جامعة الكويت
KUWAIT UNIVERSITY

نموذج توصيف مقرر
Course Description Form

Name of College\Faculty : Faculty of Science **اسم الكلية:**

Name of Department: Biological Sciences (Microbiology Program) **اسم القسم العلمي:**

Course Name	Microbiology of Extreme Environments	**اسم المقرر**
Course No.	0495-465	**رقم المقرر**
No. of Credits	4	**عدد الوحدات**
Theoretical Hours	**3**	**عدد الساعات النظرية**
Practical Hours	**3**	**عدد الساعات المحلية**
Course topics		**مواضيع المقرر**

Course Topics:

1. Types of extreme environments and microbial diversity.
2. Environmental role of extremophiles.
3. Effect of extreme environmental factors on microorganisms and related adaptation mechanisms.
4. Effect of pollutants on microorganisms and related adaptation mechanisms.
5. Biotechnological application of extremophiles.

Course Content:

1. **Introduction:**

General microbial ecology, factors affecting the distribution of microorganisms, types of extreme environments (natural and manmade), types and activities of microorganisms inhabiting extreme environments.

2. **Microbial Life at Extreme Temperatures:**

High Temperatures:
Ecological Aspects: Types of high temperature environments (e.g. hot springs, geothermal vents and compost); types of microorganisms inhabiting such environments; ecological significance of thermophilic/thermotolerant microorganisms.
Physiological Aspects: Damaging effects of high temperature; mechanisms of adaptation; thermo-stability of membranes, enzymes and macromolecules.
Low Temperatures:
Ecological Aspects: Types of low temperature environments (terrestrial, aquatic, atmospheric); types of microorganisms inhabiting such environments; ecological significance of psychrophilic/psychrotolerant microorganisms.
Physiological Aspects: Damaging effects of low temperature; mechanisms of adaptation; membrane structure; composition and fluidity; enzymes).

3. **Microbial Life at Low Water Availability:**

Ecological Aspects: Types of environments that are dry, saline and sweet; types of microorganisms inhabiting such environments; ecological significance of halophilic, osmotolerant, and xerotolerant microorganisms.
Physiological Aspects: Damaging effects of water stress; mechanisms of adaptation; osmo-regulation.

4. **Microbial Life Under Pressure:**

Ecological Aspects: The deep sea environment (including hydrothermal vents), types of microorganisms living in such environments, ecological significance of barophilic and barotolerant microorganisms.
Physiological Aspects: Damaging effects of hydrostatic pressure, mechanisms of adaptation.

5. **Microbial Life at Extreme Hydrogen Ion Concentrations:**

Ecological Aspects: Types of low and high pH environments; types of microorganisms inhabiting such environments; ecological significance of acidophilic and alkalophilic microorganisms.
Physiological Aspects: Damaging effects of extreme pH; mechanisms of adaptation; modification of external and internal pH.

6. **Microbial Life in Polluted Environments:**

Ecological Aspects: Sources and types of radiation, heavy metals; hydrocarbons and other pollutants; microorganisms inhabiting such environments; ecological significance of such microorganisms (mycorrhizal associations, lichens, and bioremediation).
Physiological Aspects: Damaging effects of radiation, heavy metals, etc. Mechanisms of adaptation (repair systems) and protection (e.g. pigmentation).

7. **Biotechnological Application of Extremophiles:**
Industrial processes: Food, pharmaceutical, paper, detergent, etc.
Mining: metal ores (E.g. copper), coal, etc.
Bioremediation of polluted environments: oil, heavy metals, radiation, etc.

Text book: (Name, Author , Year , Publisher)	**عنوان الكتاب : (الاسم ، المؤلف ، سنة الطبع ، دار النشر)**

1. Madigan *et al*. 2015. Brock Biology of Microorganisms. 14th edition. Prentice Hall. USA.
2. Gerday and Glansdorff. 2007. Physiology and Biochemistry of Extremophiles.

References: (Name , Author , Year . Publisher)	**عنوان المرجع : (الاسم ، المؤلف ، سنة الطبع ، دار النشر)**

1. Relevant published papers in peer reviewed journals

متطلبات المقرر

Prerequisites:

1. Bacteriology (0495-205)
2. Mycology (0495-206)
3. Microalgae and Protozoa (0495-207)

Grading	**Exams**		**20%**		**الاختبارات**	**آلية رصد المقرر**
	Quizzes		**8%**		**امتحانات قصيرة**	
	H.W.		**2%**		**واجبات**	
	Project (field study)		**%**		**مشاريع (دراسة ميدانية)**	
	Final		**40%**		**الاختبار النهائي**	
	Lab		**30%**			
	100%					

أهداف مخرجات المقرر :					
الرقم	أهداف مخرجات المقرر :	أمثله من المقرر لتحقيق هذه الأهداف	المستوى المطلوب من عضو هيئة التدريس لتحقيق الهدف :		
			عالي	متوسط	منخفض
1					
2					
3					
4					
5					
الحقول					
المهارات					
منسق المقرر (اسم عضو هيئة التدريس المشرف على توصيف المقرر ، توقيعه ، الختم و الرتبة الأكاديمية)					
تاريخ إعداد النموذج			/ /		

Course objectives					
No.	Course Objectives (Learning Outcomes)	Example(s) of relevant (Topics and activities)	Recommended Level to satisfy the objectives		
			High	Medium	Low
1	Define important terms related to microbiology of extreme environments.	Thermophile, acidophile, xerophile, barophile, etc.		✓	
2	Describe different types of extreme environments.	Hot springs, hydrothermal vents, soda lakes, etc.	✓		
3	Explain the effect of different extreme factors on microorganisms.	Denaturation of proteins, disruption of membranes, etc.	✓		
4	Compare the various modes of adaptation exhibited by prokaryotic and eukaryotic microorganisms.	Saturated fatty acids, compatible solutes, proton pumps, etc	✓		
Fields	Microbiology, Microbial ecology, Microbial biotechnology				

Skills	**Microbiology Laboratory Skills**
Coordinator (Name and Rank) :	**Dr. Dunia Al-Gharabally (** Assistant Professor **)**
Signature and stamp :	
Date:	**3\ 12 \2024**