BIOLOGY 0848. DNA: Friend or Foe – Section 001 (3.0 credits).
Spring Semester. 2019. 9:00 AM - 9:50 MW. Room 332 Biology LS Bldg.
Lecture dates: 1-14-19 to 4-29-19.

DNA: Friend or Foe is a General Education course. First-year students who first enroll at Temple University at any time after the Fall 2008 semester must complete the GenEd curriculum, which consists of courses in 9 different areas. However, core students (who entered Temple before Spring 2009) can use Gen Ed courses to satisfy their Core requirements. DNA: Friend or Foe is classified as a Science B course in the core curriculum. Gen Ed students cannot take core courses such as Human Biology at Temple to satisfy their Gen Ed requirement.

There are no prerequisites or co-requisites for Biology 0848.

DNA: Friend or Foe is an introduction to the principles of heredity and the genetic material that is responsible for heredity. DNA: Friend or Foe is an inquiry-based course that will link traditional genetics and genetic engineering concepts of modern biology in order to understand how modern biology affects our daily lives, and how it may impact future generations. This course will develop critical thinking, promote intellectual curiosity in the life sciences, and stimulate student-student interactions. By using tools of investigative science, students will examine basic concepts and applications of recombinant DNA technology. Topics will include DNA in modern forensic analysis, basic scientific and sociological aspects of human genetic information including genetic polymorphisms and disease, biological terrorism, embryonic and adult stem cells and therapeutic cloning, in vitro fertilization and pre-implantation genetic analysis, ethics of human and animal cloning, genes and behavior, pharmacogenetics and rational drug design, proteomics, and emerging infectious diseases. Other topics will include human gene therapy, susceptibility genes for neuropsychiatric and neurodegenerative disorders, plant biotechnology including insect-resistant plants, genetically modified foods, and bioremediation and phytoremediation. Finally, bioethical considerations of genetic information will be explored in detail throughout the course.

Lab for DNA: Friend or Foe meet on Fridays from 9 – 10:50 AM. Lab meets in Room 151 Biology Life Sciences Bldg. (SW quadrant), 12th and Norris Streets. Entrance is on 12th Street or from Bell Tower side with a Temple ID card. Labs will meet once a week for one hour and 50 minutes in room 151 Biology Life Sciences Bldg. during the semester. However, the first lab of the semester will meet during the second week of the spring semester. Mandatory safety training will be held during your first lab. Please remember that attendance for lab is mandatory. If you miss the Thursday morning lab and wish to make up the lab please contact Dr. Craig Brumwell. Dr. Brumwell is the lab coordinator for DNA: Friend or Foe. He will teach both lab sections for the course. His office is Room 248K Biology Life Sciences Bldg.

Instructor: Gregory Smutzer, Ph.D. Office: Biology Life Sciences Building, Room 301 (or 352), Biology Life Sciences Building, Temple Main campus. Phone: (215) 204-1236, e-mail: smutzerg@temple.edu.

Textbook: No textbook is required. A reading assignment on DNA fingerprinting will be posted on the class website.

Grading: This course has both lecture and laboratory component. The lab will make up 26% of the course grade.

The lecture component will comprise 74% of your final grade. For the lecture component, there will be one midterm exam during the session and a final exam. Both exams will have almost equal weight, and both exams will comprise 69% of your final grade. Exams will be multiple-choice, true-false and discussion questions. The final exam will NOT be comprehensive.

The remaining 5% of your lecture grade will be from a genetics asst., an in-class assignment, and two announced quizzes. Finally, remember that a grade of C minus or better is required to receive credit for this course.

<table>
<thead>
<tr>
<th>Mid-term exam</th>
<th>32.0%</th>
<th>Approx. 65 MC and TF questions. Wednesday, March 13, 2019</th>
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<tbody>
<tr>
<td>In class asst.</td>
<td>1.0%</td>
<td>(One in-class assignments per semester, following midterm) March 18</td>
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<tr>
<td>Final Exam</td>
<td>37.0%</td>
<td>(not comprehensive, approximately 120 MC and TF questions)</td>
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<tr>
<td>Genetics Assignment</td>
<td>2.0%</td>
<td>Genetics Problem Set due Monday March 25th</td>
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<tr>
<td>DNA Fingerprint Asst.</td>
<td>2.0%</td>
<td>DNA Fingerprinting Problem Set due on Monday April 29, 2019</td>
</tr>
<tr>
<td>Lab grade</td>
<td>26.0%</td>
<td>(Attendance at labs is mandatory). Labs start on Friday, Jan 25th.</td>
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</table>
Grading Scale [curve] for Final Grade. Incomplete grades (I grades) are not normally given in this course. If you cannot complete the course, you will need to contact the lecture instructor for receiving an incomplete grade.

For test grade, take your score, and divide by the total number of points x 100. Plus-minus grading will be used for this course. The curve is shown below:

- 88% - 100% A
- 78% - 87.9% B
- 55% - 77.9% C
- 50% - 54.9% D
- <50% F

Extra credit. Extra-credit cannot be extended to individual students. Extra-credit questions for all students will be included in the lecture exams unless excessive talking occurs during lecture.

Fire Alarm during exam. In case of a fire alarm, place your exam face down on your desk, and immediately exit the room.

Lecture Attendance. Attendance at the lecture is strongly recommended.

Makeup exams: If the hourly exam is missed due to a medical or legal reason, you MUST take the exam during the two hour final exam time – immediately after you have completed the lecture exam. (Monday, May 6, 2019 between 8:00 AM and 10:15 PM). There will be no exceptions. In order to take a make-up exam, written documentation will be required during the final exam time. Written documentation includes medical, dental, and legal excuses from your physician, dentist, or lawyer. Notes from PAs, chiropractors, auto repair technicians, being a contestant on American Idol, public transit problems, and podiatrists are generally not accepted.

I will need a copy of the documentation for my files. PLEASE UPLOAD YOUR EXCUSE TO OWLBOX BEFORE THE FINAL EXAM ON MAY 6TH. If a medical, dental, or legal excuse is not presented by the student, then a missed exam will result in a grade of zero percent. All makeup exams will be multiple-choice, true-false, short answer, and completion questions. Makeup exams will include very few true-false questions, and have a limited number of multiple-choice questions.

Withdrawals: Monday, January 28th is the last day to withdraw from a course (without a W grade). Monday, March 18th is the last day to withdraw from graduate and undergraduate courses (with a W grade).

Makeup Quizzes: There will be no makeup quizzes, or makeups for the two in-class assignments. Please present a valid excuse for any missed quizzes or in-class assignments, and your grade for the missing quiz or assignment will be prorated. A committee of myself and your lab instructor will determine the appropriateness of all excuses.

Final Exam: All classes end Monday, April 29. Tuesday, April 30 and Wednesday, May 1 are study days Final exam for lecture is on Monday, May 6th from 8 AM to 10 AM. The final exam for lecture will not be comprehensive. The final exam will cover the second half of the course, along with the reading assignment and online video. We cannot administer the exam earlier (or later) than the scheduled date for anyone who is registered for the course.

Office hours: I will be in Room 301 BLS on Mondays, Wednesdays, and Fridays from 2 to 4 PM during the semester. Please e-mail me if you wish to come by at another time.

Cell Phones: Room 332 is a Quiet Room. The first room in every building is a quiet room between the hours of 7 AM and 7 PM. Please have consideration for your fellow students. Please turn off all cell phones and electronic devices before the start of each class. Also, please start up any laptop computers before class starts. In addition, try not to leave and re-enter the classroom during lecture. The “Cell Phone Curve” will be in effect from Wednesday, January 18 until the end of the semester.

Blackboard and Problem Sets: Depending on the subject matter, most multiple-choice questions with answers will be posted onto the Temple Blackboard site (http://tuportal.temple.edu) to help you study. To reach Blackboard, you must use the link mentioned above. You MUST have a temple.edu e-mail address to access Blackboard. Your USER NAME in your e-mail address is your logon name. Please note that these problem sets are supplemental, and are to help you learn. We won't go over the multiple-choice questions in class. If you are unsure of any answers, please ask in class or during office hours. You can also post any questions on the DISCUSSION BOARD in the communication section of Blackboard Please type in the entire question so that I can check your answer. You can post
questions anonymously. Exam questions will likely include questions from the multiple-choice questions.

**Academic Assistance.**

The math-science center is located on the second floor of 1800 Liacouras Walk, extension 1-8466. This center provides instruction for the basic sciences, and preparation for exams. In addition, your teaching assistant can help with lecture or lab questions.

**Temple e-mail account.** You can obtain an e-mail account online. Go to: [http://www.temple.edu/cs/](http://www.temple.edu/cs/), and press "activate account." You can instantly obtain a Temple e-mail account.

**Accommodation.**

Any student who has a need for accommodation based on the impact of a disability should contact Disability Resources and Services at 100 Ritter Annex (003-00), 1301 Cecil B. Moore Ave., Philadelphia, PA 19122. The phone number is 215-204-1280. Accommodations for exams and quizzes will be made for students with documented disabilities.

**Academic Integrity**

All relevant Temple University policies regarding Academic Integrity must be followed. These policies include no cheating, no plagiarism and reporting any knowledge thereof. Plagiarism is the act of presenting the intellectual work of others as if it were one's own. Please consult the Student Handbook, or the appropriate webpage [http://oll.temple.edu/ih/writing/plagiarism2.htm](http://oll.temple.edu/ih/writing/plagiarism2.htm) for further information.

**Student Learning Outcomes.**

The student will demonstrate knowledge of fundamental information concerning DNA structure and function, proteins, genetics, biotechnology, bioterrorism, and bioethics. **Assessment:** Basic knowledge of these facts, processes, and concepts will be quantitatively assessed through the use of lecture quizzes, lecture exams, lab reports, class presentations, and lab quizzes.

**Final Grades.**

If you feel that your final grade is incorrect, we will recheck all of your grades to identify any potential errors. Please make sure that you fill in your name correctly on the blue Scantron sheets to minimize any grading errors. As a safeguard, you **should routinely examine your posted exam, quiz, and lab grades on the course Blackboard site** during the semester. If you are not satisfied with your final grade for the course, please contact the Biology Dept. ombudsperson, Room 159 B TLS.

**DNA: Friend or Foe – Spring 2019. The reading Assignment and Video are Posted on Last Page of Syllabus.**

**Module One.** General background and Bioethics

- Introduction to the Scientific Method
- Bioethics
- Nuremburg Code and Informed Consent
- Tuskegee, Willowbrook, and Guatemala CIA programs
- Project MKULTRA studies
- Edgewood, Md. Arsenal studies
- Holmsburg prison studies and Retin A

**Module Two.** Brief introduction to Proteins

- Proteins encoded by genes
- Primary, secondary, tertiary, quaternary structure of proteins
- Protein function
- Proteins and Membranes
- Examples of proteins – Hemoglobin, myoglobin, keratin, thaumatin.

**Module Three.** Biological warfare

- History of Biological Warfare
- Micro-organisms and Proteins - their use in Biological Warfare
- Anthrax and anthrax toxin
- Tularemia, botulism, Ricin, Smallpox
- Cholera
Salmonella as a bioweapon- 1984 Rajneeshee bioterror attack
Aflotoxin and cancer
Modified proteins and their use in nerve gas defense

**Module Four.** DNA structure & Chromosomes
- Nucleic acids - Structure of DNA and RNA
- DNA methylation
- Packaging of DNA in chromosomes, Chromosome structure
- Telomeres and Cellular Aging
- The cell cycle and mitosis.
- Brief overview of meiosis.
- Genetic mechanisms that allow genetic diversity

**Midterm Exam. Wednesday, March 13, 2019 in Bio 332.**

**In class Assignment One. Monday, March 18, 2018.**

**Module Five.** Brief overview of Mendelian Genetics, Non-Mendelian Genetics, and Human Genetics
- Mendel’s Law of Segregation
- Test Crosses
- Mendel’s Law of Independent Assortment
- Non-Mendelian Genetics
  - Genes and behavior
  - Allele silencing and Prader-Willi syndrome
- Human Genetics
  - Autosomes and Sex chromosomes
  - Autosomal recessive genes
  - Autosomal dominant genes
  - X-linked recessive genes
  - Sex-influenced genes
  - CAIS
  - XX males and XY females, unequal crossing over between sex chromosomes.
  - Swyer syndrome

**Genetics Assignment (Problem Set) due on Monday, March 25, 2019**

**Module Six.** DNA and Genomic Medicine
- Prenatal Diagnosis and Pre-implantation genetics
- The Genetics of Sex Determination
- Genetic Testing
- Human DNA tests, Genetic Testing (Breast cancer and BRCA1 etc).
- Human neurological disorders & genetics – Alzheimer’s Disease and Apo e4 allele
- Parkinson’s Disease and alpha-synuclein,
- Huntington’s Disease and genetic testing.
- Ancestry tests and SNPs
- Manhattan Plots and Genetic Disorders
- GINA and Genetic discrimination

**Module Seven.** Molecular Genetics
- An Introduction to Genes and Genomes
- Mitochondrial genome
- DNA synthesis and DNA polymerase
- Analysis of SNPs – taste blindness, asparagus odor
- Genetic Code
- RNA polymerases
- Gene transcription and gene regulation
- Transposons
- DNA methylation
- Protein Translation
Module Eight. Intro to Biotechnology
Classic biotechnology
Recombinant DNA technology
Restriction Enzymes
DNA ligases
Plasmids
Gene cloning
Reverse Transcriptases
PCR
HUGO
Automated DNA sequencing
NextGen DNA sequencing

Module Nine. DNA Fingerprinting
RFLP analysis and DNA Fingerprinting
VNTRs, STRs
Modern DNA fingerprinting with PCR
CODIS
Forensic DNA Analysis
  Narborough village case
  Sam Shepherd Case
  DNA profiling and open data personal genomics databases
  Golden State Killer case
  Innocence Project
mtDNA fingerprinting
Y chromosome analysis and T. Jefferson
Supreme Court decision and DNA collection

Module Ten. Applied Molecular Biology & Applications of Recombinant DNA technology
Proteins as Gene Products, Proteomics
Animal Biotechnology and recombinant proteins
Recombinant vaccines
Mammalian cloning and genomic imprinting
Microbial Biotechnology and production of recombinant proteins
Bioremediation using bacteria and plants
Plant Biotechnology, Ti plasmid and gene transfer in plants
Genetically modified foods – Starlink corn, Bt plants, food allergies
Golden Rice

Module Eleven. Medical Biotechnology
Introduction to Medical Biotechnology
Embryonic Stem Cells and Stem Cell Therapy
Therapeutic cloning and somatic cell nuclear transfer
Mitochondrial DNA replacement, and three-parent children
Should humans be cloned?
Adult stem cells – umbilical cord and hematopoetic stem cells
Ethics of Stem Cell Therapy
Human gene therapy
Human vaccine production
CRISPR (clustered regularly interspaced short palindromic repeats)
Gene editing and HIV, designer babies.

Read “The Wrong Man” chapter on Canvas

Video Assignment on CRISPR
Module Twelve. Pharmacogenomics and Rational drug design
Primaquine, malaria, and G6PD
Role of Cytochrome P450 in drug breakdown
SSRI and depression
Herceptin and cancer immunotherapy
Sovaldi [nucleotide analog prodrug] and Hepatitis C, cost of drug treatment.
Gleevec and CML
6-mercaptopurine (6-MP) and childhood leukemia
Pharmacogenetics and SNPs.
Personalized medicine and Genomic medicine.

Module Thirteen. Selected topics
HeLa cells – recent genome sequencing, bioethical concerns
Mo Cell line and patenting cell lines
Gene Patents
Patenting living organisms - Oncomouse
Confidentiality Agreements

DNA Fingerprinting Assignment due Monday, April 29, 2019 (last day of class)
Final Exam: Monday May 6, 8:00 AM - 10:00 AM in Bio 332. Exam not comprehensive

<table>
<thead>
<tr>
<th>9:00-9:50</th>
<th>M W F</th>
<th>Monday</th>
<th>5/6</th>
<th>8:00-10:00</th>
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1. **Remember**: Don’t miss lab without a valid excuse. Missing two labs without a valid excuse will LOWER YOUR FINAL GRADE BY ONE LETTER GRADE. MISSING MORE THAN TWO LABS WITHOUT A VALID EXCUSE WILL RESULT IN A FINAL GRADE OF F.

2. **Remember**: If you missed the mid-term lecture exam with a valid excuse, you need to make it up immediately following the final exam, during the 2.25 hours that are scheduled for the final exam. Makeup exams will be taken after you finish your final exam.

3. **Remember**: You NEED TO bring a number two pencil for lecture exams. A pencil sharpener will be available for you to use.

One Reading Assignment from *When Science Goes Wrong*. Read for final exam

One Video Assignment.
2. Video Assignment on CRISPR and HIV – View for the final exam. 2:07 minute video.

Spring Semester Calendar

- Monday, January 14
- Monday, January 21
- Monday, January 28
- Monday, February 18
- Monday, March 4 - Sunday, March 10
- Monday, March 11
- Monday, March 18
- Thursday, March 28
- Thursday, April 4
- Monday, April 29
- Tuesday, April 30 - Wednesday, May 1
- Thursday, May 2 - Wednesday, May 8

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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Jan 14</td>
<td>Full Term 16-week Courses begin</td>
</tr>
<tr>
<td>Jan 21</td>
<td>Dr. Martin Luther King, Jr. Day (no classes held)</td>
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<tr>
<td>Jan 28</td>
<td>Last day to add or drop a Full Term 16-week course</td>
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<tr>
<td>Feb 18</td>
<td>Undergraduate midterm progress ratings begin</td>
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<tr>
<td>Mar 4-10</td>
<td>Spring Break (no classes held)</td>
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<tr>
<td>Mar 11</td>
<td>Undergraduate midterm progress ratings end</td>
</tr>
<tr>
<td>Mar 18</td>
<td>Last day to withdraw from a Full Term 16-week course</td>
</tr>
<tr>
<td>Mar 28</td>
<td>Priority registration for Summer 2019 begins</td>
</tr>
<tr>
<td>Apr 4</td>
<td>Priority registration for Fall 2019 begins</td>
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<tr>
<td>Apr 29</td>
<td>Full Term 16-week Courses end</td>
</tr>
<tr>
<td>Apr 30 - May 1</td>
<td>Study Days</td>
</tr>
<tr>
<td>May 2 - May 8</td>
<td>Final Exams for Full Term 16-week Courses. Final is 5/6.</td>
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