

Ministry of Higher Education and Scientific research



Department of Environmental Sciences

College of Sciences

University of Salahaddin

**Subject: Principles of Environmental Science-Part 1
Theory**

Course Book – (1st COURSE)

**Lecturer's name Assistant Professor Dr. Siraj Muhammed
Abdulla Goran**

Academic Year: 2023/2024

Course Book

1. Course name	Principle of Environmental Sciences
2. Lecturer in charge	Dr. Siraj Muhammed Abdulla Goran
3. Department/ College	Environmental Science and Health- Sciences
4. Contact	e-mail: Siraj.abdulla@su.edu.krd Tel: +9647504546250
5. Time (in hours) per week	Theory: 2 hour and Supervision of Practical lectures also 2 hours
6. Office hours	Every day before and after the lecture except off day
7. Course code	
8. Teacher's academic profile	<p>* Graduated at the Department of Community of the Health, Erbil Technical Institute/ Medical Institute (1997-1998).</p> <p>* Graduated at the Department of Biology, Salahaddin University/ College of Science (2003-2004).</p> <p>* M.Sc. in Fresh Water ecology and phycology at the Salahaddin University, (2006). Thesis title “Limnology And Non-Diatom Phytoplankton Composition Of Dilope Spring And Kesnezan Impoundment, Hewler –Kurdistan Region Of Iraq”.</p> <p>* Ph.D. at the Salahaddin University, (2014). Dissertation title “Ecological Study On Dukan Lake With Particular References To Bioaccumulation Of Some Heavy Metals And Pabs In Fish And Gull Tissues –Sulaimani –Kurdistan Region O Iraq 2014.” I have 18 articles published.</p>
9. Keywords	Environment, Food Chain, Food Web, Energy flow
10. Course overview:	<p>The course will cover principal information about Environment, and understanding of environmental life that present in different form of ecological system may be terrestrial aquatic environment, this requires knowledge not only of the organisms themselves but also of those external influences which directly or indirectly affect them. A suitable environment is necessary for any organism, since life depends upon the continuance of a proper exchange of essential substances and energies between the organism and its surroundings. And the study of the chemistry, biology, geology and physics of Environment that are found in the earth. The course will give students a better understanding of the Environment that surrounded us.</p>

While there are several important differences relation between organisms and food energy, food chain, food web and biogeochemical cycle.

11. Course objective:

The course will cover principal information about Environment, and that all things about all that surrounded us like physical, chemical, biological and geological factors and covers information about air, water and land. The course will give students a better understanding of the Environment that surrounded us, and teaching the student how protect the environment from different form of pollution

12. Student's obligation

When I ask the student for preparing in class, exam, preparing and writing a report and discusses in class, this stimulate the students to become more active and able to learn more things about environment science.

13. Forms of teaching

Different forms of teaching will be used to reach the objectives of the course: power point presentations for the head titles and definitions and summary of conclusions, classification of Environment and any other illustrations, besides worksheet will be designed to let the chance for practicing on several aspects of the course in the classroom, furthermore students will be asked to prepare research papers on selective topics and summarise articles contents published in English into either Kurdish or Arabic language, those articles need to be from printed media or internet articles. There will be classroom discussions and the lecture will give enough background to translate, solve, analyze, and evaluate problems sets, and different issues discussed throughout the course.

14. Assessment scheme

Your final grade will be derived as follows:

Quizzes: About 10 quizzes will be given throughout the semester. They will be given at the beginning of the class period and last 10 minutes.10% of the grade.

Reports throughout the study course.

Workload and assignments also will be considered.

Exams: There will be three closed book exams given throughout the semester. Each test will be scheduled for 60 minutes. 30% of your grade.
Final Exam: The Final Exam is Comprehensive in all course outlines. 50% of your grade and it will be updated according to new instructions for Bologna system.

Mean of three examinations: 15% and it will be updated according to new instructions for Bologna system. To include quizzes, reports and workload.

Practical Examination 35% (and it will be updated according to new instructions for Bologna system.)

Final examination: 50% Theory Only(and it will be updated according to new instructions for Bologna system.)

Final Exam: The Final Exam is Comprehensive in all course outlines. 50% of your grade

15. Student learning outcome

Environmental Sciences is one of the most important lecture in Environmental Sciences Department because the student in this Course learn the student many things about Environment that around us and can the student to Environmental management ,how Environmental pollution control , guideline of safe and health environment and increase the number of people who not full-time Environments can understand and apply its general concepts to a broad range of related disciplines all these things can students apply in our daily life for services the community

16. Course Reading List and References:

Required book:

1- Environmental Science. Dr. Y. K. Singh. Copyright © 2006 New Age International (P) Ltd., Publishers.

2- Principles of Environmental Science & Technology. Dr. K. Saravanan Prof. S. Ramachandran R. Baskar. Copyright © 2005, New Age International (P) Ltd., Publishers.

3- Environmental Science. LINDA D. WILLIAMS. Copyright © 2005 by the McGraw-Hill Companies, Inc.

4- Environmental Science: In Context. Brenda Wilmoth Lerner & K. Lee Lerner, Editors. © 2009 Gale, Cengage Learning.

5- Principles of Environmental Sciences. Jan J. Boersema • Lucas Reijnders Editors. © 2009 Springer Science + Business Media B.V.

6- Introduction to Population Ecology. Larry L. Rockwood. © 2006 by Larry L. Rockwood BLACKWELL PUBLISHING.

7- Basics of Environmental Science 2nd Edition. Michael Allaby. This edition published in the Taylor & Francis e-Library, 2002.

8- Ecosystems Second edition. Gordon Dickinson and Kevin Murphy. 2007. Gordon Dickinson and Kevin Murphy.

9- ENVIRONMENT AND OUR GLOBAL COMMUNITY. Susan G. Shapiro, editor. Copyright © 2005 by open Society Institute.

10- Environmental Technologies New Developments. Edited by E. Burcu Özkaraova Güngör. © 2007 I-Tech Education and Publishing

The core materials of the course consists of the above book, articles from media and internet, and lecture's notes, make sure you read all the materials and prepare well before going for the examinations.

Students are encouraged to search for any other materials that may help improve their English language ability in reading, writing, listening and speaking plant communities' texts.

The Topics:	Lecturer's name
Week 1: Introduction to Environmental Science:- 1.1. Introduction 1.2. Definitions of Environment 1.3. Element of Environment 1.4. Classification of environment	Dr. Siraj M.A. Goran ex: (2 hrs)

<p>1.4.1. Physical Environment.</p> <p>1.4.2. Living Environment.</p> <p>Week 2: Introduction to Environmental Science:-</p> <p>2.1The Structure of the Atmosphere</p> <p>2.1.1. Troposphere</p> <p>2.2.2. Stratosphere</p> <p>2.2.3. Mesosphere</p> <p>2.2.4. Thermosphere</p> <p>Week 3: Inter-relationship between the components and subcomponents</p> <p>3.1. Need for public awareness</p> <p>3.2. Various types of environment</p> <p>3.3. Structure of environment</p> <p>3.4. Weather and climate</p> <p>Week 4: Physics, Chemistry and Biology of Water</p> <p>4.1. The Physics Water Quality Parameters</p> <p>4.2. The Chemistry Water Quality Parameters</p> <p>Week 5: 5.1. The Biology Water Quality Parameters</p>	
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<p>5.2. Physics, Chemistry and Biology of Air</p> <p>Week 6: 6.1. Physics, Chemistry and Biology of Land 6.2. Environmental stress-causes, classification and impact</p> <p>Week 7: Structure and functional components of the eco system 7.1. Ecology and ecosystem 7.2. Historical background 7.3. Aspects of eco-system</p> <p>Week 8: 8.1. General characteristics of an ecosystem 8.2. Basic Theme of Ecosystems 8.3. Functions of Ecosystem</p> <p>Week 9: Energy flow in ecosystem 9.1. Energy flow in ecosystems 9.2. It is very simplified energy flow model of three trophic levels</p> <p>Week 10: Material cycles in ecosystems</p>	
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<p>10.1. Water Cycle or Hydrological Cycle</p> <p>10.2. Carbon Cycle</p> <p>10.3. Nitrogen Cycle</p> <p>10.4. Oxygen Cycle</p> <p>10.5. Sulphur Cycle</p> <p>10.6. Phosphorous Cycle</p> <p>Week 11:</p> <p>Food Chain</p> <p>11.1. Trophic levels</p> <p>11.2. Entropic losses in the chain</p> <p>11.3. Chemoautotrophy</p> <p>11.4. Entropic losses in the chain</p> <p>Week 12:</p> <p>Food Webs</p> <p>12.1. Energy and the Food Web</p> <p>12.2. Structure of food webs</p> <p>12.3. Grazing Food Webs</p> <p>12.4. Detritus food web</p> <p>Week 13:</p> <p>The Ecological Pyramid</p>	
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<p>13.1. Pyramid of number</p> <p>13.2. Pyramid of Biomass</p> <p>13.2. Pyramid of Energy</p> <p>Week 14:</p> <p>Ecological succession-meaning and types</p> <p>14.1. Causes of ecological succession are classified under two categories</p> <p>14.2. Why does "ecological succession" occur?</p> <p>14.3. How are humans affected by ecological succession?</p> <p>14.4. Types of Succession</p> <p>Week 15:</p> <p>General process of ecological succession (Mechanism of succession)</p> <p>15.1. Important General Principles Associated with Ecological Succession</p> <p>15.2. Seral communities</p> <p>15.3. Climax community</p>	
<p>18. Practical Topics (If there is any)</p>	
<p>19. Examinations: I Put Type of Examination (A and B with typical answer)</p> <p>Examination (A)</p>	

Q1) Choose the correct answer from the following sentences:-

1- In ----- ecosystem lesser number of producers support greater number of herbivores who in turn support a fewer number of carnivores.(Grassland , Desert , Forest , Aquatic)

2- A food web differs from a food chain in that the latter shows only a portion of the food web involving a simple, ----- series of species connected by feeding links.(complex, smaller, cross , linear).

3- Indiscriminate use of DDT and other pesticides has an adverse effect on the food chain and consequently ----- the ecosystem. (disturbs, distrubs, distuebs , distributs).

4- The energy fixation in any given ecosystem are ----- . (Stable, Unknown, Limited, indefinite)

5- Agriculture is by no means wholly beneficial to the ecosystem because it introduces -----.

(irritability, instability, irristability, stability)

6- A person's environment consists of the sum total of the ----- -- which he receives from his conception until his death. (Forces, influences, stimulation, conditions)

Q2) Explain the following terms:-

1- Major classifications of environment

2- The depletion of the ozone layer over Arctic less severe than Antarctica

3- Biogeochemical cycles are important

4- Sulphur cycle is both a gas and sedimentary cycle.

5- Kurt Lewin has used the term life space

6- Aspect of Ecosystem

7-Deterius food chain by diagram

8- Pyramid of Biomass in aquatic community by diagram

9- trophic-dynamic model by diagram

10- Relationships between the detritus web and the grazing web

Q3) Write about the following: -

1- Methods of Nitrogen gas fixation can be taken from the atmosphere

2- A food web aims 3- Biotrophs

Typical answer (A)

Q1) Choose the correct answer from the following sentences:-

1- In ----- **Forest ----- ecosystem lesser number of producers support greater number of herbivores who in turn support a fewer number of carnivores.(Grassland , Desert , **Forest** , Aquatic)**

2- A food web differs from a food chain in that the latter shows only a portion of the food web involving a simple, ----- **linear ----- series of species connected by feeding links.(complex, smaller, cross , **linear**).**

3- Indiscriminate use of DDT and other pesticides has an adverse effect on the food chain and consequently ----- disturbs ----- the ecosystem. (disturbs, distrubs, distuebs , distributs).

4- The energy fixation in any given ecosystem are ----- Limited -----.
(Stable, Unknown, Limited, indefinite)

5- Agriculture is by no means wholly beneficial to the ecosystem because it introduces -instability -----.

(irritability, instability, irristability, stability)

6- A person's environment consists of the sum total of the ----- stimulation ----- which he receives from his conception until his death. (Forces, influences, stimulation, conditions)

2) Explain the following terms:-

1- Major classifications of environment

Sol) A) Physical Environment: External physical factors like Air, Water, and Land etc. This is also called the A biotic Environment.

(B) Living Environment: All living organisms around us viz. plants, animals, and

Microorganisms. This is also called the Biotic Environment.

2- The depletion of the ozone layer over Arctic less severe than Antarctica

Sol) Seasonal depletion over the Arctic has also been reported, but it is less severe and of shorter duration, because Arctic winter stratospheric temperatures are higher than those of the Antarctic and a polar vortex rarely forms.

3- Biogeochemical cycles are important

Sol) Because they help to retain vital nutrients in forms usable by plants and animals and help to maintain the stability of ecosystems.

4- Sulphur cycle is both a gas and sedimentary cycle.

Sol) The source of sulphur is the lithosphere. Sulphur found in the soil in the form of elemental sulphur (compounds containing sulfate groups).Sulphur may enter the atmosphere as H₂S (Hydrogen sulfide) or as SO₂ (Sulphur Dioxide).

5- Kurt Lewin has used the term life space

Sol) Kurt Lewin has used the term 'life space' for explaining psychological environment. The Psychological environment enables us to understand the personality of an individual. Both the person and his goal form psychological environment.

6- ASPECTS OF ECO-SYSTEM

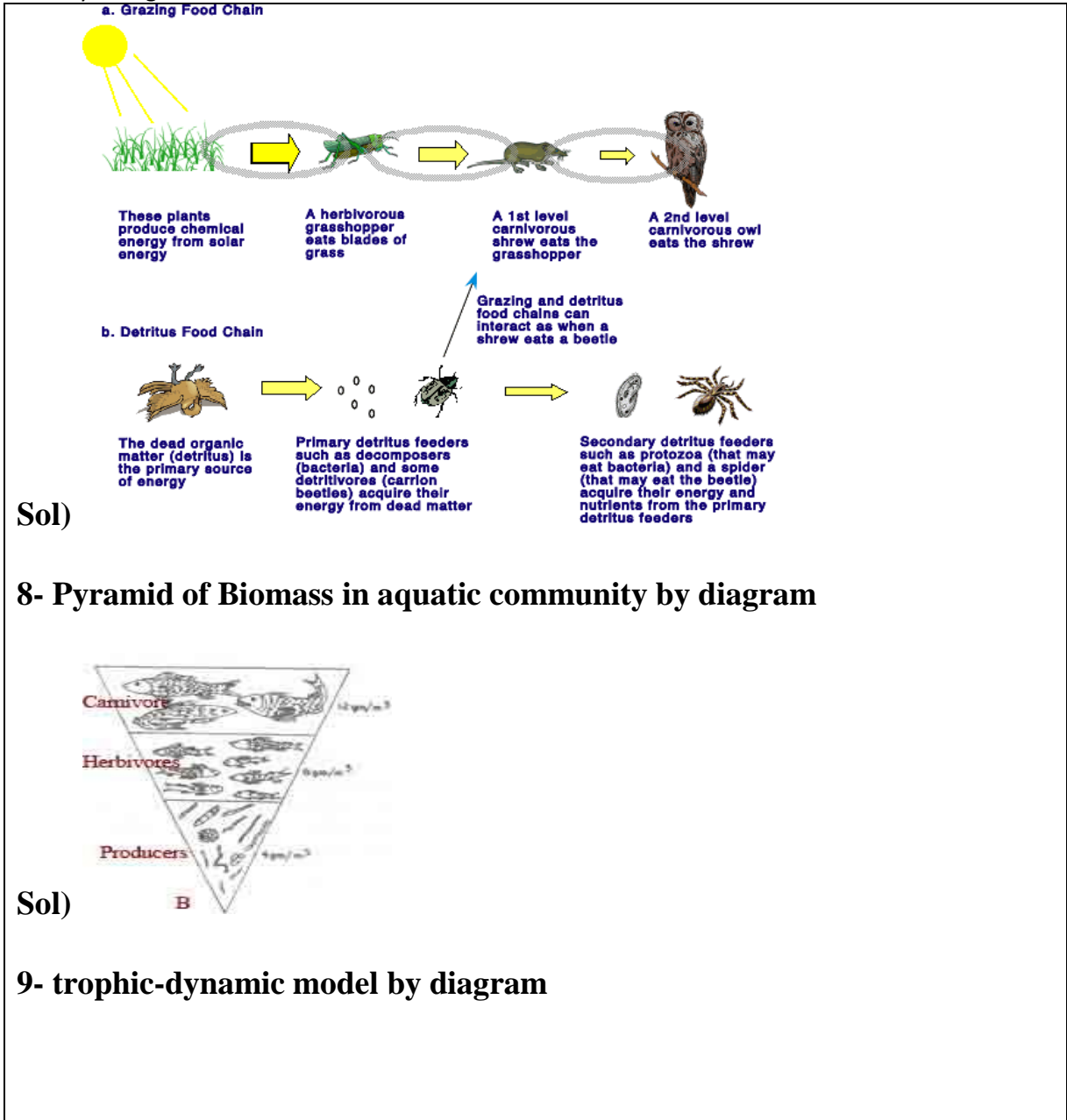
Sol) 1. Structural Aspect

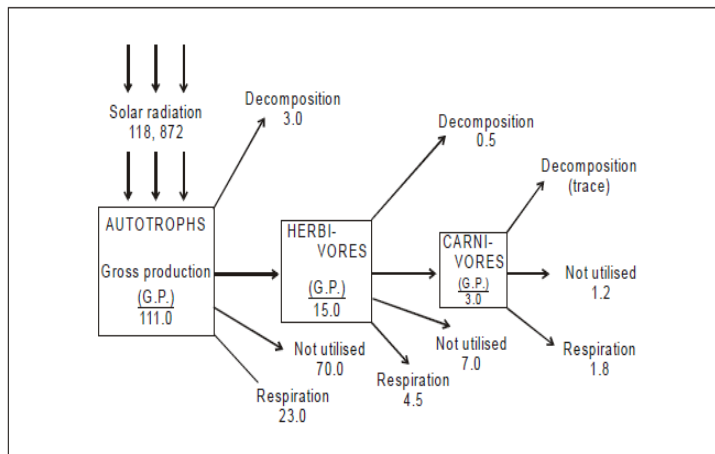
The structural aspects of ecosystem include a description of the arrangement, types and numbers of species and their life histories, along with a description of the physical features of the environment.

2. Functional

The functional aspects of the ecosystem include the flow of energy and the cycling of nutrients.

7-Deteriuos food chain by diagram





Sol)

10- There are often relationships between the detritus web and the grazing web

Sol) Mushrooms produced by decomposers in the detrital web become a food source for deer, squirrels, and mice in the grazing web. Earthworms eaten by robins are detritivores consuming decaying leaves.

Q3) Write about the following: -

1- Methods of Nitrogen gas fixation can be taken from the atmosphere

Sol) Nitrogen gas can be taken from the atmosphere (fixed) in two basic ways.

First, lightning provides enough energy to "burn" the nitrogen and fix it in the form of nitrate, which is nitrogen with three-oxygen attached.

The other form of nitrogen fixation is by nitrogen fixing bacteria, which use special enzymes instead of the extreme amount of energy found in lightning to fix nitrogen. These nitrogen-fixing bacteria come in three forms:

some are free-living in the soil;

some form symbiotic, mutualistic associations with the roots of bean plants and other legumes (rhizobial bacteria);

and the third form of nitrogen-fixing bacteria are the photosynthetic cyanobacteria (blue-green algae) which are found most commonly in water.

2- A food web aims

Sol) A food web aims to depict a more complete picture of the feeding relationships, and can be considered a bundle of many interconnected food chains occurring within the community.

3- Biotrophs

Sol) On the other hand biotrophs resort to a long-term exploitation of their living food resource. For example, root-feeding nematodes and aphids, obligate plant parasites, e.g., and mycorrhizae and root nodules, etc.

Exam(B)

Q1) Put the correct word in the suitable place in these sentences (10 Marks)

(Assimilation, sample, slice, water vapour, oxygen, complex, slime, nitrogen, conversion, simple, hydrogen, stratospheric clouds, adsorption, weather)

1- In fact, most of the Earth's species live in a thin ----- of the biosphere.

2- -----comprises up to 4 per cent in the lower atmosphere, but above about 12 km it is virtually absent.

**3- In comparison with gaseous cycles, sedimentary cycles seem relatively -
----- in nature.**

4- In its gas form, ----- is useless to most organisms.

5- The efficiency of the producers in absorption and ----- of solar energy.

Q2) Re-write the following sentences:- (10 Marks)

1- When energy is transferred to the next trophic level, typically only 80% of it is used to build new biomass, becoming stored energy

2- The detritus food web works in separate with the grazing food web, but its conjunction function merits separate mention.

3- Fire is also like producer. Fire can release chemical energy and nutrients held in plant and animal material.

4- The structure of an eco-system is related to its species diversity; as such the more complex ecosystem has low species diversity.

5- Stability of Ecosystem: The stability of ecosystems refers to the balance between autotrophs and omnivores of each element in the ecosystem.

Typical answers(B)

Q1) Put the correct word in the suitable place in these sentences (Assimilation, sample, slice, water vapor, oxygen, complex, slime, nitrogen, conversion, simple, hydrogen, stratospheric clouds, adsorption, weather)

1- Slice.

2- water vapor.

3- simple.

4- nitrogen.

5- conversion.

Q2) Re-write the following sentences:-

1- When energy is transferred to the next trophic level, typically only 10% of it is used to build new biomass, becoming stored energy.

2- The detritus food web works in conjunction with the grazing food web, but its separate function merits separate mention.

3- Fire is also like decomposition. Fire can release chemical energy and nutrients held in plant and animal material.

4- The structure of an eco-system is related to its species diversity; as such the more complex ecosystem has high species diversity.

5- Stability of Ecosystem: The stability of ecosystems refers to the balance between production and consumption of each element in the ecosystem.

