# BIOL 4010, *Advanced Genetics*- Syllabus

**Summer Semester II 2019, Special Topics in Biology**
**Undergraduate Section A (CRN# 51640, 4 Credit hours)**
**Graduate Section A (CRN# 51642, 4 Credit hours) & Supplemental***
**Department of Biology, College of Science & Math, Valdosta State University**

**Lecture (BC 1202 & 2071): T & R 11:10 a.m. – 2:10 p.m.**

**Laboratory (BC 2071-2073): T & R 2:30 p.m. - 5:20 p.m.**

**Instructor:** Dr. Brian C. Ring
Office: BC 2084
Office hours: **W** 12:00 p.m. – 3:00 p.m.
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**Pre-Requisites:** BIOL 3200 or permission of instructor.

**Course Description:** This course is an advanced exposure to 1 of 3 divisions of introductory genetics (BIOL 3200) known as transmission genetics (aka Mendelian genetics). In other words, the study of how traits are transmitted (inherited) across generations at the organismal level. Lecture will be composed of discussions of modes of inheritance as previously discovered in model organisms such as the fruit fly, *Drosophila melanogaster*. This includes basic terminology, history, and problem solving in transmission advanced genetics. The laboratory is the major focus of this course as students will perform guided genetic crosses and make predictions on modes of inheritance in a variety of model organisms. In addition, students will engage in inquiry-based research by designing their own cross scheme to uncover the mode of inheritance and chromosomal location of a mutant allele in the fruit fly.

**Course Outcomes:** Upon completion of this course the student should be able to:

**1)** Comprehend how traits are transmitted from genotype to phenotype across generations through predictable inheritable patterns of transmittable gametes (**BO3, BO4, & GE4, & GE7**);
**2)** Understand how genetics of inheritable chromosomes (nuclear inheritance) containing different alleles of genes interact to produce form and function of organisms (**BO3, BO4, & GE4**);
**3)** Develop practical laboratory knowledge, skills, and abilities through both guided and inquiry-based experimentation employing genetic breeding techniques amongst several model organisms (**BO1, BO4, GE5 & GE7).**

These course outcomes support the VSU Biology Department Outcomes # 1, 3, & 4 and the University General Educational Outcomes # 4, 5 & 7 as listed in the VSU Undergraduate Catalogue (see below).

**VSU Biology Department Objectives:**

**BO1.** Develop and test hypotheses, collect and analyze data, and present the results and conclusions in both written and oral formats.
**BO3.** Demonstrate an understanding of the cellular basis of life.
**BO4.** Relate the structure and function of DNA/RNA to the development of form and function of the organism and to heredity.

**VSU General Educational Outcomes:**

**GE4.** Students will express themselves clearly, logically, and precisely in writing and in speaking, and they will demonstrate competence in reading and listening.
**GE5.** Students will demonstrate knowledge of scientific and mathematical principles and proficiency in laboratory practices.
**GE7.** Students will demonstrate the ability to analyze, to evaluate, and to make inferences from oral, written, and visual materials.

**NOTE:** Graduate students enrolled in the co-listed BIOL 6010 course will receive a supplementary syllabus. Basically graduate students will help us keep track of class data so it is important that we all communicate.

## Required Materials:

**Text:**

**1)** No specific text required, but you must maintain good lecture notes for quizzes and final!
**2)** Optional: An Introductory Genetics textbook (e.g. BIOL 3200 course you had) or there are lots of great resources online
**3)** In addition your instructor may post reading materials on the course BlazeView website. **TBA**

**Laboratory Manual:**

**1)** None; mainly handouts or laboratory protocols and papers provided or posted on Blazeview. **TBA**
**2) Laboratory Notebook: MUST** maintain a good, well organized lab notebook for weekly checkoff! Data collection sheets will be provided but must be maintained in your notebook.

**Graded Course Components:** Your final grade will be based on your performance and participation in lecture and the laboratory as outlined below.

**Lecture/Discussions:** (40%) Students will be graded on their performance during lecture time based on the following criteria: 6 weekly quizzes worth 30% of this category and 1 cumulative final exam worth 10% of this category (see Table below). Note that 1 lowest graded quiz will be dropped from final grade calculation. Quizzes and the final are composed of primarily multiple choice and short answer problem solving (e.g. genetic cross schemes).

Participation is key to the success of this course. Some lecture will be provided by your instructor, but the majority of the time is left for discussion or problem solving. Therefore, attendance in this course is mandatory and missed course time equivalent to greater than 20% (~5 days) will result in a failing grade as per University policy. **ABSOLUTELY NO LECTURES OR QUIZZES CAN BE "MADE UP."**

**Laboratory:** (60%) The majority of our time in this course will be spent in the laboratory performing genetic crosses. Although we are scheduled to meet T/R for labs, the lab will be open during the week for you and your partner to set up and score your fly genetic crosses as you collect data in your dedicated laboratory notebook. We will also collect data on other model organisms such as corn (maize) and c-ferns demonstrating different modes of inheritance. To facilitate your data weekly notebook checks of your progress by your instructor are required (20%, rubric provided). Finally, 3 papers are assigned that cover the majority of your work (40%) and are categorized as follows:

**Paper 1:** Results of Guided Crosses in D. melanogaster, fruit flies. Due date **TBD**
**Paper 2:** Results of Other Model Crosses demonstrating modes of inheritance. Due date **TBD**
**Paper 3:** Results of your Inquiry-Based crosses to prove the location of a mutant fly allele. Due date **TBD**

**Note:** As a class, we will develop a template paper with standard format of Introduction, M & M, Results (Figures & Tables), and Conclusions/Discussion. A template will standardize your papers to simplify the writing process. Since you will also work in pairs, your papers may be a group effort and the computer lab is always available on the third floor for you to write up your results.

**Grade Calculation & Distribution:** Final grades will be based on categories as percent of total and will be made available in class and/or BlazeView. See below chart.

| Grade Calculation | | Grade Distribution | | |
|---|---|---|---|---|
| **Category** | **Percent Total** | **Letter** | **Percentage** | |
| Quizzes 1-6 | 30% | A | 90-100% | |
| Notebook 1-6 | 20% | B | 80-89% | |
| Papers 1-3 | 40% | C | 70-79% | |
| Final Exam | 10% | D | 60-69% | |
| | | F | ≤ 59% | |

**Notes on grading:** Students should note that a grade of "A" in this course represents an exemplary command of the material covered. To obtain this grade of excellence, it is recommended that students study daily, be prepared to participate in class discussion and laboratory sessions, and clarify with their instructor any problems regarding course material, as they arise. Additionally, the instructor may implement an overall curve based on class performance at the **end of the course**.

**Mid-term and Attendance:** Students will have several lecture and laboratory assignments to determine their overall grade by the Mid-Term and decide whether to withdraw at the deadline date (**7/5/2019**).

**Student identification**: Students should have in their possession at all times their VSU student identification card. In order to verify the identification of students officially enrolled in the course, it is the instructor's prerogative to request official student photo identification cards at any time during lecture or during exams.

**Academic Dishonesty (e.g. cheating or plagiarism):** A student cheating or plagiarizing will be penalized by receiving a zero for the assignment and will be reported to the dean of students. Refer to the Student Code of Ethics in the VSU Student Handbook.

**Privacy Act (FERPA):** The Family Educational Rights and Privacy Act (FERPA) prohibit the public posting of grades by Social security number or in any manner personally identifiable to the individual student. No grades can be given by email or over the telephone, as positive identification cannot be made by this manner.

**Students with Disabilities:** Students requesting classroom accommodations or modifications because of a documented disability must let me know and must also contact the Access Office for Students with Disabilities located in room 1115 Nevins Hall. The phone numbers are 245-2498 (voice) and 219-1348 (tty).

## TENTATIVE LECTURE & LABORATORY OUTLINE:

| Week: | Date: | Topics: | Post/ Paper: | Lab Topics |
|---|---|---|---|---|
| 1 | June 13 (R) | Course Introduction & Objectives | **puzzle** | **L1:** Introduction, Fly Lab Prep, Phenotyping |
| | | | | Inquiry Based Experiments |
| 2 | June 18 (T) | Sex-Linkage & Autosomal Linkage | **post** | **L2:** X vs Autosomal Linkage Mapping (Inquiry Selection) (P → F1 → F2 set up) |
| | June 20 (R) | Genetic Recombination & Mapping **Quiz 1** | **--** | **L3:** 2-PT & 3-PT Mapping (F1 → F2 set up) |
| 3 | June 25 (T) | Continued | **post** | **L4:** 2-Gene Interactions & Monohybrids (from Lab 2) (F1 → F2 set up) |
| | June 27 (R) | Monohybrids Among Flies & Plants **Quiz 2** | **--** | **L5:** Albino Plants Set up **Corn Cob Monohybrids** |
| 4 | July 02 (T) | Dihybrids Among Flies & Plants **Quiz 3** | **post** | **L6:** Dihybrids (F1 → F2 set up) **Corn Cob Dihybrids** |
| | **July 04 (R)** | **Holiday- NO CLASS** | **--** | **NO LAB!** |
| | July 05 (F) | **Midterm- Last Day to Drop** | **--** | |
| 5 | July 09 (T) | Exploring Extensions of Mendelian Genetics in Flies | **post** | **L7:** Continue Crosses & Data Collection (from Lab 4) **F2, F5, F8 Corn Plants** |
| | July 11 (R) | Cont. **Quiz 4** | **--** | **L8:** Cont. Crosses & Data Collection **C-Fern Dot Mutants** |
| 6 | July 16 (T) | Population Genetics & Selection | **post** | **L9:** Cont. Crosses & Data Collection |
| | July 18 (R) | Cont. **Quiz 5** | **--** | **L10:** Cont. Crosses & Data Collection |
| 7 | July 23 (T) | Exploring Other Model Organisms | **Post & Paper** | **L11:** Cont. Crosses & Data Collection **Mangrove Killifish Mutants** |
| | July 25 (R) | Cont. **Quiz 6** | **--** | **L12:** Finish Up |
| 8 | July 30 (T) | Catch-up & Review | **--** | **L13:** Lab Clean up |
| | **Aug. 25 (R)** | **Final Exam** | | **10:15 – 12:15** |

**NOTES:** Papers, protocols, and lab handouts will be posted on D2L Blazeview. Various practice problems may be posted as well at the beginning of each week. Lab schedule subject to change.
The following major goals will be accomplished in the laboratory and assessed on each lab exam:
1) Practice and employ advanced genetic crossing skills under guidance of your instructor (Paper 1).
2) An inquiry based set of crosses you will design, set up, collect data, and report (Paper 3).
3) Genetic analysis of crosses in other model organisms as they grow or are analyzed in lab (Paper 2).