Laboratory Techniques in Biomedical Research
(BE T 197; Section 002; Schedule # -534934; 2 credits)

(Tuesday 1 hr lecture [3:00 – 4:00pm] and Thursday 3 hr laboratory [3:00 – 6:00pm])
Lecture in Hershey Center for Applied Research (HCAR)
Room 1100 & Laboratory in HCAR Suite 3100

Course Director: Kent E. Vrana, Ph.D.
Elliot S. Vesell Professor and Chair of Pharmacology
HCAR 3009
531-8285; e-mail: kvrana@psu.edu

Course Instructors: Kent Vrana, Ph.D., Lindsay Ryland, Melissa Gimbor

Teaching Assistants: Ed Stahl and Doug Dluzen

Course Advisor: Catherine Caruso, M.Ed.
Academic Placements Officer
Office of Educational Affairs
Penn State College of Medicine
500 University Drive, H073
Hershey, PA 17033
717-531-7579; email: ccaruso@psu.edu

Penn State
Harrisburg Contact: Katina M. Moten, M.A.
Sr. Undergraduate Studies Adviser
Division of Undergraduate Studies
Penn State Harrisburg
777 West Harrisburg Pike
Middletown, PA 17057
717-948-6604; email: kmm29@psu.edu

Program Objectives:
This dual listed, college credit course for highly advanced high school students is intended to provide an introduction to common biomedical research methodologies in a combination lecture/laboratory format. Specifically, students will receive “hands-on” instruction in digital pipetting, molarity calculations, pH measurements, centrifugation, milligram level reagent preparations, protein analysis, RNA/DNA extraction and quantification, gel electrophoresis and molecular weight determination and elementary statistical analysis. In addition, they will receive theoretical instruction in radioactivity determination, eukaryotic cell culture, and high-throughput genomic and proteomic technologies. Emphasis will be on experimental precision and
reproducibility. Therefore, one aspect of the grade assessment will be based on quantification of randomly assigned individual “unknowns”. It is anticipated that, at the end of the course, participants will be well well-prepared to undertake independent study projects and/or internships within biomedical research laboratories. Moreover, they will have prepared a practical experience portfolio to document their technical proficiencies. In addition, at the beginning of the course students will be assigned a current topic in biomedical research (generally a disease) and will prepare a 15 minute formal presentation on the use of laboratory technologies in understanding the pathogenesis and treatment of the disease. This presentation will be subjected to a combination of professor and peer evaluation.

**Program Requirements:**
Recommended Text: Basic Methods for the Biochemical Lab, M. Holtzhauer (Springer Lab Manual)

Schedule: 1 hour of lecture each week with 3 hours of laboratory

Grading: Grading will be based on a combination of class participation (25% including a student presentation), scheduled mid-term and final exams (50% equally weighted, non-comprehensive final), and laboratory notebook (25%).

Transportation: Students must be able to transport to the Hershey Center for Applied Research (HCAR) each week for 13 weeks (HCAR, 1214 Research Boulevard, Hershey PA 17033).

For Directions: [http://www.hersheyresearch.com/about-hcar-location.html](http://www.hersheyresearch.com/about-hcar-location.html)

**Class Size Limit:** 10 Total (2-3 students from each school)

**Course Prerequisites:** Biology
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<th>Date</th>
<th>Instruction Type</th>
<th>Instructor</th>
<th>Topic</th>
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<tr>
<td>9/2/10</td>
<td>Thursday</td>
<td>Lecture</td>
<td>Kent Vrana, Ph.D. Melissa Gimbor and Lindsay Ryland</td>
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<td>Introduction, Course Syllabus, Lab Notebooks</td>
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<td>9/7/10</td>
<td>Tuesday</td>
<td>Lecture</td>
<td>Melissa Gimbor</td>
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<td>Measurements and Statistics</td>
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<tr>
<td>9/9/10</td>
<td>Thursday</td>
<td>Lab</td>
<td>Melissa Gimbor/Ed Stahl</td>
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<td>Calculation of Variance and Error</td>
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<td>9/14/10</td>
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<td>Lecture</td>
<td>Kent Vrana, Ph.D.</td>
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<td>Molarity, Databases, Project Assignments</td>
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<td>9/16/10</td>
<td>Thursday</td>
<td>Lab</td>
<td>Kent Vrana, Ph.D./Ed Stahl</td>
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<td>Preparation of Solutions</td>
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<td>9/21/10</td>
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<td>Lecture</td>
<td>Kent Vrana, Ph.D.</td>
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<td>pH, Buffers, Centrifugation</td>
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<td>9/23/10</td>
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<td>Kent Vrana, Ph.D./Ed Stahl</td>
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<td>pH of Solutions, pH of Unknowns</td>
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<td>9/28/10</td>
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<td>Lecture</td>
<td>Renee Donahue/Ed Stahl</td>
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<td>Spectrophotometry and Cell Macromolecules</td>
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<td>9/30/10</td>
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<td>Lab</td>
<td>Renee Donahue/Ed Stahl</td>
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<td>Protein Standard Curve, Quantitation</td>
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<td>10/5/10</td>
<td>Tuesday</td>
<td>Lecture</td>
<td>Lindsay Ryland</td>
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<td>Proteins and Protein Isolation</td>
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<td>Tissue Homogenization</td>
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<td>10/12/10</td>
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<td>10/14/10</td>
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<td>10/19/10</td>
<td>Tuesday</td>
<td>Lecture</td>
<td>Rebecca Watts</td>
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<td>Protein Electrophoresis, Detection, and Western Blotting</td>
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<td>10/21/10</td>
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<td>Lab</td>
<td>Rebecca Watts/Ed Stahl</td>
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<td>Protein Electrophoresis</td>
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<td>Lecture</td>
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<td>Enzymes and Enzyme Assays</td>
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<td>10/28/10</td>
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<td>Lab</td>
<td>(Open)/Doug Dluzen</td>
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<td>Enzyme Assay</td>
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<td>11/2/10</td>
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<td>Lecture</td>
<td>Lindsay Horvath</td>
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<td>Nucleic Acid Isolation and Electrophoresis</td>
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<td>11/4/10</td>
<td>Thursday</td>
<td>Lab</td>
<td>Lindsay Horvath/Ed Dluzen</td>
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<td>Nucleic Acid Isolation and Quantitation</td>
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<td>11/9/10</td>
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<td>Lecture</td>
<td>Jessica Mathers (Biddle)</td>
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<td>PCR, RT-PCR, and Primer Design</td>
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<td>Lab</td>
<td>Jessica Mathers (Biddle)/ Doug Dluzen</td>
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<td>DNA and RNA Gel Electrophoresis</td>
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<td>11/16/10</td>
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<td>Kent Vrana, Ph.D.</td>
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<td>Workshop on Presentations</td>
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<td>11/18/10</td>
<td>Thursday</td>
<td>Lab</td>
<td>Doug Dluzen</td>
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<td>11/23/10</td>
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<td>11/25/10</td>
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<td>12/14/10</td>
<td>Tuesday</td>
<td>Final Exam</td>
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Admission Process:

Students/High Schools must submit the following information to:
Ms. Katina Moten, Division of Undergraduate Studies, Penn State Harrisburg, 777 W. Harrisburg Pike, Middletown, PA 17057

1. Attached high school dual enrollment application by May 15
2. Current, official high school transcript
3. SAT, ACT, or PSAT scores
4. Letter or recommendation from high school guidance counselor or principal supporting student's enrollment at Penn State.

Course Registration

Following admission, the student will be contacted by an academic adviser at Penn State Harrisburg, who will assist the student in course scheduling. The student will also be provided with a Dual Enrollment Student Handbook, technology access account, and Penn State ID Card.

Cost of the Program:

Tuition and Fees based upon the current 2009-2010 rates:

$498.00 Tuition for a 2 credit course (represents 50% PSU discount for high school students)
$ 78.00 Information Technology Fee (for less than 5 credits)
$ 31.00 Facilities Fee (for less than 5 credits)
$ 23.00 Student Activities Fee (for less than 5 credits)

$630.00 Total Cost
(After July 1, 2010, please consult the Bursar's Office for the 2010 – 2011 tuition and fees)

Tuition Discounts/Payment

1. If student attends a high school, which receives grant funding via the Pennsylvania dual enrollment grant program, the high school may support the remaining balance of tuition charges. Students should discuss this opportunity with their high school guidance counselors.

2. If student is a dependent of an employee of the Pennsylvania State University or Hershey Medical Center the student is eligible for a 75% tuition discount through the University’s Dependent Grant In Aid Program. The parent/guardian must request, complete, and return the Authorization for Dependent Grant-in-Aid Form to the Human Resources Office at the campus of employment. Students, who receive employee dependent grant in aid funds, will be billed 25% of tuition costs.

3. Students not participating through their high school’s Dual Enrollment grant program or the PSU Dependent Grant in Aid Fund are responsible for tuition, fees and books.
Billing

Information regarding the payment of tuition expenses will be provided in the Dual Enrollment Handbook. Bills are submitted and confirmed through eLion, Penn State’s Web-based service that provides secure access to academic and financial records.

Confidentiality of Student Records

Students will be required to sign and submit a “Consent to Release Information to a Third Party Form” for grades, and/or other academic information to be forwarded to their high school.
High School Dual Enrollment Form

A student registering for the first time at Penn State as an undergraduate nondegree student must complete and return this form to Penn State Harrisburg's Registrar's Office in the Swatara Building. Enrollment as nondegree does not imply admission to the University. The student must make formal application to be considered for admission as an undergraduate degree student.

SECTION 1: Biographic Information
Last Name: ____________________ First Name: ____________________ Middle Name: ______________
*Social Security Number: ____________________________________________
Gender: _____ Male _____ Female
Date of Birth: __________________________
Parent is employed by the Pennsylvania State University?   No______  Yes______

SECTION 2: Address Information
Home Address
Street 1: __________________________________________
Street 2: __________________________________________
City/State/Zip: ________________________________
Home Phone Number: ______-________-__________
Cell Phone Number: ______-________-__________
E-mail address: ________________________________
Parent[s] e-mail address: _____________________________

Emergency Contact Information
Name: ____________________________ Phone Number: ______-________-__________

SECTION 3: Educational Background: Highest Level of Education (Check One)

_____ Non-High School Graduate

_____ Currently Enrolled in High School
High School Name: __________________________
Grade: _____ 9th _____ 10th _____ 11th _____ 12th
High School is a participant in Pennsylvania’s dual enrollment grant.   No____  Yes____
If yes, I have received approval from my high school counselor as a participant in the dual enrollment grant program?   No_____ Yes____

_____ Currently enrolled as a home-schooled high school student
Local school district is a participant in Pennsylvania’s dual enrollment grant program.   No__ Yes__
If yes, I have received approval from my local school district as a participant in their dual enrollment grant program?  No_____ Yes____

_____ High School Graduate or GED Equivalency

Are you using this class to fulfill a high school required course for graduation?   No______ Yes____
If so, please explain __________________________________________

Have you ever enrolled at Penn State?
_____ No _____ Yes - Date of last enrollment: ________________________
Laboratory Techniques in Biomedical Research
(BE T 197; Section 002; Schedule # -534934; 2 credits)

Are you currently in an academic drop status from Penn State or any other college or university previously enrolled?
____ No _____ Yes

Are you currently dismissed or suspended from Penn State or any other college or university for disciplinary reasons?
____ No _____ Yes

Have you ever been denied admission to Penn State?
____ No _____ Yes

SECTION 4: Enrollment
Enrollment Request for (Check One): _____ Spring _____ Summer _____ Fall _____ Year __________

SECTION 5: Residency Status
Are you a U.S. Citizen? ____ Yes ____ No - (If no, which of the following statements describes you citizenship status?)
_____ I am an immigrant (permanent resident) residing in Pennsylvania.
_____ I am an immigrant (permanent resident) residing in another U.S. state or territory.
_____ I have a nonimmigrant visa - specific type: _______________________________

Are you a legal resident of the Commonwealth of Pennsylvania?
_____ Yes, but less than one year
_____ Yes, for more than one year
_____ No

SECTION 6: Ethnic Background
Federal law requires that institutions of higher education gather the following information regarding the ethnicity and race of their students and employees. Your individual information will be kept strictly confidential. The law only requires institutions to report aggregate totals for each category. Select the appropriate responses regarding your ethnicity and your race.

1. Is your ethnicity Hispanic/Latino-[Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin]?
   a. _____ Yes, Hispanic/Latino/a
   b. _____ No, not Hispanic/Latino/a

2. What is your race-[select one or more]:
   _____ White _____ Black or African American _____ American Indian or Alaska Native _____ Native Hawaiian/Pacific Islander

SECTION 7: Signature
I have completed all applicable sections of this form and I affirm accuracy of the information provided. Should there be any misinterpretation of the facts on this form, I understand this may be cause of refusal or cancellation of my enrollment.
Student Signature: _______________________________ Date: _______________

*The social security number (SSN) you provide for enrollment purposes, or when requesting specific services, will be used by the University to verify your identity for official record keeping and reporting. If you choose not to supply your SSN, certain services, such as transcripts, academic verification, tax reporting, financial aid and other services may not be available to you, and Penn State cannot guarantee a complete academic record for you. Your SSN will be stored in a central system and only used for official reporting and record keeping. It will not be used as a primary source to identify you within the Penn State system; the PSU ID will be used as the primary identifier.