I. Course information
Course Title: VEM 5440, Fundamentals of Orthopedic Surgery
Phase: II
Semester: Spring
Year: 2
Course credit: 1

II. General information
Course director: Dr. Daniel Lewis
Office location & office hours: SAH 265
Office phone number: 352-294-4426
Email: lewisdan@ufl.edu
Course Faculty: M. Brown, S. Kim, D. Lewis, A. Pozzi

III. Course description, educational goals of the course: Fundamentals of Orthopedic Surgery - 1 credit.
Basic orthopedic techniques and principles. Course Coordinator - Dr. Dan Lewis; Grading System - Letter grade.

Course objectives: This course is designed to give the student a sound clinical understanding of basic veterinary orthopedics. This is a preclinical course and will emphasize fundamental principles which can be applied to all species. The initial lectures will emphasize basics regarding fractures, fracture management and joint diseases. The final series of lectures in this course will be devoted to common orthopedic problems of individual small and large animal species.

Course Outline & schedule:
Lecture
Fracture Classification & Assessment
Fracture Mgt, Bone Healing & Grafting
Coaptation: Bandages, Splints & Casts
External Skeletal Fixation
Prin of Internal Fixation: Intramedullary Fixation
Principles of Internal Fixation: Wires
Principles of Internal Fixation: Plates & Screws
Orthopedic Complications
Midterm (Lectures 1-8)
Joint Physiology, Pathophysiology & Mgt of Joint Dis
Joint Physiology, Pathophysiology & Mgt of Joint Dis
Common Hind limb Disorders in Small Animals
Common Hind limb Disorders in Small Animals
Developmental Forelimb Disorders in Small Animals
Acquired Forelimb Disorders in Small Animals
Dx & Tx of Musculoskeletal Problems in Athletic Horses
Diagnostic Aids 16
Common Conditions & Therapies in Large Animal Ortho
Problems of the Foot & Hoof
A Guide to Equine Acute Laminitis
REVIEW
FINAL (Lectures 9-19)
IV. Course Materials

Include Learner Objectives:

Objectives are provided to define the areas of the material which are fundamental to a working knowledge of orthopedic surgery. Although examination questions will focus on these areas, objectives are not a preview of examination questions. The knowledge obtained by working through the learning objectives, should be useful with respect to studying for exams. After completing the reading, attending lectures, and reviewing the provided notes, you will be expected to...

Fracture Classification & Assessment (Lewis)
1. list the basic forces to which bone is subjected and what fracture patterns result from an excess of each type of force.
2. describe a fracture based on its radiographic appearance.
3. classify the various types of open fractures.
4. classify physeal fractures based on the Salter-Harris classification scheme.
5. name which zone of the growth plate that physeal fractures purportedly traverse and why this zone is susceptible to trauma.
6. discuss the prognostic significance of the Salter-Harris classification scheme.
7. assign an appropriate fracture assessment score based on a fracture’s radiographic appearance and patient clinical information.
8. understand the relationship between fracture assessment score and treatment considerations.

Fracture Management, Bone Healing & Grafting (Lewis)
1. understand the goal of fracture treatment.
2. describe what is meant by biological fixation.
3. know the meaning of reduction and alignment.
4. describe the clinical, radiographic, and histologic events of 1st & 2nd fracture healing.
5. know the four functions of bone grafts and relate them to the different types of grafts.
6. discuss the method of harvesting and using autogenous cancellous bone graft.

Coaptation: Bandages, Splints & Casts (Lewis)
1. compare the advantages and disadvantages of an open vs. closed reduction.
2. list several specific methods used to reduce and align fractures.
3. list the forces which a clinician considers when choosing what form of fracture immobilization will be employed.
4. list the factors that must be counteracted to stabilize fractures.
5. regurgitate and explain the cardinal rule of coaptation.
6. why is it generally inadvisable to employ coaptation following open reduction and internal fixation.
7. explain why it is important to pad depression when using a pre-formed splint.
8. describe the following forms of coaptation, their applications, indications for use, advantages, and disadvantages: casts, spica splint or cast, Schroeder-Thomas splint, Robert Jones bandage, Mason metasplint, velpeau sling.

External Skeletal Fixation (Lewis)
1. compare the advantages and disadvantages of an open vs. closed reduction when applying external skeletal fixation.
2. understand the basic components which are used to construct a linear, circular and hybrid fixator.
3. describe the basic configurations (type I, II and III) of linear external fixators.
4. list the attributes which make external skeletal fixation an excellent choice of stabilization for open fractures.
5. list several indications/uses for external skeletal fixation.
6. describe the basic application process for an external fixator (specifically pin angle, pin type, method of pin placement, etc.).
7. name the weakest link in the external skeletal fixation system, and how this relates to post-operative morbidity. The student should be able to describe the steps in fixator construction and application which directly influence these complications.
8. list the attributes which make external skeletal fixation an excellent choice of immobilization for comminuted fractures.
9. describe the appropriate post-operative management for an animal with an external fixator.
10. list the advantages and disadvantages of acrylic connecting systems.

**Principles of Internal Fixation: Intramedullary Fixation** (Lewis)
1. state the force(s) Steinmann pins effectively counteract.
2. state which forces Steinmann pins poorly counteract, and what adjunctive measures can be used to increase the stability of a repair by counteracting these poorly neutralized forces.
3. describe what is meant by three-point fixation.
4. discuss the relevance of filling the medullary cavity with intramedullary pins to mechanical support and vascularity.
5. list the different types of points available on Steinmann pins and what properties these impart to the implant.
6. define the terms normograde and retrograde.
7. discuss which fractures are not amenable to intramedullary pin fixation and why.
8. define the term stack pinning, describe how stack pinning is performed, and what stack pinning is purportedly accomplishes.
9. define the terms Rush pin, in the manner of a Rush pin, and dynamic intramedullary cross pinning.
10. list the advantages interlocking intramedullary nails possess when compared to Steinmann pins.
11. describe how the holes are located for screw placement when implanting an interlocking intramedullary nail.

**Principles of Internal Fixation: Wires** (Lewis)
1. regurgitate the ten rules governing the proper application of cerclage wires.
2. discuss the relative merits and disadvantages of both loop and twist cerclage wires.
3. describe the tension band principle, which types of fractures it applies to, and the basic application of a pin and tension band.

**Principles of Internal Fixation: Plates & Screws** (Pozzi)
1. explain the principles of plate and screw fixation.
2. describe the surgical steps for applying a screw.
3. explain the difference between a lag and a position screw.
4. classify plates based on their function.
5. Discuss the general criteria for selecting a fracture for plate fixation.

**Orthopedic Complications** (Pozzi)
1. describe the difference between delayed union, non union and malunion.
2. classify non-union fractures and understand the difference between a viable and non-viable non-union.
3. describe the pathophysioloogy of osteomyelitis.
4. explain how to recognize osteomyelitis on radiographs.
5. describe the causes of implant failure.
6. diagnose septic arthritis following a surgical procedure.

**Joint Physiology, Pathophysiology & the Management of Joint Disease** (Brown)
1. discuss joint anatomy and physiology.
2. describe joint pathobiology and response to injury.
3. discuss the diagnosis and treatment of the common types of joint disease: developmental, traumatic/degenerative, and septic arthritis.

**Common Hind limb Disorders in Small Animals** (Pozzi)
1. explain the pathophysiology of hip dysplasia.
2. describe the typical clinical presentation of a dog with hip dysplasia.
3. list the most common treatment strategies for hip dysplasia.
4. diagnose traumatic hip luxation.
5. describe common techniques to treat hip luxation.
6. choose between closed reduction and open reduction or salvage procedures.

**Common Hind limb Disorders in Small Animals** (Pozzi)
1. describe the classification of medial patellar luxation.
2. list the most common surgical techniques for medial patellar luxation.
3. discuss the pathophysiology of cranial cruciate ligament insufficiency.
4. diagnose cranial cruciate ligament insufficiency.
5. list the most common stabilization techniques for cranial cruciate ligament insufficiency.
6. explain the mechanism of osteochondrosis.
7. describe the typical radiographic pattern of osteochondrosis.

Developmental Forelimb Disorders in Small Animals (Kim)
1. regurgitate the differential diagnosis for a skeletally immature large breed dog with a forelimb lameness.
2. describe the abnormalities that would be present on physical examination with each of the developmental orthopedic conditions that affect rapidly growing, immature, large and giant breed dogs.
3. describe the radiographic abnormalities typical of each of the developmental orthopedic conditions that commonly affect skeletally immature large and giant breed dogs.
4. discuss the treatment options for each of the developmental orthopedic conditions that commonly affect skeletally immature large and giant breed dogs.

Acquired Forelimb Disorders in Small Animals (Lewis)
1. describe the clinical abnormalities typically present on the physical examination in a dog with infraspinatus contracture.
2. describe the surgical treatment for infraspinatus contracture.
3. describe the clinical abnormalities typically associated with bicipital tenosynovitis.
4. list the medical and surgical treatment options for a dog with bicipital tenosynovitis.
5. contrast the typical etiologies of medial and lateral scapulohumeral luxations.
6. discuss what factors might influence the successfulness of treating a dog with a medial scapulohumeral luxation.
7. list the treatment options for a dog with a medial scapulohumeral luxation.
8. contrast the differences between congenital and traumatic elbow luxations.
9. list the abnormalities typically present on the physical examination in dogs with congenital and traumatic elbow luxations.
10. explain why most traumatic elbow luxations are lateral.
11. describe in detail how you would perform a closed reduction of a traumatic lateral elbow luxation and what form of coaptation you would apply to maintain reduction.
12. list the potential causes of premature physeal closure in dogs and cats.
13. classify physeal fractures by the Slater-Harris classification scheme, and discuss the importance of this classification scheme as it relates to potential premature physeal closure.
14. name the zone of the growth plate through which physeal fractures traverse and why this region is predisposed to fracture.
15. discuss how different methods of stabilization might influence the occurrence of premature physeal closure.
16. describe the anatomic features of the distal ulnar physis which predispose it to premature closure.
17. describe the changes that would be expected in the antebrachium if there was premature closure of the distal ulnar physis.
18. regurgitate the percentage of growth the proximal and distal radial and ulnar growth plates contribute to the over length of the antebrachium.
19. list the factors that influence what ultimate deformity will develop if there is premature closure of a growth plate.
20. discuss how to treat a 3 month old dog with an angular limb deformity of the antebrachium secondary to a premature closure of the distal ulnar physis, and how treatment would differ if this dog was a year old.
21. list what surgical measure can be taken to prevent an osteotomy from healing.
22. explain what a stress radiograph is and what role stress radiographs play in evaluating animals with ligamentous injuries of the carpus.
23. list the treatment options for a dog with a ligamentous injury of its carpus.
Diagnosis & Treatment of Musculoskeletal Problems in Athletic Horses (Colahan)

1. Develop a general familiarity with doing orthopedic examination on a horse.
   − Ability to understand what is done in the examination
   − Ability to understand the why it is done
   − Ultimately you can structure your lameness exam for any species

Diagnostic Aids (Colahan)

1. Develop a general familiarity with doing orthopedic examination on a horse
   − Ability to understand what ancillary and imaging examinations are available
   − Ability to understand what ancillary and imaging examinations are appropriate and when they are indicated

Common Conditions & Common Therapies in Large Animal Orthopedics (Colahan)

1. Develop an understanding of the general types of orthopedic problems suffered by large animals and the types of therapies available to treat them.
   − Fractures of
     • Long bones,
     • Sesamoids,
     • Cuboidal bones,
     • Phalangeal bones
   − Fractures types
     • Mid-shaft fractures
     • Stress fractures
     • Intra-articular fractures
   − Ligament and tendon injuries
   − Degenerative joints disease
   − Therapies:
     • External immobilization
       • Casting
       • Splinting
       • Pin fixators
     • Surgical
       • Internal fixation
       • Arthroscopy
       • Sequestrectomy
     • Medical therapies
       • NSAIDS
       • Intra-articular
       • Biological
Problems of the Foot & Hoof (Colahan)
1. To understand diagnosis and treatment of specific examples of the types of orthopedic problems suffered by large animals that involve the foot and hoof
   - Septic processes
     • Abscesses
     • Thrush
     • Canker
   - Traumatically induced injuries
     • Bruises
     • Hoof defects

A Guide to Equine Acute Laminitis (Colahan)
1. To understand diagnosis and treatment of laminitis
   - Systemic nature of the condition
   - Available therapies
   - Prognostication and client communication

Key words for each IU:
Fracture Classification & Assessment (Lewis)
- articular fractures, bending, bone, closed fracture, comminuted fracture, compression, crepitus, depression fracture, diaphyseal fracture, epiphyseal fracture, fracture assessment score, fracture classification, fracture pattern, greenstick fracture, load, metaphyseal fracture, oblique fracture, open fracture,
- physeal fractures, Salter-Harris type I, II, III, IV & V fractures, segmental fracture,
- shear, spiral fracture, tension, torsion, transverse fracture

Fracture Management, Bone Healing & Grafting (Lewis)
- allignment, autogenous cancellous bone graft, biological fixation, bone grafting, cancellous bone grafts, contact healing, cortical bone grafts, corticocancellous bone graft, fixation, gap healing, inflammatory phase, mechanical fixation, osteoconduction, osteogenesis, osteoinduction, primary bone healing, reduction, remodeling phase, reparative phase, secondary bone healing, stabilization

Coaptation: Bandages, Splints & Casts (Lewis)
- 90/90 flexion bandage, cardinal rule of coaptation, carpal flexion bandage, casts, closed reduction, coaptation, Ehmer sling, figure-of-eight bandage, internal fixation, Mason metasplint, open reduction, Robert Jones bandage, Schroeder-Thomas splint, spica splint, splint, Velpeau sling
External Skeletal Fixation (Lewis)
acrylic connecting systems, arthrodesis, circular fixator, distraction, Ellis pin, external skeletal fixation, hybrid fixator, Kirschner-Ehmer (KE) apparatus, linear fixator, negative profile pin, partially threaded pin, pin angle, positive profile pin, SCAT pin, SK external fixator system, threaded pins, transfixation pins, Type I, II and III linear external fixators

Principles of Internal Fixation: Intramedullary Fixation (Lewis)
chisel tipped, counter sinking, dynamic intramedullary cross pinning, interlocking intramedullary nail, intramedullary fixation, Kirschner wires, K-wires, medullary cavity, normograde, retrograde, Rush pin, stack pinning, Steinman pin, thread-shaft interface, three-point fixation, trocar point

Principles of Internal Fixation: Wires (Lewis)
cerclage wire, hemicerclage wire, loop wire, tension band, twist wire

Principles of Internal Fixation: Plates & Screws (Pozzi)
anatomic reduction, buttress plate, cancellous screw, compression plate, cortical screw, dynamic compression plate (DCP), fracture gap, implant screw, lag screw, limited contact dynamic compression plate (LC-DCP), neutralization plate, plate-bone contact zone, position screw, stable internal fixation

Orthopedic Complications (Pozzi)
atrophic nonunion, defect nonunion, dystrophic nonunion, fracture disease, hypertrophic nonunion, implant failure, malunion, necrotic nonunion, nonunion, nonviable nonunion, oligotrophic nonunion, osteitis, osteomyelitis, quadriceps contracture, viable nonunion

Joint Physiology, Pathophysiology & the Management of Joint Disease (Brown)
aggrecan, aggrecanase, arthrocentesis, arthroscopic surgery, arthroscopy, articular cartilage, chondrocytes, collagen, corticosteroids, cytokines, delayed ossification, developmental orthopedic disease, diagnosis, epiphyseal, glycosaminoglycans, nutraceuticals, hyaluronan, joint capsule, joint lavage, lameness, matrix metalloproteinases, non-steroidal anti-inflammatory drugs, nutrition, osteoarthritis, osteochondritis dissecans, oxygen-derived free radicals, physyeal, physical therapy, polysulfated, prostaglandins, proteoglycans, radiographic sign, regional antibiotic perfusion, rest, septic arthritis, subchondral bone, subchondral bone cysts, synovial, synovial culture, synovial fluid cytology, synovial joint, synovial membrane, synoviocytes, treatment

Common Hind limb Disorders in Small Animals (Pozzi)
block chondroplasty, capsulectomy, capsulorrhaphy, CCLR, chondroplasty, coxofemoral luxation, cranial cruciate ligament, cranial drawer, fabellar-patellar suture, fabellar-tibial antirotational suture, fabellar-tibial suture techniques, fascial imbricating, femoral head and neck osteotomy, FHO, fibular head transposition (FHT), hip dysplasia, hip luxation, intertrochanteric osteotomy, lateral collateral ligament, luxation, medial meniscus, meniscus, Ortalani, osteoarthritis, osteochondritis dissecans, over-the-top intracapsular repair, patellar luxation, pectineal myectomy, pubic symphysiodesis, retinacular/capsular imbrication, synthetic capsule repair, THR, tibial plateau leveling osteotomy (TPLO), tibial tuberosity advancement (TTA), toggle pin, total hip replacement, TPO, transposition of the rectus femoris origin, triple pelvic osteotomy, trochlear sulcoplasty, trochlear wedge recession, under-and-over intracapsular repair

Developmental Forelimb Disorders in Small Animals (Kim)
osteochondrosis, panosteitis, ununited anconeal process, fragmented coronoid process, retained cartilage core, sesamoid disease

Acquired Forelimb Disorders in Small Animals (Lewis)
angular limb deformity, antebrachium, bicipital tenosynovitis, carpal instability, congenital elbow luxations, hyperextension, infraspinatus contracture, medial scapulohumeral luxation, physeal disturbances, subluxation, traumatic elbow luxations,

Diagnosis & Treatment of Musculoskeletal Problems in Athletic Horses (Colahan)
blocking, bone scan, Churchill’s hock test, fluoroscopy, intra-articular block, joint block, lameness grades, lameness, musculoskeletal, nerve block, physical history, scintigraphy, soundness, thermography
Diagnostic Aids (Colahan)

aspartate aminotransferase (AST), bone scan, computer activated tomography (CAT) scan, creatine kinase (CPK), digital radiography, fluoroscopy, force plate, gait analysis systems, lactate dehydrogenase (LDH), magnetic resonance imaging (MRI), nuclear scintigraphy, thermography, treadmill, ultrasonography, xerography

Common Conditions & Common Therapies in Large Animal Orthopedics (Colahan)

arthritis, arthroscopy, arthrosis, bone plating, bowed tendon, bucked shin, chondroitin sulfate, coaptation, condylar fracture, corticosteroid therapy, COX I, COX II, exostosis removal, fracture types, glycosaminoglycans, hyaluronan, intra-articular fracture, lag screw fixation, metaphyseal fracture, non steroidal anti-inflammatory drugs (NSAID’s), osteostixis, phalangeal fracture, sesamoid fractures, splint bone, squesrectomy, stress fractures, tarsitis, tendon/ligamental injuries

Problems of the Foot & Hoof (Colahan)

abscess, corn, distal phalanx fracture types, hoof bruise, navicular syndrome, posterior digital neurectomy, septic navicular bursitis, thrush

A Guide to Equine Acute Laminitis (Colahan)

deep flexor tenotomy, endotoxiemia, founder, hoof wall resection, lamina, laminitis, rotation

Required texts”:

1. Course Notes. SCAVMA (also available online in pdf form for students enrolled in the course)
3. McIlwraith CW and Trotter GW. Joint Disease in the Horse. WB Saunders, 1996.

Recommended/ Reference texts:

5. Selected references available online through the Course Sakaii website or on reserve in the Veterinary Reading Room.
6. Other articles/videos will be available throughout the course notes. (See Learning Modules or SCAVMA Notes).

Additional Resources/ equipment:

We do have certain expectations of those students enrolled in the course. Lectures will follow a traditional didactic lecture format. All required reading will be considered testable material. The required textbook for this course is Fossum TW (ed). Small Animal Surgery. 3rd ed, 2007, St. Louis, Mosby. Additional required reading materials will be made available on the course E-Learning Website or put on reserve in the VAB reading room.

Lectures and extra files may be placed on the UF E-Learning site at https://lss.at.ufl.edu/. Students can access the course E-Learning site using their Gator Link login information. Only students who are registered for the course will have access to the site. Whenever possible copies of the lecture slides and required reading or viewing can be found at this site. Course communications will be through the Online E-Learning site or by e-mail.

V. Evaluation/ Grading/ Testing:

Give the grading scheme:

There are two scheduled examinations for this course. Each lecture period will be assigned an equal number of points on the examinations. These examinations may include multiple choice, true/false questions and short written questions. Exams will usually be held in the HSC Computer Testing Center.
The final grades assigned for this course will be based on the percentage of total points earned. There is no College standard for equating test scores to letter grades. The student’s grades will be posted on the course’s E-Learning site. The students will be notified as soon as the grades become available.

VI. Administrative Policies: see Student Handbook @

Remediation
Individual students can reschedule examinations in the case of documented medical or family need, or other unusual extenuating circumstances. This should be done prior to the scheduled examination. The course instructor should be notified as soon as possible if special arrangements need to be made.

Attendance
Attendance in all scheduled lectures is expected. Students are responsible for all material and assignments from all scheduled activities. Instructors have the authority to administer unannounced quizzes which may be given at the beginning of some lecture periods. These quizzes will not account for more than 20% of the overall points in the course. Instructors may also, at any time, assess and record individual student attendance; course grades for those students who are absent without legitimate reason may be reduced by a half-letter grade for each instructional period for which an absence occurs. The class notes provided are intended to supplement the lecture presentations. Students should expect some examination questions which directly refer to material covered in lectures that may not appear in the notes. In addition, students will be expected to complete all supplemental reading assignments. Several of the lecture periods deviate from the traditional didactic lecture format. There may be radiographs, computer assignments including web pages or other materials posted to be reviewed prior to lecture.

Academic Honesty
The College of Veterinary Medicine expects students to be honest in all their class work. Therefore, students are required to commit themselves to academic honesty by signing the following statement as part of the admissions process:

"I understand that the University of Florida expects its students to be honest in all of their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action, up to and including expulsion from the University of Florida."

Professional Behavior
Satisfactory demonstration of professional attitudes considered important for successful performance in veterinary medicine including, but not limited to, academic honesty, interpersonal relations and communication skills, behavior and conduct with animals, clients, faculty, students, staff, and adherence to the provisions of the Veterinary Medical Practice Act of the State of Florida as set forth by the Department of Business and Professional Regulations. Satisfactory demonstration of professional attitudes considered important for successful performance in veterinary medicine including, but not limited to, academic honesty, interpersonal relations and communication skills, behavior and conduct with animals, clients, faculty, students, staff, and adherence to the provisions of the Veterinary Medical Practice Act of the State of Florida as set forth by the Department of Business and Professional Regulations.

Student Evaluation of Instruction
Each instructor involved in didactic teaching efforts is evaluated by the students in the course of his or her major involvement as determined by the Department Chair. Comments are also solicited from students with respect to the instructor's personal qualities or teaching skills which contributed to or hindered the success of the course. In addition, comments are requested to determine the students’ overall opinions regarding the course and any printed materials associated with the course.

Accommodations for Students with Disabilities
Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.