BIO-1230: ANATOMY AND PHYSIOLOGY OF THE EYE

Cuyahoga Community College

Viewing:BIO-1230 : Anatomy and Physiology of the Eye
Board of Trustees:
2018-05-24

Academic Term:
2018-08-27

Subject Code
BIO - Biology

Course Number:
1230

Title:
Anatomy and Physiology of the Eye

Catalog Description:
Detailed examination of the anatomy and physiology of the eye. Emphasis on ocular terminology, structure, function, movement, disorders, diseases, lens physics, and visual testing/analysis. Study of eye model and preserved eye dissection.

Credit Hour(s):
4

Lecture Hour(s):
3

Lab Hour(s):
3

Other Hour(s):
0

Requisites
Prerequisite and Corequisite
Departmental approval: admission to Optical Technology program.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.
For specific information pertaining to ADA accommodation, please contact your campus SAS office or visit online at http://www.tri-c.edu/accessprograms. Blackboard accessibility information is available at http://access.blackboard.com.

Eastern (216) 987-2052 - Voice
Metropolitan (216) 987-4344 – Voice. (216) 987-4048 – TTY.
Western (216) 987-5079 – Voice. (216) 987-5117 – TTY.
Westshore (216) 987-3900 – Voice. (216) 987-4048 – TTY.
Brunswick (216) 987-5079 – Voice. (216) 987-5117 – TTY.
Off-Site (216) 987-5079 - Voice

III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts.

Therefore, attendance is recorded in the following ways:

• For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

• For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have “Never Attended” a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts,’ for assessment of course and program outcomes and the College’s Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student’s grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available at http://www.tri-c.edu/student-resources/documents/studenthandbook.pdf. You must also comply with the College’s Zero Tolerance for Violence on College Property available at http://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf

Outcomes
Course Outcome(s):
Apply fundamental knowledge of ocular anatomy and physiology to didactic and clinical experiences in the ophthalmic professions.
Objective(s):
1. Explain how the skeletal, muscular, cardiovascular and nervous systems pertain to ocular physiology.
2. Identify medical terminology that will be utilized in ophthalmic record keeping.
3. Discuss the visual processing and identify factors that impact healthy vision.
4. Describe ophthalmic treatments, including prescription lenses, ophthalmic surgeries and medications.
5. Identify ocular structures and describe their function.
6. Describe ocular conditions and their symptoms.
7. Describe and list the different levels of structural organization of the body.
8. Describe the structure of the cell and explain the function of cellular organelles.
9. Discuss the function of the cell membrane as it relates to active transport, generation of an action potential and receptor binding.
10. Identify directional terminology as it applies to the brain and eye.
11. Discuss the physiology, conditions and evaluation techniques that are associated with each ocular structure.
12. Apply fundamental knowledge of ocular anatomy and physiology to spectacle and contact lens fitting.

Course Outcome(s):
Apply fundamental knowledge of ocular anatomy and physiology to attain professional credentials.

Objective(s):
1. Identify medical terminology that will be utilized in ophthalmic record keeping.
2. Discuss the visual processing and identify factors that impact healthy vision.
3. Describe ophthalmic treatments, including prescription lenses, ophthalmic surgeries and medications.
4. Identify ocular structures and describe their function.
5. Describe ocular conditions and their symptoms.
6. Identify directional terminology as it applies to the brain and eye.
7. Discuss the physiology, conditions and evaluation techniques that are associated with each ocular structure.
8. Apply fundamental knowledge of ocular anatomy and physiology to spectacle and contact lens fitting.

Course Outcome(s):
Discuss key concepts of applied ocular anatomy and physiology with patients and ophthalmic professionals.

Objective(s):
1. Discuss the visual processing and identify factors that impact healthy vision.
2. Describe ophthalmic treatments, including prescription lenses, ophthalmic surgeries and medications.
3. Identify ocular structures and describe their function.
4. Describe ocular conditions and their symptoms.
5. Identify directional terminology as it applies to the brain and eye.
6. Discuss the physiology, conditions and evaluation techniques that are associated with each ocular structure.
7. Apply fundamental knowledge of ocular anatomy and physiology to spectacle and contact lens fitting.

Methods of Evaluation:
Exams
Lab exams
Group projects
Peer evaluation

Course Content Outline:
1. Introduction
   a. Definitions
      i. Anatomy
      ii. Physiology
   b. Levels of Organization
      i. Chemicals
      ii. Cells
      iii. Tissues
      iv. Organs
      v. Systems
      vi. Organisms
   c. Directional terms
   d. Planes
i. Sagittal
ii. Coronal
iii. Transverse

e. Cell structure
   i. Cell Membrane
      1. Structure
         a. Phospholipid bilayer
         b. Integral Proteins
         c. Ion channels
            i. Non-gated ion channels
            ii. Ligand gated
            iii. Voltage gated
      2. Functions
      3. Membrane transport
         a. Active processes
         b. Passive processes
   ii. Cytoplasm
   iii. Organelles
      1. Nucleus
      2. Ribosomes
      3. Endoplasmic Reticulum
      4. Golgi apparatus
      5. Mitochondria
      6. Lysosomes

2. Skeletal System
   a. Regions
      i. Axial
      ii. Appendicular
   b. Skull (axial skeleton)
      i. Structure
      ii. Function
   c. Orbit
      i. Structure
      ii. Function

3. Muscular System
   a. Types
      i. Skeletal
      ii. Smooth
      iii. Cardiac
   b. Extraocular Muscles
      i. Function
      ii. Innervation
      iii. Position of gaze
   c. Palpebral muscles
   d. Ciliary muscle
   e. Muscles of the iris
   f. Yoked muscles

4. Cardiovascular system
   a. Heart
   b. Vessels
      i. Arteries
      ii. Capillaries
      iii. Veins
   c. Circulatory routes
      i. Systemic circulation
      ii. Pulmonary circulation
   d. Vascular tunic of the eye
i. Iris
ii. Ciliary body
iii. Choroid

5. Nervous System
   a. Organization
      i. Central Nervous System
      ii. Peripheral Nervous System
   b. Histology
      i. Neuroglia
         1. Function
         2. Types
      ii. Neurons
         1. Structure
            a. Axon
            b. Dendrite
            c. Cell body
         2. Classification
            a. Structure
            b. Function
   c. Physiology
      i. Nerve impulse
         1. Resting potential
         2. Action potential
         3. Repolarization
         4. Refractory period
         5. Saltatory conduction
         6. Speed of transmission
      ii. Conduction across a synapse
   d. Neural layer of the eye
      i. Retinal Pigment Epithelium
      ii. Layers of the retina
         1. Photoreceptor layer
         2. External limiting membrane
         3. Outer nuclear layer
         4. Outer plexiform layer
         5. Inner nuclear layer
         6. Inner plexiform layer
         7. Ganglionic layer
         8. Fibers to optic nerve
   e. Brain
      i. Brain Stem
         1. Medulla oblongata
         2. Pons varolii
         3. Midbrain
      ii. Diencephalon
         1. Thalamus
         2. Hypothalamus
      iii. Cerebrum
         1. Cortex
         2. Hemispheres
      iv. Cerebellum
   v. Cranial nerves
   f. Motor, sensory and integrative functions
      i. Sensory functions
         1. Receptors
         2. Cranial Nerves with ocular sensory function
         3. Visual pathway
a. Retina
   i. Photoreceptors
      1. Rods
      2. Cones
   ii. Bipolar cells
   iii. Ganglion cells
   iv. Horizontal cells
   v. Amacrine cells
b. Optic nerve
c. Optic chiasm
d. Optic tract
e. Lateral geniculate nucleus
f. Optic radiations
g. Visual cortex

ii. Motor function
   1. Extraocular muscles
   2. Cranial nerve innervation of ocular structures

iii. Integrative functions

6. Anatomy and Physiology of the Eye
   a. Bones of the orbit
   b. Ocular anatomy
      i. Tear film
       1. Cornea
          a. Epithelium
          b. Bowman’s layer
          c. Stroma
          d. Descemet’s membrane
          e. Endothelium
          1. Limbus
          2. Sclera
       3. Conjunctiva
          a. Bulbar conjunctiva
          b. Conjunctival fornix
          c. Palpebral conjunctiva
       4. Anterior chamber
       5. Posterior chamber
       6. Vitreous body
       7. Pupil
       8. Ciliary muscle
       9. Zonules
       10. Crystalline lens
   11. Uvea
      a. Iris
      b. Ciliary body
      c. Choroid
   12. Adnexa
      a. Eyebrow
      b. Conjunctiva
      c. Palpebrae
      d. Lacrimal system
   13. Extraocular muscles
      a. Superior rectus
      b. Inferior rectus
      c. Medial rectus
      d. Lateral rectus
      e. Superior oblique
      f. Inferior oblique
   14. Optic Nerve
1. Ocular Physiology
   a. Corneal physiology
   b. Lacrimal dynamics
      i. Production
         1. Goblet cells
         2. Lacrimal gland
         3. Meibomian gland
      ii. Drainage
   c. Aqueous dynamics
      i. Production
      ii. Drainage
   d. Physiology of the Iris
   e. Ocular motility
   f. Accommodation
   g. Photopic vision
   h. Scotopic vision
   i. Binocular vision
   j. Visual fields

7. Ocular Disorders
   a. Refractive Errors
   b. Astigmatism
   c. Presbyopia
   d. Strabismus
   e. Amblyopia
   f. Cataract
   g. Disorders of the skin and lids
      i. Blepharitis
      ii. Chalazion
      iii. Dermatochalsis
      iv. Ectropion
      v. Entropion
      vi. Ptosis
   h. Disorders of the conjunctiva
      i. Conjunctivitis
         1. Allergic conjunctivitis
         2. Bacterial conjunctivitis
         3. Giant papillary conjunctivitis
         4. Viral conjunctivitis
      ii. Pinguecula
      iii. Pterygium
   i. Disorders of the cornea
      i. Arcus senilis
      ii. Corneal dystrophy
      iii. Keratitis
      iv. Keratoconus
      v. Neovascularization
      vi. Corneal ulcer
   j. Disorders of the Anterior Chamber
      i. Glaucoma
      ii. Hyphema
      iii. Hypopyon
      iv. Narrow angles
   k. Disorders of the iris and pupil
      i. Anisocoria
      ii. Argyll Robertson’s syndrome
      iii. Iris synechiae
      iv. Marcus Gunn pupil
      v. Uveitis
   l. Disorders of the retina
i. Retinopathy
  ii. Age-related macular degeneration
  iii. Retinal detachment
m. Disorders of the optic nerve
  i. Cupping
  ii. Optic neuritis
  iii. Papilledema

8. Basic examination techniques
a. Applanation tonometry
b. Color vision test
c. Corneal topography
d. Cross cover test
e. History
f. Hirschberg test
g. Keratometry
h. Lensometry
  i. Ocular motility
  j. Pachymetry
k. Pupil evaluation
l. Refractometry
m. Retinoscopy
n. Schirmer’s test
o. Slit-lamp examination
p. Visual acuity
  i. Snellen chart
  ii. Jaeger chart
q. Visual fields
  i. Amsler grid
  ii. Confrontation fields
  iii. Perimetry

9. Basic overview of ophthalmic surgery
10. Basic overview of ophthalmic pharmacology
11. Basic overview of ophthalmic medical terminology
12. Corrective lenses
  a. Spectacle lenses
  b. Contact lenses
  c. Prescription for lenses
  d. Scope of practice

Resources

Resources Other
Alcon https://www.myalcon.com/tools-resources/patient-education/
American Optometric Association http://www.aoa.org/patients-and-public/caring-for-your-vision/contact-lenses?sso=y