

GENEL TANIM / GENERAL DESCRIPTION

Ders Adı / Course Name	Effects of Environmental Pollutans on Vertebrates-II / Effects of Environmental Pollutans on Vertebrates-II	
Ders Kodu / Course Code	9105035502019	
Ders Türü / Course Type		
Ders Seviyesi / Course Level	Second Cycle / Second Cycle	
Ders Akts Kredi / ECTS	8.00	
Haftalık Ders Saati (Kuramsal) / Course Hours For Week (Theoretical)	3.00	
Haftalık Uygulama Saati / Course Hours For Week (Objected)	0.00	
Haftalık Laboratuvar Saati / Course Hours For Week (Laboratory)	0.00	
Dersin Verildiği Yıl / Year	1	
Öğretim Sistemi / Teaching System	Face to Face / Face to Face	
Eğitim Dili / Education Language	Turkish / Turkish	
Ön Koşulu Olan Ders(ler) / Precondition Courses	Yok	None
Amacı / Purpose	Bu dersin amacı, öğrencileri, iş kazalarına ve meslek hastalıklarına karşı bilgilendirmek, onlara işçi sağlığı ve iş güvenliği tedbirlerini öğretmek, ilk yardım konusunda bilgilendirmek, çevre kirliliğini kimyasıyla ilişkilendirerek çevre kirliliği ile ilgili farkındalık oluşturmak ve çevreciliği bir yaşam biçimine dönüştürecek davranışlar kazandırmaktır.	The aim of this course is to learn the effects of environmental pollutants on animals in different vertebrate classes and to understand the negative effects of environmental pollution on a more comprehensive basis and to contribute to a cleaner environmental awareness.
İçeriği / Content	<ul style="list-style-type: none"> • Çevre kirleticileri ve genel özellikleri • Farklı omurgalı gruplarının önemli türlerinde çevre kirleticilerinin oluşturduğu olumsuz etkiler • Çevre kirliliğinin önlenmesi için alınabilecek tedbirler 	<ul style="list-style-type: none"> • Environmental pollutants and their general properties • Negative effects of environmental pollutants in important species of different vertebrate groups • Measures to prevent environmental pollution
Önerilen Diğer Hususlar / Recommended Other Considerations	Yok	None
Staj Durumu / Internship Status	Yok	None
Kitabı / Malzemesi / Önerilen Kaynaklar / Books / Materials / Recommended Reading	<p>Bauerle B, Spencer DL, Wheeler W (1975). The use of snakes as a pollution indicator species. Copeia 367</p> <p>Stafford DP, Plapp JR, Fleet RR (1977). Snakes as indicators of environmental contamination: Relation of detoxifying enzymes and pesticide residues to species occurrence in three aquatic ecosystems. Archives of Environmental Contamination and Toxicology 5(1):15-27.</p> <p>Sayım F (2007) Dimethoate Induced Biochemical and Histopathological Changes in the Liver of Rats," Exp. Toxicol. Pathol 59(3-4):237-243.</p>	<p>Bauerle B, Spencer DL, Wheeler W (1975). The use of snakes as a pollution indicator species. Copeia 367</p> <p>Stafford DP, Plapp JR, Fleet RR (1977). Snakes as indicators of environmental contamination: Relation of detoxifying enzymes and pesticide residues to species occurrence in three aquatic ecosystems. Archives of Environmental Contamination and Toxicology 5(1):15-27.</p> <p>Sayım F (2007) Dimethoate Induced Biochemical and Histopathological Changes in the Liver of Rats," Exp. Toxicol. Pathol 59(3-4):237-243.</p>

Sayim F (2007) Histopathological Effects of Dimethoate on Testes of Rats," Bull. Environ. Contam. Toxicol 78(6):479-484.

Sayim F (2010) Toxicity of Trifluralin on the Embryos and Larvae of Red-Bellied Toad, *Bombina bombina*, Turkish Journal of Zoology 34:479-486.

Fenoglio C, Albicini F, Milanese G, Barni S (2011) Response of renal parenchyma and interstitium of *Rana* *esculenta* to environmental pollution. *Ecotoxicology and Environmental Safety* 74:1381-1390.

Mitra A, Chatterjee C, Mandal FB (2011). Synthetic Chemical Pesticides and Their Effects on Birds. *Research Journal of Environmental Toxicology* 5(2):81-96.

Çakıcı Ö, Akat E (2012) Histopathological Effects of Carbaryl on Testes of Snake-eyed Lizard, *Ophisops elegans*. *Environmental Science and Pollution Research* 19(1):64-71.

Çakıcı Ö, Akat E (2013) Effects of Oral Exposure to Diazinon on Mice Liver and Kidney Tissues: Biometric Analyses of Histopathologic Changes. *Analytical and Quantitative Cytopathology and Histopathology* 35(1):7-16.

Birceanu O, Sorensen LA, Henry M, McClelland GB, Wang YS, Wilkie MP (2014). The effects of the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) on fuel stores and ion balance in a non-target fish, the rainbow trout (*Oncorhynchus mykiss*). *Comparative Biochemistry and Physiology, Part C*. 160:30-41.

Cascaes MJ, Oliveira RT, Ubarana MM, Sato RM et al. (2014). Persistent organic pollutants in liver of Brazilian sharpnose shark (*Rhizoprionodon lalandii*) from southeastern coast of Brazil. *Marine Pollution Bulletin* 86:591-593.

Ceballos DM, Beaucham CC, Kurtz K, Musolin K (2015). Assessing occupational exposure to sea lamprey pesticides. *International Journal of Occupational and Environmental Health*. 21(2):151-160.

Gillbert JM, Baduel C, Li Y, Reichelt-Brushett AJ, Butcher PA et al. (2015) Bioaccumulation of PCBs in liver tissue of dusky *Carcharhinus obscurus*, sandbar *C. plumbeus* and white *Carcharodon carcharias* sharks from south-eastern Australian waters. *Marine Pollution Bulletin* 101:908-913.

Adel M, Conti GO, Dadar M, Mahjoub M, Copat C, Ferrante M (2016) Heavy metal concentrations in edible muscle of whitecheek shark, *Carcharhinus dussumieri* (elasmobranchii, chondrichthyes) from the Persian Gulf: A food safety issue. *Food Chemical Toxicity* 97:135-140.

Capaldo A, Gay F, Scudiero R, Trinchella F, Caputo I, Lepretti M, Marabotti A, Esposito C, Laforgia V (2016). Histological changes, apoptosis and metallothionein levels in *Triturus carnifex* (Amphibia, Urodela) exposed to environmental cadmium concentrations. *Aquatic Toxicology* 173:63-73.

Çakıcı Ö (2016). Histopathological Study of Toxic Effects of Carbaryl on Digestive Tract of *Bufotes variabilis* (Anura: Bufonidae). *Environmental Science and Pollution Research* 23 (13):13432-13437.

Ozmen O (2016) Endosulfan splenic pathology and amelioration by vitamin C in New Zealand rabbit, *Journal of Immunotoxicology* 13(3):349-354.

Sanchez-Sarmiente A, Vilca FZ, Rossi S, Monteiro SH et al. (2016). Determining

Sayim F (2007) Histopathological Effects of Dimethoate on Testes of Rats," Bull. Environ. Contam. Toxicol 78(6):479-484.

Sayim F (2010) Toxicity of Trifluralin on the Embryos and Larvae of Red-Bellied Toad, *Bombina bombina*, Turkish Journal of Zoology 34:479-486.

Fenoglio C, Albicini F, Milanese G, Barni S (2011) Response of renal parenchyma and interstitium of *Rana* *esculenta* to environmental pollution. *Ecotoxicology and Environmental Safety* 74:1381-1390.

Mitra A, Chatterjee C, Mandal FB (2011). Synthetic Chemical Pesticides and Their Effects on Birds. *Research Journal of Environmental Toxicology* 5(2):81-96.

Çakıcı Ö, Akat E (2012) Histopathological Effects of Carbaryl on Testes of Snake-eyed Lizard, *Ophisops elegans*. *Environmental Science and Pollution Research* 19(1):64-71.

Çakıcı Ö, Akat E (2013) Effects of Oral Exposure to Diazinon on Mice Liver and Kidney Tissues: Biometric Analyses of Histopathologic Changes. *Analytical and Quantitative Cytopathology and Histopathology* 35(1):7-16.

Birceanu O, Sorensen LA, Henry M, McClelland GB, Wang YS, Wilkie MP (2014). The effects of the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) on fuel stores and ion balance in a non-target fish, the rainbow trout (*Oncorhynchus mykiss*). *Comparative Biochemistry and Physiology, Part C*. 160:30-41.

Cascaes MJ, Oliveira RT, Ubarana MM, Sato RM et al. (2014). Persistent organic pollutants in liver of Brazilian sharpnose shark (*Rhizoprionodon lalandii*) from southeastern coast of Brazil. *Marine Pollution Bulletin* 86:591-593.

Ceballos DM, Beaucham CC, Kurtz K, Musolin K (2015). Assessing occupational exposure to sea lamprey pesticides. *International Journal of Occupational and Environmental Health*. 21(2):151-160.

Gillbert JM, Baduel C, Li Y, Reichelt-Brushett AJ, Butcher PA et al. (2015) Bioaccumulation of PCBs in liver tissue of dusky *Carcharhinus obscurus*, sandbar *C. plumbeus* and white *Carcharodon carcharias* sharks from south-eastern Australian waters. *Marine Pollution Bulletin* 101:908-913.

Adel M, Conti GO, Dadar M, Mahjoub M, Copat C, Ferrante M (2016) Heavy metal concentrations in edible muscle of whitecheek shark, *Carcharhinus dussumieri* (elasmobranchii, chondrichthyes) from the Persian Gulf: A food safety issue. *Food Chemical Toxicity* 97:135-140.

Capaldo A, Gay F, Scudiero R, Trinchella F, Caputo I, Lepretti M, Marabotti A, Esposito C, Laforgia V (2016). Histological changes, apoptosis and metallothionein levels in *Triturus carnifex* (Amphibia, Urodela) exposed to environmental cadmium concentrations. *Aquatic Toxicology* 173:63-73.

Çakıcı Ö (2016). Histopathological Study of Toxic Effects of Carbaryl on Digestive Tract of *Bufotes variabilis* (Anura: Bufonidae). *Environmental Science and Pollution Research* 23(13):13432-13437.

Ozmen O (2016) Endosulfan splenic pathology and amelioration by vitamin C in New Zealand rabbit, *Journal of Immunotoxicology* 13(3):349-354.

	<p>organochlorine pesticides in samples of green sea turtles by QuEChERS approach. Braz. J. Vet. Res. Anim. Sci. 53(1):97-102.</p> <p>Wu B, Liang L, Ma L, Du W (2016). Effects of Pesticide Exposure on Embryonic Development and Hatchling Traits of Turtles. Asian Herpetological Research 7(1):28-33.</p> <p>Tremblay N, Arana AO, Jauregui MG, Rendon-von Osten J (2017). Relationship between organochlorine pesticides and stress indicators in hawksbill sea turtle (<i>Eretmochelys imbricata</i>) nesting at Punta Xen (Campeche), Southern Gulf of Mexico. Ecotoxicology 26:173-183.</p> <p>Wu C, Zhang Y, Chai L, Wang H (2017). Oxidative stress, endocrine disruption, and malformation of <i>Bufo gargarizans</i> embryo exposed to sub-lethal cadmium concentrations. Environmental Toxicology and Pharmacology 49:97-104.</p> <p>Al-Amoudi (2018). Toxic effects of Lambda-cyhalothrin, on the rat thyroid: Involvement of oxidative stress and ameliorative effect of ginger extract. Toxicology Reports 5:728-736.</p> <p>Çakıcı Ö (2018). Histopathological Analysis of Carbaryl-induced Toxicity in the Spleen of Levantine Frog, <i>Pelophylax bedriagae</i> (Anura: Ranidae). Environmental Science and Pollution Research 25(25):24917-24922.</p> <p>Wei P, Zhao F, Zhang X, Liu W, Jiang G, Wang H, Ru S (2018) Transgenerational thyroid endocrine disruption induced by bisphenol S affects the early development of zebrafish offspring. Environmental Pollution 243:800-808.</p> <p>Cao F, Li H, Zhao F, Wu P, Qian L, Huang L, Pang S, Martyniuk CJ, Qui L (2019). Parental exposure to azoxystrobin causes developmental effects and disrupts gene expression in F1 embryonic zebrafish (<i>Danio rerio</i>). Science of the Total Environment 646:595-605.</p>	<p>Sanchez-Sarmiente A, Vilca FZ, Rossi S, Monteiro SH et al. (2016). Determining organochlorine pesticides in samples of green sea turtles by QuEChERS approach. Braz. J. Vet. Res. Anim. Sci. 53(1):97-102.</p> <p>Wu B, Liang L, Ma L, Du W (2016). Effects of Pesticide Exposure on Embryonic Development and Hatchling Traits of Turtles. Asian Herpetological Research 7(1):28-33.</p> <p>Tremblay N, Arana AO, Jauregui MG, Rendon-von Osten J (2017). Relationship between organochlorine pesticides and stress indicators in hawksbill sea turtle (<i>Eretmochelys imbricata</i>) nesting at Punta Xen (Campeche), Southern Gulf of Mexico. Ecotoxicology 26:173-183.</p> <p>Wu C, Zhang Y, Chai L, Wang H (2017). Oxidative stress, endocrine disruption, and malformation of <i>Bufo gargarizans</i> embryo exposed to sub-lethal cadmium concentrations. Environmental Toxicology and Pharmacology 49:97-104.</p> <p>Al-Amoudi (2018). Toxic effects of Lambda-cyhalothrin, on the rat thyroid: Involvement of oxidative stress and ameliorative effect of ginger extract. Toxicology Reports 5:728-736.</p> <p>Çakıcı Ö (2018). Histopathological Analysis of Carbaryl-induced Toxicity in the Spleen of Levantine Frog, <i>Pelophylax bedriagae</i> (Anura: Ranidae). Environmental Science and Pollution Research 25(25):24917-24922.</p> <p>Wei P, Zhao F, Zhang X, Liu W, Jiang G, Wang H, Ru S (2018) Transgenerational thyroid endocrine disruption induced by bisphenol S affects the early development of zebrafish offspring. Environmental Pollution 243:800-808.</p> <p>Cao F, Li H, Zhao F, Wu P, Qian L, Huang L, Pang S, Martyniuk CJ, Qui L (2019). Parental exposure to azoxystrobin causes developmental effects and disrupts gene expression in F1 embryonic zebrafish (<i>Danio rerio</i>). Science of the Total Environment 646:595-605.</p>
Öğretim Üyesi (Üyeleri) / Faculty Member (Members)	Prof. Dr. Özlem ÇAKICI	Prof. Dr. Özlem ÇAKICI

ÖĞRENME ÇIKTILARI / LEARNING OUTCOMES

1	Çevre kirleticileri ve genel özelliklerini öğrenme	To learn environmental pollutants and their general properties
2	Farklı omurgalı türlerinde çevre kirleticilerinin oluşturduğu etkileri anlama	Understand the effects of environmental pollutants in different vertebrate species
3	Canlılar üzerinde meydana gelen olumsuz etkileri öğrenerek çevre kirliliğinin önlenmesi için alınabilecek tedbirlerin önemini kavrama	To comprehend the importance of the measures that should be taken to prevent environmental pollution by learning the negative effects on living organisms
4	Temiz bir çevre bilincinin önemini kavrama	Understanding the importance of a clean environment
5	Öğrenilen bilgiler ile temel bir izleme araştırması tasarlayabilme	To design a monitoring study based on the information learned

HAFTALIK DERS İÇERİĞİ / DETAILED COURSE OUTLINE

Hafta / Week					
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
1	Çevre kirleticileri ve genel özellikleri				
	Environmental pollutants and general properties				
2	Çevre kirleticilerinin omurgalı sınıflarındaki etkileri I.Classis: Cyclostomata: Yuvarlak Ağızlı Balıklar				
	Effects of environmental pollutants on vertebrate classes I.Classis: Cyclostomata				
3	II. Classis: Chondrichthyes: Kıkırdaklı balıklar				
	II. Classis: Chondrichthyes: Cartilaginous fish				
4	III. Classis: Osteichthyes: Kemikli balıklar				
	III. Classis: Osteichthyes: Bony fish				
5	IV. Classis: Amphibia -Urodela: Kuyruklu kurbağalar				
	IV. Classis: Amphibia -Urodela: Tailed amphibians				

	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
6	IV. Classis: Amphibia -Anura: Kuyruksuz kurbağalar				
	IV. Classis: Amphibia -Anura: Tailles amphibians				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
7	V. Classis: Reptilia Kertenkele				
	V. Classis: Reptilia Lizards				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
8	Arasınan				
	Midterm Exam				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
9	V. Classis: Reptilia Yılanlar				
	V. Classis: Reptilia Snakes				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
10	V. Classis: Reptilia Kaplumbağalar				
	V. Classis: Reptilia Turtles				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
11	VI. Classis: Aves Kuşlar				
	VI. Classis: Aves Birds				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary

	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
12	VII. Classis: Mammalia Fareler				
	VII. Classis: Mammalia Mice				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
13	VII. Classis: Mammalia Sıçan				
	VII. Classis: Mammalia Rat				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
14	VII. Classis: Mammalia Tavşan				
	VII. Classis: Mammalia Rabbit				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
15	Ödev ve Sunumların Rapor Edilmesi				
	Reporting homework's				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
16	Final Sınavı				
	Final exam				
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary

DEĞERLENDİRME / EVALUATION

Yarıyıl (Yıl) İçi Etkinlikleri / Term (or Year) Learning Activities	Sayı / Number	Katkı Yüzdesi / Percentage of Contribution (%)
Ara Sınav / Midterm Examination	1	100
Toplam / Total:	1	100
Başarı Notuna Katkı Yüzdesi / Contribution to Success Grade(%):		40

Yarıyıl (Yıl) Sonu Etkinlikleri / End Of Term (or Year) Learning Activities	Sayı / Number	Katkı Yüzdesi / Percentage of Contribution (%)
Final Sınavı / Final Examination	1	100
Toplam / Total:	1	100
Başarı Notuna Katkı Yüzdesi / Contribution to Success Grade(%):		60

Etkinliklerinin Başarı Notuna Katkı Yüzdesi(%) Toplamı / Total Percentage of Contribution (%) to Success Grade:	100
Değerlendirme Tipi / Evaluation Type:	DDS

İŞ YÜKÜ / WORKLOADS

Etkinlikler / Workloads	Sayı / Number	Süresi (Saat) / Duration (Hours)	Toplam İş Yüğü (Saat) / Total Work Load (Hour)
Makale Kritik Etme / Criticising Paper	5	10.00	50.00
Bireysel Çalışma / Self Study	9	6.00	54.00
Rapor Hazırlama / Report Preparation	1	12.00	12.00
Rapor Sunma / Report Presentation	1	3.00	3.00
Ara Sınav İçin Bireysel Çalışma / Individual Study for Mid term Examination	1	15.00	15.00
Ara Sınav / Midterm Examination	1	1.00	1.00
Okuma / Reading	14	3.00	42.00
Final Sınavı için Bireysel Çalışma / Individual Study for Final Examination	1	20.00	20.00
Derse Katılım / Attending Lectures	14	3.00	42.00
Final Sınavı / Final Examination	1	1.00	1.00
Toplam / Total:	48	74.00	240.00

Dersin AKTS Kredisi = Toplam İş Yüğü (Saat) / 30.00 (Saat/AKTS) = 240.00/30.00 = 8.00 ~ 8.00 / Course ECTS Credit = Total Workload (Hour) / 30.00 (Hour / ECTS) = 240.00 / 30.00 = 8.00 ~ 8.00

PROGRAM VE ÖĞRENME ÇIKTISI / PROGRAM LEARNING OUTCOMES

Öğrenme Çıktıları / Learning Outcomes	Program Çıktıları / Program Outcomes						
	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.1.7
1.Çevre kirleticileri ve genel özelliklerini öğrenme / To learn environmental pollutants and their general properties	5						
2.Farklı omurgalı türlerinde çevre kirleticilerinin oluşturduğu etkileri anlama / Understand the effects of environmental pollutants in different vertebrate species		5	5	5	5	5	5
3.Canlılar üzerinde meydana gelen olumsuz etkileri öğrenerek çevre kirliliğinin önlenmesi için alınabilecek tedbirlerin önemini kavrama / To comprehend the importance of the measures that should be taken to prevent environmental pollution by learning the negative effects on living organisms		4	4	4	4	4	4
4.Temiz bir çevre bilincinin önemini kavrama / Understanding the importance of a clean environment		4	4	4	4	4	4
5.Öğrenilen bilgiler ile temel bir izleme araştırması tasarlayabilme / To design a monitoring study based on the information learned		4	4	4	4	4	4

Katkı Düzeyi / Contribution Level : 1-Çok Düşük / Very low, 2-Düşük / Low, 3-Orta / Moderate, 4-Yüksek / High, 5-Çok Yüksek / Very high