIW | SIW |
| 2 | 3 | 4 | 5 | 6 | 7 |
| History of climate change science [1-4]. | 2 | 2 | - | 2 | 2 |
| Gases that cause global warming. Carbon emission [1-4] | 2 | 4 | - | 2 | 2 |
| Global warming problem [1-4]. | 2 | 2 | - | 2 | 4 |

| | | | | | |
|---|-----------|-----------|----------|-----------|-----------|
| The concept of continuous sustainable development[2-4] | 2 | 2 | - | 2 | 2 |
| Impact of climate changes on demographic explosion [2-4] | 2 | 2 | - | 2 | 2 |
| Adaptation to climate changes [2-4] | 2 | 2 | - | - | 2 |
| Causes of global warming [2-4] | 2 | 2 | - | - | 2 |
| Consequences of global warming [4] | 2 | 2 | - | 2 | 4 |
| Climate change policy [2-4] | 2 | 2 | - | - | 2 |
| United Nations Framework Convention on Climate Change. Kyoto Protocol [1-4] | 2 | 2 | - | 2 | 2 |
| International cooperation in the fight against climate change [2-4] | 2 | 2 | - | 2 | 2 |
| Measures against the greenhouse effect [2-4]. | 2 | 2 | | 2 | 2 |
| Organization of transition to alternative energy [4] | 2 | 2 | - | 2 | 2 |
| Paris Agreement [1-4] | 2 | 2 | | 2 | 4 |
| Climate sensitivity [2-3]. | 2 | 2 | - | 2 | 2 |
| Total | 30 | 30 | - | 24 | 36 |

Exemplary topics of workshop (seminar) lessons

1. Sources of environmental pollution
2. Structure of the atmosphere
3. Methods of atmosphere protection
4. Alternative energy at the global level
5. Climate changes and human development
6. Impact of deforestation on global warming
7. Impact of global climate change on the Republic of Azerbaijan
8. Impact of global climate change on the world
9. Green economy
10. Measures to reduce the impact of climate change
11. International climate agreements
12. Scientific agreement on climate change
13. Public opinion on climate change
14. Nature of climate change

15. Appropriate climate change strategy

Thematic plan of independent work of students with the teacher

| Topic | The purpose of the lesson | Report form | Recommended literature |
|---|--|-------------|------------------------|
| 1 | 2 | 3 | 4 |
| 1. General principles of using nature | Strengthening of theoretical knowledge | Abstract | [1-4] |
| 2. Biosphere | _____ | _____ | [1-5] |
| 3. Nature and society | _____ | _____ | [1-5] |
| 4. Classification of natural resources | _____ | _____ | [1-4] |
| 5. Ecological bases of efficient use of natural resources | _____ | _____ | [1-4] |
| 6. Environmental planning | _____ | _____ | [1-5] |
| 7. The concept of sustainable development | _____ | _____ | [1-4] |
| 8. Economic laws of using nature | _____ | _____ | [1-2] |
| 9. State cadastre of natural resources | _____ | _____ | [1-4] |
| 10. Land resources of Azerbaijan and their effective using | _____ | _____ | [1-4] |
| 11. Water resources of Azerbaijan and their efficient using | _____ | _____ | [1-3] |
| 12. Environmental problems of water resources of Azerbaijan | _____ | _____ | [1-3] |
| 13. Biological resources of Azerbaijan | _____ | _____ | [1-5] |
| 14. Management and organization of the use of natural resources | _____ | _____ | [1-3] |
| 15. International cooperation through the use of natural resources and environmental protection | _____ | _____ | [1-4] |
| 16. Anthropogenic factor and environmental pollution | _____ | _____ | [1-2] |
| 17. Economic assessment of natural resources | _____ | _____ | [1-4] |
| 18. Importance of land fund | _____ | _____ | [1-5] |
| 19. Mineral resources of Azerbaijan | _____ | _____ | [1-3] |
| 20. Minerals of Azerbaijan | _____ | _____ | [1-4] |
| 21. Sources of environmental pollution | _____ | _____ | [1-4] |
| 22. Types of energy | _____ | _____ | [1-3] |
| 23. Renewable energy | _____ | _____ | [1-3] |

| | | | |
|--|-------|-------|-------|
| 24. United Nations Framework Convention on Climate Change | _____ | _____ | [1-3] |
| 25. Kyoto Protocol | _____ | _____ | [1-3] |
| 26. Paris agreement | _____ | _____ | [1-4] |
| 27. Causes of climate change | _____ | _____ | [1-4] |
| 28. Greenhouse effect | _____ | _____ | [1-5] |
| 29. Carbon footprint | _____ | _____ | [1-5] |
| 30. Appropriate climate change strategy | _____ | _____ | [1-5] |
| 31. Appropriate climate change policy | _____ | _____ | [1-5] |
| 32. Scientific consensus on climate change | _____ | _____ | [1-5] |
| 33. Public review on climate change | _____ | _____ | [1-3] |
| 34. The essence of climate change | _____ | _____ | [1-3] |
| 35. Demographic explosion | _____ | _____ | [1-5] |
| 36. Transition to alternative energy in the Republic of Azerbaijan | _____ | _____ | [1-5] |
| 37. Exhaustible and inexhaustible energy | _____ | _____ | [1-5] |
| 38. Effect of destruction of flora on climate changes | _____ | _____ | [1-5] |
| 39. Effects of extinction of fauna on climate changes | _____ | _____ | [1-5] |
| 40. Biodiversity conservation | _____ | _____ | [1-5] |

Sample topics for student independent work assignments

1. Interaction between urbanization and natural components
2. Climate variability during the formation of urbanization
3. Impact of urbanization on urban climate change
4. Interaction between climate change and variability at different spatial scales
5. Urban heat island formation mechanism
6. Classification of gases that create a heat effect
7. Sources of greenhouse gases and their impact on global warming
8. Sources of heat-producing gases in the Republic of Azerbaijan
9. Waste of gases that create heat effect in the Republic of Azerbaijan
10. Absorption of heat-producing gases in the Republic of Azerbaijan
11. Alternative Energy and climate change
12. International cooperation in combating climate changes

13. Calculation of the amount of greenhouse gases
14. Impact of urbanization on carbon emissions
15. The essence of the Kyoto Protocol
16. Measures to combat climate change
17. Calculation of the amount of greenhouse gases released during the burning of different fuels
18. Assessment of vulnerability to climate changes
19. Inventory of gases that create heat effect
20. CO₂ emissions and absorptions
21. CO₂ emissions in the energy sector
22. Industrial sector and CO₂ emissions
23. CH₄ emissions and uptakes
24. N₂O emissions and absorptions
25. Calculation of CO₂ emitted when fuel is burned
26. Waste from transport
27. CO₂ released from the transport sector
28. Volatile emissions from fuel
29. CH₄ emissions in oil and gas management
30. CO₂ absorption from forest areas
31. CH₄ emission from municipal solid waste
32. Separation of methane from waste water of industrial areas
33. N₂O emissions released during life activities
34. Programs in which the Republic of Azerbaijan participates
35. The current climate of the Republic of Azerbaijan and its changing trend
36. Climate scenario
37. Variation of precipitation

38. Assessment of agroclimatic resources
39. Impact of climate changes on coastal areas
40. Extreme heat and human health
41. Transport and environment
42. Agriculture and environment
43. Energy and environment
44. Construction and environment
45. UN Framework Convention on Climate Change
46. Climate changes and food security
47. Climate changes caused by environmental pollution
48. Regional climate changes in Azerbaijan
49. Dangerous hydrometeorological phenomena.
50. Food safety

Methodological support of the subject

| Author | The name of the methodological resource | Publishing | Date | Number | |
|---|---|----------------------------|------|---------|-------------------|
| | | | | library | At the department |
| Abasov İ.D. | Priority areas of food security and agriculture | Baku Science and Education | 2011 | - | 1 |
| Mahmudov R. | Regional climate changes and dangerous hydrometeorological events in Azerbaijan | Baku Science and Education | 2022 | - | 1 |
| Nadirov Z.A. Ahmedova R.R. etc | Basis of calculation of harmful substances released into the atmosphere | Sumgait SSU | 2006 | 5 | 3 |
| Nadirov Z.A. | Environmental protection facilities | Sumgait | 2005 | 2 | 3 |
| Mammedov R. Beharchi T. Mehdiyeva V | Global problems and the natural environment | Baku Science | 2007 | - | 1 |

| | | | | | |
|---------------------------|--|-----------------|------|---|---|
| Sadıgov A. Khalilov İ. | Ecology and environmental protection. | Baku Science | 2009 | 3 | 1 |
|---------------------------|--|-----------------|------|---|---|

Exam questions

1. History of climate change science
2. Gases that create the global warming effect.
3. Carbon footprint
4. Global warming problem
5. The concept of continuous sustainable development
6. Impact of climate changes on demographic explosion
7. Adaptation to climate changes
8. Causes of global warming
9. Consequences of global warming
10. Climate change policy
11. United Nations Framework Convention on Climate Change. Kyoto Protocol
12. Fight against climate change and international cooperation
13. Measures against the greenhouse effect
14. Organization of transition to alternative energy
15. The Paris Agreement
16. Climate sensitivity
17. Sources of environmental pollution
18. Classification of natural resources
19. Alternative energy types
20. Alternative energy at the global level
21. Climate changes and human development
22. Impact of deforestation on global warming
23. Impact of global climate change on the Republic of Azerbaijan
24. Impact of global climate change on the world
25. Green economy

26. Measures to reduce the impact of climate change
27. International climate agreements
28. Scientific agreement on climate change
29. Public opinion on climate change
30. Nature of climate change
31. Appropriate climate change strategy
32. United Nations Framework Convention on Climate Change.
33. Kyoto Protocol
34. Paris Agreement
35. Causes of climate change
36. Demographic explosion
37. Transition to alternative energy in the Republic of Azerbaijan
38. Exhaustible and inexhaustible energy
39. Effect of destruction of flora on climate changes
40. Effect of destruction of fauna on climate changes
41. Conservation of biodiversity
42. Interaction between urbanization and natural components
43. Climate variability during the formation of urbanization
44. Impact of urbanization on urban climate change
45. Interaction between climate change and variability at different spatial scales
46. Urban heat island formation mechanism
47. Classification of gases that create a heat effect
48. Sources of greenhouse gases and their impact on global warming
49. Sources of gases that create heat effect in the Republic of Azerbaijan
50. Waste of gases that create heat effect in the Republic of Azerbaijan
51. Absorption of heat-producing gases in the Republic of Azerbaijan
52. Alternative Energy and climate change
53. International cooperation in combating climate changes

54. Calculation of the amount of greenhouse gases
55. Impact of urbanization on carbon emissions
56. Essence of the Kyoto Protocol
57. Measures to combat climate change
58. Calculation of the amount of greenhouse gases released during the burning of different fuels
59. Assessment of vulnerability to climate changes
60. Inventory of gases that create heat effect
61. CO₂ emissions and absorptions
62. CO₂ emissions in the energy sector
63. Industrial sector and CO₂ emissions
64. CH₄ emissions and uptakes
65. N₂O emissions and absorptions
66. Calculation of CO₂ emitted when fuel is burned
67. Waste from transport
68. CO₂ released from the transport sector
69. Volatile emissions from fuel
70. CH₄ emissions in oil and gas management
71. CO₂ absorption from forest areas
72. CH₄ emission from municipal solid waste
73. Separation of methane from waste water of industrial areas
74. N₂O emissions released during life activities
75. Programs in which the Republic of Azerbaijan participates
76. Current climate of the Republic of Azerbaijan and its change trend
77. Climate scenario
78. Variation of precipitation
79. Assessment of agroclimatic resources
80. Impact of climate changes on coastal areas
81. Extreme heat and human health

82. Transport and environment
83. Agriculture and environment
84. Energy and environment
85. Construction and environment
86. UN Framework Convention on Climate Change
87. Climate changes and food security
88. Climate changes caused by environmental pollution
89. Regional climate changes in Azerbaijan
90. Dangerous hydrometeorological phenomena

Teaching and learning methods

The teaching and learning environment is organized in such a way that the students can achieve the expected learning outcomes in the subject of Climate changes and global warming in the Education program.

Teaching and learning methods are continuously reviewed and improved, taking into account innovative educational practices. Regular improvement of teaching and learning methods is carried out in cooperation with the Quality Control and Evaluation department of the Teaching Methodological Center and is the main component of the quality assurance system of SSU.

Individual teaching methods are widely used in the training process. These methods encourage a student-centered approach and students' active role in the learning process.

The following teaching and learning methods are used in the training process:

- lecture and practical exercise
- presentations, discussions and debates;
- free (independent) work
- problem-based teaching;
- group assessment;
- distance education.

Evaluation

The assessment is organized in such a way that it is possible to effectively measure the students' achievement of the expected learning outcomes in the subject of Climate Change and Global Warming. This allows to monitor the achieved achievement, to evaluate the extent to which the results of the Education program have been achieved, to evaluate the extent to which the teacher

correctly applies education and learning methods, and to organize an exchange of ideas with students.

Assessment methods are continuously reviewed and improved, taking into account innovative educational practices. Regular improvement and updating of evaluation methods is carried out in cooperation with the Quality Control and Evaluation department of the Educational Methodological Center and is the main component of the quality assurance system of SSU.

Individual assessment methods are widely used in the teaching process. These methods encourage a student-centered approach and the active role of students in the learning process.

The following assessment methods are used in the teaching process:

- written assignments;
- inquiries;
- open discussions;
- the students can do according to the observations in the practical exercise

Evaluation criterion of student's knowledge

The student's exam grade for the subject is determined from the table based on the sum of the points (max 100%) collected in the tasks given by the stages (max 50%) and according to the final attestation (exam) result (max 50%).

| Score | Assessment | Symbol |
|--------|--------------|--------|
| 91-100 | excellent | A |
| 81-90 | good | B |
| 71-80 | sufficient | C |
| 61-70 | satisfactory | D |
| 51-60 | insufficient | E |
| 0-50 | | F |

Obligation of the student

To study the subject, the student must:

1. Not being late for classes;
2. Not to miss classes without an excuse, to submit a certificate in case of illness, and in other cases a written explanation;
3. Attend all classes;
4. Complete and deliver all tasks according to the calendar plan;
5. To work the missed classes overtime set by the teacher.

Faculty Chairman of TMC:

assos.prof. A.Y.Bakhshalyev