FLORIDA ATLANTIC UNIVERSITY

COURSE CHANGE REQUEST
Undergraduate Programs

Department Biological Sciences

College CESCOS

UUPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

***Current* Course Prefix and Number** Zoo4690	***Current* Course Title** Comparative Vertebrate Morphogenesis

*Syllabus must be attached for **ANY** changes to current course details. See Checklist. Please consult and list departments that may be affected by the changes; attach documentation.*

Change title to:
Vertebrate Structure Development & Evolution

Change prefix
From: **To:**

Change course number
From: **To:**

Change credits*
From: **To:**

Change grading
From: **To:**

Change WAC/Gordon Rule status**
Add ☐ **Remove** ☐

Change General Education Requirements***
Add ☐ **Remove** ☐

*Review Provost Memorandum
**WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to this form. See WAC Guidelines.
***General Education criteria must be indicated in syllabus and approval attached to this form. See GE Guidelines.

Change description to:
Phylogeny and diversity of vertebrate structures, along with their development through organogenesis, differentiation and growth lead to an understanding of the relationships and functioning of living organisms. Key events in vertebrate evolution are discussed.

Change prerequisites/minimum grades to:
BSC 1010, BSC 1011, BSC 1010L, BSC 1011L / minimum grade of C

Change corequisites to:

Change registration controls to:

Please list existing and new pre/corequisites, specify AND or OR and include minimum passing grade (default is D-).

Effective Date *(TERM & YEAR)* Fall 2018	**Terminate course** **List final active term**

Faculty Contact/Email/Phone Jeanette Wyneken / jwyneken@fau.edu / 561-297-0146

Approved by	***Date***
Department Chair	12-8-17
College Curriculum Chair	
College Dean	
UUPC Chair	
Undergraduate Studies Dean	
UFS President	
Provost	

Email this form and syllabus to mjenning@fau.edu seven business days before the UUPC meeting.

Vertebrate Structure Development & Evolution: ZOO 4690 3 cr
Prerequisites: BSC 1010, BSC 1011, BSC1010L, BSC1011L or equivalent
Fall 2018 Classroom TBD

Professor: Dr. Jeanette Wyneken
266 Sanson Science
Phone: (561) 297-0146
jwyneken@fau.edu

Teaching Assistants: TBD

Dr. Wyneken's Office Hours: W11:30 – 2:30 PM. Electronic office hours (e-mail or Canvas) T 8:00 PM – 9:00 PM. If you have time conflicts with all office hours, please make an appointment. Due to unforeseen circumstances or professional obligations that overlap with office hours, I occasionally may be absent. Make-up office hours will be announced and posted in those events. TA office hours and locations will be announced in class.

Text — The **required** textbook is **Vertebrates: Comparative Anatomy, Function, and Evolution, *7th Edition***, 2015 by Kenneth V. Kardong. There is much required reading from this book. You will not pass without reading.

Course Purposes and Policies — This course will familiarize you with vertebrate development from cells to tissues to organs to organisms. Study of the phylogeny and diversity of vertebrate structures, along with their development, lead to our understanding of the relationships and functions of living organisms. Key events in vertebrate evolution are integrated into the material. Phylogenetic relationships among vertebrates will emphasize comparative structure and function. You will be required to integrate information from lectures, assigned readings, and your knowledge gained in prerequisite courses. You will be expected to learn and be able to explain:

1. how and why vertebrates are unique among chordates,
2. how structures develop, are organized, the implications of developmental processes, and their significance
3. major processes that produce key structures,
4. the significance and evolutionary relationships of structures and species,
5. how specific studies have increased our understanding of chordate evolution/diversity, development & function
6. understand key studies in the field and know the scientists who conducted them.
7. how developmental biology integrates into understanding of vertebrate structure and evolution

When you complete the course, you should have a critical understanding of vertebrate anatomy, development, function, and evolution and you should be able to critically evaluate major concepts in the field.
You will gain new perspectives that will enhance your next visit to a zoo, aquarium or natural history museum

Method of Instruction – Students are expected to attend lectures, participate in lecture exercises, take their own notes in lecture, and do their own drawings. Colored pencils or pens are helpful. You must read and understand the required readings. Take notes from the book. Students are expected to integrate information from lectures with that from required readings. Occasionally, material will be posted on canvas. Each normal class will start with a word of the day. Every student must come prepared to explain the term and its relevance to class. Don't rely on Wikipedia; use your text. Questions in lecture or afterwards are welcome (and enthusiastically encouraged). Dr. Wyneken and the TAs are available to discuss questions, concepts and ideas inspired by the lecture or lab material.

The TAs attend lecture and take notes. They are not there to take notes for you; they are not a substitute for attending class. If you miss class and have a legitimate excuse (the FAU handbook defines legitimate excuses). If you have a legitimate excuse for absence, you may request a copy of the notes from one of the TAs by providing with proper documentation of your excused absence.

Attendance – Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family

emergencies, military obligation, court-imposed legal obligations or participation in University approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence. *Religious Accommodations*: Students who wish to be excused from coursework, class activities or examinations must notify the instructor well in advance of their intention to participate in religious observation and request an excused absence.

Absences — If you miss an exam or in-class exercise because you are sick or have another FAU-defined legitimate excuse, you must notify Dr. Wyneken by e-mail and follow the FAU policies for documenting an excused absence as described in the undergraduate catalog. Because the class is fast-paced, and the volume of information is great, past experience has shown that students do poorly on make-up exams. For this reason, make-up exams usually are not offered. Students with legitimate excuses for missing an exam will have their grade pro-rated, based upon the performance on the other two exams or other. Similarly, if an in-class exercise missed and the student has followed the FAU policies for documenting an excused absence, that in-class exercise score will be pro-rated based on the other in-class exercise scores. The exception is the zoo, aquarium or natural history museum visit summary

Textbook Assignments. **Required reading assignments** are given below and occasionally will be assigned in class. Everyone must learn and understand **the required reading materials.** *Italicized reading assignments are not covered in class*. **Recommended readings** overlap the required sections. Recommended readings include more contextual information and go beyond what is required. It is up to each person to decide how best to use the recommended readings (such as to overcome any gaps in your background, pursue additional interests, and address current needs). Some of you have had recent course-work that enables you to immediately understand the required material; however, you may want some review or to refresh your background with the recommended readings. The textbook explains topics not covered in lecture, expands upon lecture topics and catches you up when you need background. I hope that you find the subject interesting on its own merits and read beyond the assignments.

Lecture – The lecture will not cover all organ systems or all taxa. I select key examples and use them to discuss critical concepts and major topics. During lecture, it is important to listen, think about the concepts behind the studies discussed, take notes and do drawings. Drawing or diagramming is an effective way to make connections among stages, events, terms and structures. Most material will be delivered in class by lecture or by doing in-class exercises, however we may post some required material on Blackboard. Details will be announced in class.

Terminology – A necessary part of this class is learning the terminology; that includes pronouncing and spelling the terms correctly. The terminology of the field is the language used to describe and discuss the facts and the concepts.

Tentative Lecture Schedule (topics may vary in duration and order as needed)

8/22	Introduction to Course, General Concepts and Terminology See material for Exam 1 for required reading
8/24	Introduction to Chordate Diversity, Vertebrate Relationships, See material for Exam 1 for required reading
8/29	Introduction to Vertebrate Development, *In class exercise: comparing kidneys for life in water, eggs, land, and air* See material for Exam 1 for required reading
8/31, 9/05	Major Processes in Structural Organization, Differentiation, Organogenesis, Pattern formation; Biogenesis and embryonic ecology See material for Exam 1 for required reading

9/07	Tissues, Integument, Ectodermal-Mesenchymal induction systems See material for Exam 1 for required reading
9/12, 9/14	Bone types, development growth and repair See material for Exam 1 for required reading
9/19	Introduction to biomechanics, skeletal systems (support/protection/levers), joints, See material for Exam 1 for required reading
9/21	Origin and development of the skulls & jaws (start of Exam 2 material) See material for Exam 2 for required reading
9/26	**Exam 1 (including required reading) Friday 26 September**
9/28	Origin and development of the skulls & jaws cont. & the ossified skull See material for Exam 2 for required reading
10/3	Skull diversity & functional changes (exams returned) See material for Exam 2 for required reading
10/5, 10/10, 10/12	Axial skeleton development, regional specialization, diversity and evolution See material for Exam 2 for required reading
10/17, 10/19	Appendicular skeletal development, regional specialization, diversity and evolution See material for Exam 2 for required reading
10/24	*In class exercise: case studies in axial and appendicular teratology* See material for Exam 2 for required reading
10/26	**Exam 2 (including required readings) Wednesday 28 October**
10/31 & 11/2	Muscle Structure, Developmental Patterns, Function, Properties, & Biomechanics (exams returned) See material for Exam 3 for required reading
11/7	*In class exercise: Vertebrates in the movies –possible and impossible monsters* See material for Exam 3 for required reading
11/9, 11/14	Circulatory System/Cardiopulmonary System, See material for Exam 3 for required reading
11/16	Nervous System, Nerves and major function See material for Exam 3 for required reading
11/21	*No lecture. Zoo, Aquarium, or Natural History Museum work on write-up due by 11/29.*
11/28, 11/30	Cranial nerves & Peripheral Nerves, Catch Up and Review See material for Exam 3 for required reading
12/13 (TBD)	Final Exam (including required reading) TBD December 2018

Reading Assignments for Vertebrates: Comparative Anatomy, Function, Evolution 7th ed., K. V. Kardong, 2015. *Italicized topics* will be covered by text but will not be covered during lecture in detail or at all. You are responsible for all **required reading** material, including topics that are not covered in lecture. **Be sure you understand the components of the chapter outlines as you read.**

Material for Exam 1	**Required readings**	**Recommended Readings**
Introduction to Course, History, General Concepts, Classification, Tools of the trade, Chordate and Vertebrate Relationships	1-5, 15-32, 37-40, (Box essays: 1.1 & 1.2), 47 48-54, 55 (Fig 2.7), 82-127 review 740-743. Note: **Chap. 3 gives fundamental background used throughout the entire course.**	Chapters 1-3 Appendix D
Major Processes in Vertebrate Development overview & formation; Heterochrony, Biogenesis, Biogenetic Laws; Evolution and Development	**161-176**, Fig 5.2, 5.6	Chapter 5

Structural organization, Differentiation: Histogenesis, Tissues, Composite Materials, Organogenesis, Functions, Extra-embryonic membranes	176-182 Fig 5.17 Fig 5.18 190-196	Chapter 5
Heterochrony, Biogenesis, Biogenetic Laws; Evolution and Development	198-201, 201-204 204-210	Chapter 5
Integument (types & functions), overview	212-216, 219 (Tetrapod Integument); 227 (Box essay 6.3); Figs. 6.1, 6.3, 6.10, 233-240	Chapter 6
Sensory systems (organs, structure, function), overview	*671-674, 691-693, 158-159. 694-707, 712-713, Figs. 17.18, 17.19, 17.21, 17.23,*	*Chapter 17*
Urogenital System (use for in-class exercise)	*545-554, Figs 14.8, 14.11, Box 14.3, 563-567 through Overview), Figs 14.18, 14.19, 589,591*	*Chapter 14*
Connective tissues, bone types, joints, bone growth.	182-189 (review Fig. 5.6)	Chapter 5, see topics to left
Material for Exam 2		
Introduction to biomechanics, size & scaling; skeletal system strength, protection, design, support	128-141, Fig 4.22, 4.24, Box 4.1 148 (strength of materials)-158 (up to optics)	Chapter 4, See listed topics
Skull components, cranial kinesis, branchial arches, origin of jaws, Phylogenetic diversity of skull form Jaw bones to ear bones Kinesis/akinesis & palate evolution Cranial neural crest	241-255 (through cranial kinesis), Box essay 7.1, 281-286, Table 7.2, Figs. 7.11, 7.17, 7.18, 7.19, 7.23, 7.34, 7.35, 7.36 263 (early tetrapods)-277, 291, Figs 7.53, 7.55, 7.56 284-288, Fig.7.64 288-293 Fig. 7.66	Chapter 7 (review 83-107)
Respiratory Systems: types form & function	*413-21, 427 (overview of Fish Respiration)-438,156 Figs. 11.39, 11.43 450 (Overview)*	*Chapter 11*
Digestive Overview	*503-508, 512-517 (to Pharynx), Box Essay 13-1, 520-521,523-527 (through vascularization of the GI tract), Figs 13.22, 13.26, 13.27, 13.28; 543-544,*	*Chapter 13*
Axial Skeleton, Parts, Development, evolution, diversity & differentiation, regionalization, Caudal fins (tails), Functional design, Overview	294-300, 322-324 301-304, 304-309, 313-317 Figs. 8.14, 8.17, 8.19, 8.21 8.27, 8.28, 8.31 Box Essay 8.1 317-321, 321-324	Chapter 8
Appendicular Skeleton components, Origins of paired appendages, Tetrapod pelvic & pectoral limbs, *Modes of locomotion, Functional examples, overview*	325-331 (to Phylogeny), Figs. 9.2, 9.5, 9.6, 9.7, 9.8, 9.16, Handout on pectoral evolution 336 (starting w/ Tetrapods)-346 Figs. 9.19, 9.21, 9.23 *348-362, Figs. 9.34, 9.35, 9.36* *Figs 9.40, 9.42; 370-371 (Overview)*	Chapter 9
Material for Exam 3 (Final Exam)		
Muscle structure & organization, Muscle fiber architecture, tendons & functions Homologies & development, Comparative anatomy & muscle groups	372-376, Fig 10.2; 376-388,390 Fig 10.6, 10.9,10.18 Box Essay 10.1 390-391 Figs. 10.19, 10.20, 10.21, 10.22 391-412 Figs. 10.26, 10.35	Chapter 10
Circulatory system components, Phylogeny, Development & Organization Aortic arches, *Venous Vessels overview, Veins & hepatic portal system,*	451- 456 (to Embryonic Development…) 457- 463, Figs. 12.13, 12.14, 12.17, 12.19, Fig 12.52 466 Overview of aortic arch evolution)-472, *Figs. 12.21, 12.23 across all 3 pages,* *473-474, 489, Figs. 12.27, 12.29, 12.30, 12.42 (Use*	Chapter 12 Figs 14.1, 14.2

Lymphatics *Heart structure* *Heat transfer, Overview*	*figures to understand each taxon's heart, aortic arches and the functional differences).* *494-495; 496-499, 499-502*	
Nervous Systems CNS & PNS, types of cells & structures, cranial nerves, Spinal reflexes, Autonomic Nervous System, Phylogenetic trends in CNS, form & function, Overview	625-637 (to Evolution), Figs. 16.6, 16.14, 16.16, 16.25, 16.32 Figs. 16.16, Tables 16.1, 16.3 638 (starting with spinal reflexes)-646, 646-650 (to spinal tracts), 669-670, Fig. 16.33 (Understand taxonomic diversity of gross form & functional specializations)	Chapter 16

Web based supplemental information can be found at: www.mhhe.com/Kardong7e

Grading and Testing – There are 3 exams (each worth 100 points) that will test your knowledge of materials presented in lecture AND in the required readings. The exams, given in class, rely on three or more types of questions (multiple-choice, analyses of explanatory text, short answer, matching, explanation of diagrams, and/or short or long essays). Once exams are returned, you will have an opportunity to compare your answers with the exam key and make your case for justified changes. (We are happy to give points for correct answers that we didn't consider in making up our key). All changes must be made between the in-class return date and the following 2 calendar weeks. After that two-week period, exams will not be discussed and grade changes will not be made.

In-class exercises are done in groups and count for 20 points each. Your in-class exercise score will be based on the average of: the score your group gives you and the score the TAs give you.
Word of the Day — All students will receive a list of terms ***to accurately define.*** ***Each student will be called at random to teach the class one of those terms*** in 5 minutes or less at the start of each class (20 points).

3 exams	100 pts each
3 in-class exercises	20 pts each
Word of the day	20 pts
Zoo/museum summary	20 pts
TOTAL	**400 pts**

The class is graded using the following scale A=400-360, B=359-320, C=319-280, D=279-240. Plus/minus grades will be based upon score distribution statistics. (For example an A- is typically 90-92% but might extend to 89.6 and up to 92.8 if the variation around the A- range is large

Zoo, Aquarium or Natural History Museum Summary.
Attend a zoo, natural history museum or aquarium and observe three animals that employ different locomotor strategies. Write a brief description for each animal on what strategy they use and how they accomplish movement. Focus on the functional morphology of a terrestrial, semi-aquatic, and fully aquatic animal. Use proper anatomical terminology from lecture, lab or the text. For example: ambulatory, cursorial, saltatorial, femur, phalanges, axial, lumbar, etc. can be used to describe the locomotor types and the structure that an animal uses.
Example paragraph: the American Green Tree Frog (*Hyla cinerea)* employs saltatorial locomotion via long, muscular hind legs adapted for quick, forceful jumps. Additionally, these frogs have evolved round, sticky discs at each toe and elongated phalanges that allow them to stick to surfaces such as trees. This is considered scansorial locomotion as the frog is using its toe pads to climb. Repeat this level of analysis for two additional different

animals (not all frogs). Papers should be no more than 2 pages, double-spaced, 12 pt font. You can include pictures on a third page if you would like. Send in a copy of the Zoo/Aquarium receipt documenting your attendance with your paper for full credit (20 pts).

Extra credit — 24 points available via Canvas for watching **all segments** of "How to be a Super Star Student". This must be completed by no later Thanksgiving break.

Advanced Comparative Vertebrate Morphogenesis – Graduate students enrolled in BSC 6936 are expected to complete the same material as undergraduate students and display more advanced analytic skills on their assignments and on exams.

Advice for Effective Learning: For some of you, note-taking and listening are well developed skills, for others these skills are still at the level of pure note-taker. You must recognize your skill level and work to attain the best balance possible. You should aim to come away from each lecture with an understanding of the concepts covered and the facts that support them. It is highly recommended that you review your lecture notes the same day, filling in any missed points; compare your notes with those taken by a few of your classmates to clarify points. The textbook will help and will provide you with another perspective on the subject; take notes from the text. It is productive to discuss the material with your TAs, classmates and professor to develop a thorough understanding of the subject.

Study Groups – I highly recommend studying in groups outside of lecture. Study group learning, in addition to individual learning, is among the most effective methods of learning the material and enhancing your breadth of understanding in an upper-level course such as this one. Group size of ~2-6 students is good. It is best to agree to meet regularly, soon after each lecture is usually best. Keep the meeting focused, avoid making it a social event and discuss the most recent material given in lecture and in the required readings. Each meeting should aim to accomplish three specific goals: (1) clarify ideas and information presented in lecture, (2) discuss the significance of the lecture material in terms of identification, function, evolutionary trends and significance, and (3) clarify the major information communicated in the required readings. Participation in a study group gets you involved in the course material and prepares you for the exams. It gets you used to thinking critically, forces you to keep up, gives you practice explaining concepts and terminology to others, tests your knowledge and provides you with feedback before you provide your knowledge on an exam. ***This course is very intensive, requires that you stay up-to-date, come to class prepared. You will learn many new ideas and concepts as well as use and understand terminology of the field. Study groups will help.***

Classroom etiquette. University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices such as cellular phones/tablets, are to be disabled during class session." If you use a tablet or computer, turn off your e-mail and various forms of messaging, video, etc., during class. It is tempting to text one another questions or comments, but this usually distracts you enough to miss key points. Instead, please share your questions in class; someone else likely has the same question.
E-mail communication – If you e-mail your professor, be sure to use proper salutations and titles (Dr. or Prof.). "Texting" abbreviations should not be part of your professional e-mails. The subject should be in the subject line.

Disability policy –In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) — in Boca Raton, SU 133 (561-297-3880); in Davie, LA 203 (954-236-1222); or in Jupiter, SR 117 (561-799-8585) — and follow all SAS procedures

Ethics – Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic

dishonesty. For more information, see University Regulation 4.001 http://www.fau.edu/ctl/4.001 Code of Academic_Integrity.pdf

Adherence to the Honor Code for academic honesty is expected of all students. ANY act of dishonesty that violates the honor code and misrepresents your efforts or ability may be grounds for immediate failure of a course, or may result in dismissal from the University. **Academic irregularities will not be tolerated**. You can find more information in the FAU Catalogue (http://www.fau.edu/academic/registrar/FAUcatalog/academics.php)

Vertebrate Structure Development & Evolution
ZOO 4690, Fall 2018
I HAVE READ AND UNDERSTAND THE COURSE SYLLABUS.

SIGNATURE	PRINTED NAME