

COURSE TITLE: Advanced Ichthyology (FNR 551); Offered in the Spring of Odd Years

COURSE DESCRIPTION: Advanced Ichthyology, presents an advanced study of the biology of fishes. In particular, the course covers aspects of the morphology, physiology, development, behavior, evolution, diversity and ecology of fishes. The course will include fishes from throughout the world; however, I emphasize the freshwater fishes of North America and particularly those found in the Midwest. The course objectives are: 1) to develop a broad knowledge of the adaptations of fishes to their environment, 2) to develop knowledge of the classification of fishes, 3) to develop species identification skills for fishes found in the Midwestern United States, and 4) to develop critical thinking skills related to fish biology and ecology. Lectures, laboratory exercises and field experiences will be used to present and study the material. Grading is based on performance in lecture exams, laboratory quizzes, a research review paper and a fish-based, peer-reviewed research proposal.

COURSE CREDITS AND INSTRUCTIONAL TYPE: Advanced Ichthyology is a 3-credit course with two lectures and one 3-hour lab period each week.

A. Justification: Advanced Ichthyology serves as an expansion of information presented in FNR 241, Ecology and Systematics of Fishes and Mammals for junior- and senior-level students in Forestry and Natural Resources (FNR) and Biological Sciences. It also serves as an in-depth treatment of fish biology, ecology, and evolution for graduate students in aquatic sciences from both FNR and Biological Sciences who may not have taken a comprehensive fish biology/ecology/evolution course prior to enrollment in graduate school. The course is intended to foster a more comprehensive understanding of fish biology, ecology, and evolution than that presented in FNR 241 for serious students of aquatic sciences. It also seeks to develop laboratory and field identification skills for students who will routinely conduct fish sampling as part of their professional careers. Finally, Advanced Ichthyology seeks to help students further develop writing skills relevant to research report and proposal writing. Comprehensive understanding of fish biology, ecology and evolution; fish identification skills; and writing skills are all essential components of success for students of fisheries and aquatic sciences at both upper-level undergraduate and graduate levels, and this course will provide students with this knowledge. There is no currently available course at Purdue University that provides such comprehensive knowledge of fish biology, ecology, and evolution.

B. Level of Course: Justify the requested course level by indicating the anticipated enrollments of undergraduate and graduate students.

C. Prerequisites: FNR 241 or equivalent, FNR 351 or equivalent, BIOL 286 or equivalent

D. Name of Instructor: Reuben Goforth

E. Course Objectives: (based on major(s)/graduate outcomes)

- 1) Familiarize students with the prehistoric and current diversity of fishes
- 2) Familiarize students with fish evolution
- 3) Familiarize students with the biological function of fishes
- 4) Familiarize students with the ecological roles that fishes play in freshwater and marine communities and ecosystems
- 5) Facilitate students' abilities to identify a wide range of fish specimens, both preserved and live, in the laboratory and the field

E1. Course Outline of Topics/Syllabus:

<u>DAY</u>	<u>DATE</u>	<u>TOPIC</u>	<u>Readings in Bond's Biology of Fish</u>
M	12 Jan	No Class	
W	14 Jan	Course Pre-test	
F	16 Jan	LAB 1: Begin Annotated Bibliography Assignment	
M	19 Jan	Martin Luther King, Jr. Day, NO CLASS	
W	21 Jan	LECTURE 1: Fish Evolution and Systematics	pp. 71-88
F	23 Jan	LECTURE 2: Early & Jawless Fishes	pp. 89-103
		LAB 2: Fish morphology, morphometrics, & meristics	
		Annotated Bibliography Due via e-mail by 5:00 PM (50 pts)	
M	26 Jan	LECTURE 3: Gnathostomes	pp. 105-128
W	28 Jan	LECTURE 4: Sarcopterygii & Actinopterygii	pp. 129-158
F	30 Jan	LECTURE 5: Teleost Fish	pp. 159-176
		LAB 3: Midwest Fish Diversity I	
		Lab Quiz 1: Fish Morphology, Morphometrics, & Meristics (50 pts)	
M	02 Feb	LECTURE 6: Ostariophysian Fish	pp. 177-192
W	04 Feb	LECTURE 7: Protacanthopterygii & Basal Neoteleosts	pp. 193-216
F	06 Feb	LAB 4: Midwest Fish Diversity II	
		Lab Quiz 2: Midwest Fish Diversity I (10 pts)	
M	09 Feb	LECTURE 8: Paracanthopterygii and Acanthopterygii	pp. 217-250
W	11 Feb	LECTURE 9: Perciform and "Oddball" Fishes	pp. 251-279
F	13 Feb	Lecture Exam I: Lectures 1-9 (100 pts)	
		LAB 5: Midwest Fish Diversity III	
		Lab Quiz 3: Midwest Fish Diversity II (10 pts)	
M	16 Feb	LECTURE 10: Fish Locomotion & Buoyancy	pp. 311-341
W	18 Feb	LECTURE 11: Fish Sensory Systems I	pp. 345-362
F	20 Feb	LAB 6: Midwest Fish Diversity IV	
		Lab Quiz 4: Midwest Fish Diversity III (10 pts)	
		Fish Research Review Paper Due via e-mail by 5:00 PM (50 pts)	
M	23 Feb	LECTURE 12: Fish Sensory Systems II	pp. 363-388
W	25 Feb	LECTURE 13: Fish Sensory Systems III	pp. 389-403
F	27 Feb	LAB 7: World Fish Diversity I	
		Lab Quiz 5: Midwest Fish Diversity IV (10 pts)	
M	02 Mar	LECTURE 14: Use & Acquisition of Food	pp. 407-439
W	04 Mar	LECTURE 15: Circulation and Gas Exchange	pp. 441-467

<u>DAY</u>	<u>DATE</u>	<u>TOPIC</u>	<u>Readings in Bond's Biology of Fish</u>
F	06 Mar	LAB 8: World Fish Diversity II (SHEDD AQUARIUM???)	
		Lab Quiz 6: World Fish Diversity (10 pts)	
M	09 Mar	LECTURE 16: Osmotic and Solute Regulation	pp. 469-492
W	11 Mar	LECTURE 17: Nervous and Endocrine Systems	pp. 493-513
F	13 Mar	NO LAB SCHEDULED	
M	16 Mar	SPRING BREAK	
W	18 Mar	SPRING BREAK	
F	20 Mar	SPRING BREAK	
M	23 Mar	LECTURE 18: Reproduction and Development	pp. 517-549
W	25 Mar	Lecture Exam II: Lectures 10-18 (100 pts)	
F	27 Mar	LAB 9: Buckets of Fish Quiz I (50 pts)	
M	30 Mar	LECTURE 19: Distribution of Fishes	pp. 601-638
W	01 Apr	LECTURE 20: Ecology of Fishes I – Basic Concepts	pp. 639-661
F	03 Apr	LAB 10: Buckets of Fish Quiz II (50 pts)	
		Draft Research Proposal Due via e-mail by 5:00 PM (50 pts)	
M	06 Apr	LECTURE 21: Ecology of Fishes II – Freshwaters	pp. 663-699
W	08 Apr	LECTURE 22: Ecology of Fishes III – Coastal Marine	pp. 701-729
F	10 Apr	LAB 11: Field Fish ID Quiz I (50 pts)	
M	13 Apr	LECTURE 23: Ecology of Fishes IV – Pelagic, etc.	pp. 731-753
W	15 Apr	LECTURE 24: Fish Behavior I	pp. 755-771
F	17 Apr	LAB 12: Field Fish ID Quiz II (50 pts)	
M	20 Apr	LECTURE 25: Fish Behavior II	pp. 773-797
W	22 Apr	LECTURE 26: Fish Parasites and Diseases	pp. 801-821
F	24 Apr	LAB 13: Makeup Fish ID Quiz (50 pts)	
		Final Research Proposal Due via e-mail by 5:00 PM (50 pts)	
M	27 Apr	LECTURE 27: Fish Conservation	
W	29 Apr	LECTURE 28: Lecture Spillover	
	04-09 May	FINAL EXAM (Exact date and time to be announced) (100 pts)	

E2. Method of Evaluation or Assessment:

Course grades are based on each student's cumulative performance in the course, as outlined below:

2 Midterm Exams @ 100 points ea.	200 points
1 Final Exam @ 100 points ¹	100 points
5 Laboratory Quizzes @ 10 points ea.	50 points
5 Laboratory Quizzes @ 50 points ea.	200 points
1 Fish Species Annotated Bibliography @ 50 points	50 points
1 Fish Species Research Report @ 50 points	50 points
1 Draft Fish Species Research Proposal @ 50 points	50 points
<u>1 Final Fish Species Research Proposal @ 50 points</u>	<u>50 points</u>
TOTAL	800 points

¹ The final exam will be a partially cumulative, comprehensive exam for the entire course.

The following schedule will be used for assigning individual course grades:

<u>Course point total</u>	<u>Percent possible</u>	<u>Course grade</u>
720 – 800	90.0 % - 100 %	4.0 (A)
640 – 719	80.0 % - 89.9 %	3.0 (B)
560 – 639	70.0 % - 79.9 %	2.0 (C)
480 – 559	60.0 % - 69.9 %	1.0 (D)
<u>0 – 479</u>	<u>0.0 % - 59.9 %</u>	<u>0.0 (F)</u>

F. Reading List/Textbook:

Barton, M. 2006. Bond's Biology of Fishes, 3rd Edition. Brooks Cole Publishing, 912 pp.
ISBN-10: 0120798751; ISBN-13: 978-0120798759