Course Name: Biology of the Visual System
Course Number: OPHT-V783
Credits: 2 credit hours
Time and Place: Spring Semester (TBD) Tuesday 10:15am-12:00 pm Thursday 10:45am – 12:00pm (in person), Fesler Hall - Classroom 315
Course directors: Yoshikazu Imanishi (director) and Padmanabhan Pattabiraman (co-director)
Conditions: No pre-requisites for this course

Course Description

Biology of the Visual System focuses on the biochemical, molecular and cell biological basis of vision. Students will learn about the structure and function of various ocular structures. Blinding disorders and their treatments will be extensively discussed.

Introduction

Biology of the Visual System is designed as an elective course for graduate students enrolled in IUPUI Graduate Programs. The course covers a wide range of topics related to the biological processes and pathways required for the maintenance and function of the eye. Special emphasis will be placed on the areas of expertise available within the IUPUI campus. Those areas include the biochemistry, molecular biology, and cell biology of vision. The retina is the most accessible neuronal tissue in the central nervous system. Various state of the art techniques have been applied to gain insight into the neurobiological basis of vision, which will be covered extensively throughout the course. Anatomy of various regions of the eye and their functions will be discussed in detail. Those regions include the anterior chamber, cornea, lens, retina, and associated vascular structures. Disruption of their structures and functions can lead to impaired vision in diseases including corneal blindness, cataract, glaucoma, diabetic retinopathy, age-related macular degeneration, inherited blindness, and ocular cancer. About 50% of the lectures will be dedicated to the discussion of their molecular basis, possible cures and treatments. The students will be exposed to the technologies that are actively used in vision research laboratories, optometry, and ophthalmology clinics. In addition to lectures, the most contemporary topics will be discussed through journal club.

Course-level Student Learning Outcomes:

After completion of the course, students will be able to do the following

- Explain the roles of neurons in the retina and brain involved in the visual and non-visual perception of light, along with the structures and functions of various ocular structures including anterior chamber, cornea, lens, and retina.
- Critically examine the molecular basis of diseases such as corneal blindness, cataracts, glaucoma, diabetic retinopathy, age-related macular degeneration, and inherited blinding disorders.
- Analyze contemporary technologies related to basic and clinical vision sciences, and evaluation of scientific literature taking advantage of these technologies.

- Evaluate the design of published research to address questions related to contemporary vision sciences using critical thinking skills developed in the class.

Course Materials

Course materials will be provided on the Canvas site. Those materials include lecture slides, peer-reviewed articles, and book chapters.

Assessment of learning:

Following is the breakdown of how assessments contribute to the final course grade:

Exam I (Midterm)	30%
Exam II (Final)	30%
Journal Club Presentation	30%
Attendance and Participation	10%

Midterm and Final Exams (30%, 30% for total of 60%)
There will be **two** exams conducted during the course, including the final. The first exam accounts for 30% of the final course grade and will cover the topics relevant to the first half of the course. The final exam accounts for 30% of the final course grade and will cover the topics relevant to the second half of the course. To excel on the exams, students should be willing to extensively review the course material and to pay particular attention to how the material integrates both with biological principles and the material they have learnt from their course. Exams consist of multiple-choice questions and essays. The questions will be written to challenge and test the **critical thinking skills and subject mastery**.

Journal Club Presentation (30% of Course Grade)
The students are expected to select a primary research article published within the past one year relevant to the course contents. Based on the selected paper, the student needs to prepare a 25 minutes presentation and 10 minutes Q & A session. The presentations will be evaluated by the course directors based on several criteria (evaluation form at the end of this syllabus).

Attendance and Participation (10% of Course Grade)
Attendance will be taken at the beginning of the course. The students are expected to actively participate in the discussion by giving questions relevant to the subject matter.

Grades and Grading Scale

Student enrolled in a degree-earning graduate program must have a minimum overall 3.0 graduate GPA. For any program that this course may be required, a minimum grade of B is required.

Letter Grade	Mastery Level	Subject Mastery	Predicted Effort
A (100 – 90%)	Outstanding	• Fully able to understand the concepts, critically analyze research data, and present it in a very comprehensive manner. • Has a complete grasp of the papers presented in the journal club. • Presents the limitations of the papers and propose inventive experimental design to improve the papers.	• Student always seeks assistance as needed. • Quizzes are completed to an exceptional standard. • All course work completed and handed in on time • All course materials read and extra literature reviewed
B (89.99 – 80 %)	Good	• Able to understand the concepts and present it in a comprehensive manner. • Critically evaluate and analyze research data. • Comprehend the limitations of the study	• Student seeks assistance as needed • Quizzes completed to an high standard • All coursework completed and handed in • All course materials read and extra literature reviewed as necessary
C (79.99 – 70%)	Competent	• Mostly able understand the concepts and present it • Evaluate and analyze research data and present the scientific concepts • Mostly comprehends the limitations of the study.	• Student seeks assistance as needed. • All assignments completed and handed in. • Course materials are read • Extra literature mostly reviewed as required
Any grade lower than a C (less than 69.99%)	Incomplete	• Unable to understand the concepts and/not able to present them well. • Unable to critically critique and analyze research data • Does not comprehend the limitations of the study.	• Failure to seek assistance • Subject materials not reviewed • Extra literature not reviewed as required • Excessive absences

Course Schedule

Dates (tentative)	Topic	Instructor
1/10/2023	Overview of the course, photoreceptor cell and their function	Imanishi
1/12/2023	Disorder causing photoreceptor degeneration	Imanishi
1/17/2023	Neural Processing in the retina	Sharma
1/19/2023	Visual Processing in the brain	Das
1/24/2023	Optic Neuropathy, Ganglion cells	Das
1/26/2023	Structure and function of Cornea/Corneal disorders and their treatments	Liu
1/31/2023	Structure and function of Lens/Cataract and its treatment	Yung
2/2/2023	Advance in the ocular stem cell based therapy and retina prosthetics	Sharma
2/7/2023	Journal Club1	Imanishi/Pattabiraman
2/9/2023	Midterm Exam	
2/14/2023	Regulation of ocular pressure in the eye	Mao
2/16/2023	Glaucoma related topic	Mao
2/21/2023	Ocular Cancer (or Pediatric Ophthalmology related topic, vascular system in the eye)	Corson
2/23/2023	Age related macular degeneration	Corson
2/28/2023	Glaucoma related topic	Pattabiraman
3/2/2023	Ocular pharmacology	Pattabiraman
3/7/2023	Ocular Immune system	Bhatwadekar
3/9/2023	Diabetic Retinopathy	Bhatwadekar
3/21/2023	Journal Club2	Imanishi/Pattabiraman
3/23/2023	Final Exam	

Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change without advanced notice.

Evaluation – Journal Club Presentation

Name of Student: _____ Title of Talk: _____

Directions…….circle a descriptor and make specific comments in space provided

1. Introduction, including rationale and significance of the topic were:

   EXCELLENT(12pts) GOOD(10pts) POOR(8pts)

2. The experimental methods and results were:
   CLEAR(12pts) SOMETIMES UNCLEAR(10pts) OFTEN CONFUSING(8pts)

3. Was the relationship of the results to the conclusions clear? Did the speaker include other possible interpretations and critical assessment of the data?

   WELL DONE(12pts) AVERAGE(10pts) POOR(8pts)

4. How well did the student answer the questions?

   EXCELLENT(12pts) REASONABLE(10pts) POOR(8pts)

5. Was the organization of the talk logical?

   Were the transitions between slides well thought out?

   LOGICAL(12pts) AVERAGE(10pts) RANDOM(8pts)

6. Was the talk paced so as to hold your interest? Was sufficient time allotted to each section?

   ALWAYS(12pts) OFTEN(10pts) GENERALLY NOT(8pts)

7. Were the slides clear? CLEAR(12pts) SOME MISTAKES(10pts)
   NUMEROUS ERRORS, BUSY, HARD TO READ(8pts)

8. Did the speaker have distracting mannerisms which may be corrected (max 6 pts for no distracting manners)?

9. Additional comments:

10. Numerical Grade Please (A, 90-100; B, 80-89; C, 70-79; F, below 70)

Numerical Grade: _____ Faculty/student signature _____