2015-2016

Catalog of Courses

AND STUDENT HANDBOOK

FAES GRADUATE SCHOOL at NIH

NATIONAL INSTITUTES OF HEALTH
10 CENTER DRIVE, BETHESDA, MD

www.faes.org

FAES GRADUATE SCHOOL AT NIH
CALENDAR FOR 2015–2016

FALL 2015 SEMESTER SCHEDULE

July 6 – September 7	**Online Registration**
August 20	Open House
September 8	**Classes begin**
September 8 – September 30	Late Registration ($10.00 late registration fee per course applies)
October 9	Last day to drop
November 13	Last day to change status (credit or audit)
December 11	**Classes end**

Fall Term Holidays

October 12	Columbus Day – No classes
November 11	Veterans Day - No classes
November 26	Thanksgiving Day – No classes

SPRING 2016 SEMESTER SCHEDULE

November 16 – January 31	**Online Registration**
January 14	Open House
February 1	**Classes begin**
February 1 – February 19	Late Registration ($10.00 late registration fee per course applies)
March 4	Last day to drop
April 8	Last day to change status (credit or audit)
May 13	**Classes end**

Spring Term Holiday

February 15	President's Day – No classes

MID-TERM START, HALF-SEMESTER OR SHORTER COURSES

To find out about registration and course drop deadlines for courses that run shorter than the full semester, please email us at **registrar@faes.org**. Generally, enrollments will be accepted until the first day of classes without a late registration fee.

IN ADDITION TO ONLINE REGISTRATION, THE GRADUATE SCHOOL ACCEPTS ENROLLMENT BY FAX, EMAIL OR IN PERSON.

Contact FAES Graduate School at NIH

Email: registrar@faes.org
Phone: 301-496-7976
Fax: 301-402-0174

FAES Administrative Offices
10 Center Drive, Room 1N241 - MSC 1115
Bethesda, MD 20892-1115

www.faes.org

VISIT **WWW.FAES.ORG** FOR INFORMATION ON TUITION, CLASS TIMES, AND LOCATION.

FOUNDATION FOR ADVANCED EDUCATION IN THE SCIENCES

FAES GRADUATE SCHOOL AT NIH

2015 – 2016 Catalog of Courses
AND Student Handbook

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Academic Program Manager/Program Lead
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10 Center Drive, Room 1N241
Bethesda, MD 20895–1115

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Stephanie Conticchio ..... Social Academic Center Coordinator

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What's New in 2015-16

FALL 2015 COURSES

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BIOL355	Principles of Biology of Bone and Other Connective Tissues
BIOL450	Stem Cell Biology
FRCH101	Introductory French I
GENL319 - PSY	Concepts in Psychology for MCAT Preparation (7 weeks)
GENL350	Introduction to Psychology and Biopsychology
MATH335	Introduction to Mathematical Modelling
MEDI502	Introduction to Traditional Chinese Medicine: A Complex Systems Approach to Health Management, Disease Management and Disease Prevention (4 weeks)
PHYS225	Survey of Biomedical Physics
SPAN208	Spanish for Healthcare Providers

SPRING 2016 COURSES

BIOF412	Advanced Perl
BIOF450	Evolutionary Genomics and Computational Biology
BIOF509	Machine Learning and Object-Oriented Programming with Python
BIOL350	Foundations of Cellular Neuroscience
BIOL375	Neurobiology of Addiction
BIOL450	Stem Cell Biology
FRCH102	Introductory French II
GENL319 - PSY	Concepts in Psychology for MCAT Preparation (7 weeks)
MEDI339	Introduction to Cancer Biology
MEDI425	Genetic Polymorphism Affecting Human Cognition
PBHL535	Methods in Randomized Behavioral Clinical Trials
PBHL581	Econometric Analysis in Evaluation of Biomedical Research Outcomes (8 weeks)
PBHL582	Analyzing Research Literature for Planning and Evaluation of Public Health Programs (8 weeks)
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NEW COURSES NOT LISTED IN THIS CATALOG MAY BE ADDED BY FAES DURING THE ACADEMIC YEAR. FOR THE MOST UP-TO-DATE LIST OF NEW COURSES, PLEASE VISIT www.faes.or/grad.

FAES GRADUATE SCHOOL at NIH

Open House

Select images courtesy of the National Institutes of Health/Department of Health and Human Services

Fall Term: **August 20, 2015 | 4:00 – 6:30pm**
Spring Term: **January 14, 2016 | 4:00 – 6:30pm**

FAES Academic Center | NIH Clinical Center, Bethesda, MD

Tuition only **$150** *to* **$450** *per class!*

Register and earn credit in over 120 affordable evening courses in biomedical sciences, public health, technology transfer, ESL, and more!

Open to the NIH community, other federal employees, and the general public.

WWW.FAES.ORG/GRAD | REGISTRAR@FAES.ORG

FAES MISSION

The Foundation for Advanced Education in the Sciences (FAES) is a non-profit foundation committed to promoting the productivity and attractiveness of professional life on the National Institutes of Health (NIH) campuses by providing advanced educational programs and supporting biomedical research within the NIH intramural program. Located at NIH's main campus in Bethesda, Maryland, FAES programs complement the work of NIH in accomplishing its mission of research and training in the biomedical sciences.

ABOUT FAES

Promoting biomedical research within the NIH intramural program since 1959.

In the early 1950s, a group of scientists at NIH organized a Graduate Evening Program to allow investigators to supplement their laboratory training with advanced formal education. The rapid growth of the program prompted the creation of a non-profit organization to administer this and related programs. In 1959, FAES was born. More than 50 years later, FAES still maintains the core values on which it was founded.

Our range of programs and services include:
scientific and non-scientific courses, advanced studies programs in technology transfer and public health; bookstore; conference management and training services; social and academic center; music and concert series; fellows housing; sponsorship of NIH lecture and seminar series, select Office of Intramural Training and Education (OITE) programs, such as Graduate Partnership Program (GPP) Student Lounge; symposia; and, group medical and dental insurance plans for NIH fellows.

ABOUT FAES GRADUATE SCHOOL AT NIH

The FAES Graduate School at NIH operates as a non-degree-granting independent postsecondary school. Its mission is to provide instruction at the cutting edge of biological sciences and its evolving applications. FAES goals also include responding to the educational and cultural needs of the NIH community and projecting FAES educational assets globally.

The FAES Graduate School at NIH works to foster education and research in the biomedical sciences by sponsoring formal and informal instruction as well as sharing of knowledge and collaboration on the NIH campuses.

FAES Graduate School at NIH delivers high-quality and innovative courses in a **dynamic, culturally diverse** learning setting. We currently **have 12 departments** and offer **over 120 evening courses** to fit around the schedule of working professionals.

- We **prepare** learners for **lifelong professional success** in careers in biomedical research, academic research and education, clinical practice, private businesses, and non-profit organizations.
- We deliver **broad and varied learning experiences** that build a **knowledgeable and skilled** NIH research community.
- We **share** knowledge and **develop skills and competencies** to enhance the career trajectory and professional development of our students.
- We **serve** NIH's **global researcher population** by organizing **English as a Second Language** courses to improve spoken and written English language skills.
- We provide **teaching opportunities for NIH postdoctoral fellows** in order to prepare them for an academic career.

- We attract **dedicated, diverse** and **highly-qualified faculty**, many of whom are leading researchers and world-class experts.
- We seek to **cultivate** a student population who **develop a sense of responsibility** for their ongoing development and professional competence consistent with the evolving needs of biomedical sciences, healthcare and society.

APPROVALS

The FAES Graduate School operates with the approval of the Maryland Higher Education Commission.

The FAES Graduate School at NIH is a non-degree-granting independent postsecondary institution. FAES courses do not currently lead to degrees.

Courses at FAES Graduate School at NIH are credit-bearing and can be accepted in transfer at other colleges and universities. For specific information, students need to consult the transfer policies of the receiving institution.

Courses at FAES Graduate School at NIH do not include laboratory work unless this activity is stated specifically in the course description.

GENERAL INFORMATION

ADMISSION

Courses are open to all qualified persons, both government and non-government. The FAES Graduate School at NIH has an open-enrollment policy, provided that students meet any applicable prerequisites as indicated in the course descriptions.

Enrollment requirements differ based on the level of the course for which the student wishes to register. Undergraduate courses, in general, are open to persons who are graduates of high school, or equivalent, or who qualify for the course because of satisfactory work experience. For admission to more advanced courses, college work in the same or related field is specified or understood. For some courses, prerequisites may be required. For yearlong courses, registration for the second half of the year (i.e. spring semester) requires completion of the first semester or permission of the instructor. When "consent of the instructor" is indicated as a prerequisite for a course, the instructor must be consulted before registration.

Students who do not have a clear financial record with FAES will not be permitted to register.

FAES does not discriminate on the basis of race, color, religion, sex, age, handicap, national or ethnic origin or veteran status, in the administration of its educational policies, admissions policies, scholarship programs, and other educational programs.

REGISTRATION

Our website contains the latest and most up-to-date information on class offerings and schedules. Courses that are shorter than the full semester (4-10 weeks) may have different registration dates, depending on the start date of the course. Registration is required each semester for yearlong Graduate School courses.

The registration dates and academic calendar can be viewed on the inside front cover of the Catalog of Courses and on our website at **www.faes.org/grad**.

The fastest and easiest way to register is online through our online registration portal. Register online with a credit card by following the link at **www.faes.org/grad**.

We also accept online payment from third parties. Employers, such as Administrative Officers or HR personnel, can make a payment by visiting the third-party Payment Gateway at **https://faes.org/student-payment**.

We also accept registration by email, fax or in person. If registering by submitting the Enrollment Form by email, fax or in person, it is important that students submit accurate and complete information by filling out all required fields. Enrollment Forms can be downloaded from our website at **www.faes.org/grad**.

Note: Registration for **BioTech** and **training** workshops occur on a rolling basis. The Training and Conferences Management Services Department does not follow the academic calendar of the Graduate School.

PAYMENT

FAES's is a non-profit organization dedicated to providing highly affordable and quality courses to the biomedical research community at the NIH and the general public. Therefore, payments for classes must be received in a timely manner.

Payment Made by Credit Card

All self-funded students must pay for the classes at the time of registration either through logging back into their account on the **Student Portal** at **https://my.faes.org/secure/Student/loginstu.aspx** OR by simply visiting our **Payment Gateway** at **https://faes.org/student-payment** to make a payment by credit card. Credit cards accepted are MasterCard, Visa, or Discover.

FAES expects payment by the start date of classes from **third-party sponsors,** such as **employers or Administrative Officers at NIH institutes.** Please email us for permission to be kept in the class in case your institute needs time beyond the start date of the term to process the request for training funds. **Third-party sponsors can make a payment with a credit card** through our secure and convenient Payment Gateway at **https://faes.org/student-payment**. Credit cards accepted are MasterCard, Visa, or Discover.

Students sponsored by their labs or employers should make sure that they first enroll in the course online while waiting for the authorization of payment. Receiving institutional approval for payment does NOT constitute enrollment in FAES classes.

Payment Made by Check or SF-182 Training Form

FAES also accepts payment by check or SF-182 U.S. Government Training Voucher. If the course will be paid for with a **SF-182 Government Training Voucher,** please contact your Administrative Officer for guidance on your institution's process for requesting training funds.

If paying by **check,** please be sure to first enroll in the course online. Check payments, together with an Enrollment Form, should be mailed to:

Foundation for Advanced Education in the Sciences
PO Box 62861
Baltimore, MD 21264-2861

TUITION AND FUNDING

TUITION

FAES Graduate School at NIH courses offer great value and unparalleled cost-effectiveness. Tuition is $150.00 per credit; courses are typically 1-3 credits. The tuition for most courses ranges between $150 - $450 (except for 600-level courses). Please consult the Catalog of Courses to determine the tuition for each class.

Students 65 years and over are eligible for 50% reduced tuition (for evening classes only).

SCHOLARSHIP AND FUNDING

FAES's core mission is to provide affordable continuing education courses that remain accessible to working professionals and researchers who are interested in furthering their education and career goals and meet the applicable prerequisites for the course.

FAES offers two limited partial scholarship programs, offering 40% tuition discount per credit, to eligible students in need of financial assistance and who can make a short and compelling justification as to how the respective FAES course would help them in their career or professional development. Both types of scholarships require that the recipient take the course for credit and complete the course satisfactorily, which is determined as "C" or above, or "Pass," when the course is graded on a Pass/Fail basis.

The **Gerald D. Aurbach Memorial Scholarship Fund** is open to guest researchers, while the **FAES Student Scholarship Fund** provides partial scholarship to postbac/graduate students, postdoctoral fellows as well as non-NIH government or non-profit employees with limited income or unemployed individuals working in research, practice or education of health sciences.

FAES expects to offer 30 scholarships in the fall semester, and 20 scholarships in the spring semester.

How to Apply

To apply, students should complete the Scholarship Application Form available at **www.faes.org/grad** and submit the form electronically, including a current resume, to **registrar@faes.org**, with SUBJECT LINE: FAES Scholarship Application_(insert last name here).

Only complete applications will be considered. All applicants, please be sure to first register for the class online at **https://my.faes.org/Common/CourseSchedule.aspx** . If you do not register, and the class fills up by the time the scholarships are determined, you will not be granted a spot in that class.

Successful applicants will be notified of the outcome of their application during the last week of regular registration.

Deadline for applications

August 31, 2015 (Fall 2015) and January 22, 2016 (Spring 2016).

Terms and Conditions

FAES will only consider applications for one course per semester. Expenses for textbooks are not covered.

Both types of scholarship require that the recipient take the course for credit and complete the course satisfactorily, which is determined as "C", or above, or "Pass," when the course is graded on a Pass/Fail basis.

The application form for both types of scholarships is available on our website at **www.faes.org/grad**. The **deadline for applications** is one week before the end of the regular registration period.

ADVANCED STUDIES

Advanced Studies in Public Health

FAES Graduate School at NIH offers Advanced Studies in Public Health to persons with a Bachelor's degree or above. Courses are offered in the evenings, making it convenient for working professionals and postgraduate fellows to gain expertise and experience, to enhance current employment position or facilitate transitioning into a career in public health.

The program comprises a 21-credit curriculum of required courses, designed to give professionals an overview of the five core disciplines of public health: epidemiology, biostatistics, environmental health sciences, health policy and management, and social and behavioral sciences. To learn more, please visit us at **www.faes.org/grad** or look up the Department of Public Health in the Catalog of Courses.

Advanced Studies in Technology Transfer

FAES Graduate School at NIH offers Advanced Studies in Technology Transfer to persons with a Bachelor's degree in science or engineering or a related field. Courses are offered in the evenings, making it convenient for working professionals and postgraduate fellows to gain expertise and experience in patenting, licensing, collaborative agreements and other fundamental intellectual property transactions. The technology transfer profession employs more than 10,000 profession-als in the U.S., with many practicing their trade in the greater Washington, D.C. metro area.The course instructors are leading practitioners in the field, so students can simultaneously gain the necessary knowledge and build professional networks.

The program comprises a 15-credit curriculum of required and elective courses that can be completed in approximately two years. To learn more, please visit us at **www.faes.org/grad** or look up the Department of Technology Transfer in the Catalog of Courses.

POLICY ON ACADEMIC INTEGRITY

The FAES Graduate School at NIH prides itself on providing quality educational experiences and upholds the highest level of honesty, integrity, and mutual respect. It is our policy that cheating, fabrication or plagiarism by students is not acceptable in any form. If a student is found to be in violation of any, or all of the below, his/her credits will be forfeited, and he/she will not be allowed to enroll in future courses or education programs administered by FAES.

- **Cheating** is defined as an attempt to give or obtain inappropriate/unauthorized assistance during any academic exercise, such as during examination, homework assignment, class presentation.
- **Fabrication** is defined as the falsification of data, information or citations in any academic materials.
- **Plagiarism** is defined as using the ideas, methods, or written words of another, without proper acknowledgment and with the intention that they be taken as the work of the deceiver. These include, but are not limited to, the use of published articles, paraphrasing, copying someone else's homework and turning it in as one's own and failing to reference footnotes. Procuring information from online sources without proper attribution also constitutes plagiarism.

COURSE HOURS AND ATTENDANCE

Most classes are held between 4:30 and 8:30 PM. Enrolled students are expected to complete the entire course, and even unavoidable absences do not relieve them from being responsible for work assigned during their absence. Students may not attend classes until they officially registered for the class.

COURSE-LEVEL TABLE

FAES Graduate School at NIH, as a continuing education school, offers courses at the following levels:

1 to 99	general adult education (may not be at undergraduate level)
100 to 199	lower-college level (Freshman/Sophomore)
200 to 299	upper-college level (Junior/Senior)
300 to 399	senior and graduate levels
400 to 499	graduate students and qualified seniors
500 to 600	graduate and/or professional level
600 to 700	Board Examination subspecialty courses

TRANSFER OF CREDIT AND TRANSFER AGREEMENTS WITH HIGHER EDUCATION INSTITUTIONS IN THE AREA

Students should not assume that courses taken at FAES will be accepted in transfer, although FAES courses can be accepted in transfer by U.S. colleges or universities. Students who wish to work for an undergraduate, graduate or higher degree should consult, in advance, with the institution from which they expect to receive a degree, and, if applicable, receive approval for any courses at the FAES Graduate School at NIH that they plan to use toward their degree.

The Master of Public Health Program (MPH) at The George Washington University (GWU) recognizes certain FAES courses as substitutes for those offered in the MPH Program. Successful completion of specific FAES courses allows students to apply for transfer of credit in the MPH Program. For further information about the MPH Program and currently eligible FAES courses, please contact the GWU MPH program office at **asksphhs@gwu.edu**.

TRANSFER AGREEMENTS

FAES has entered into a partnership with the University of Maryland University College to offer further opportunities for students to get ahead with their academic and professional goals.

University of Maryland University College (UMUC), Graduate School of Management and Technology

Students who have successfully completed the Advanced Studies in Technology Transfer at FAES can transfer all 15 credits as a block toward an M.S. degree at UMUC Graduate School of Management and Technology. By completing only 21 more credits at UMUC, students can be awarded M.S. degrees (with a specialization in Technology Transfer) in Management or Technology Management or Information Technology or Biotechnology Studies. Students also have the opportunity to earn a Master of Business Administration (MBA) degree from UMUC by completing an additional 18 credits upon completion of the M.S. degree. To learn more, please visit **www.faes.org/grad.**

CREDITS AND GRADES

CREDIT

One credit corresponds to 15 standard classroom hours. A standard classroom hour is defined as 50 minutes instruction time and 10 minutes break. Students registered for credit must complete all course work as required by the instructor.

AUDIT

An auditor must pay the same tuition and meet the same prerequisites as a credit student. S/he receives full privileges of class participation, if s/he chooses to exercise them. An auditor does not receive a grade or credit; s/he receives a grade of "AUD."

CHANGE FROM CREDIT TO AUDIT

Students may request status change from credit to audit, or vice versa, provided the request is submitted in writing to the Graduate School Office at **registrar@faes.org** and in accordance with the published timeline. Reporting a credit-audit change to the instructor does not constitute an official change. **Students who have been sponsored by their workplace to take FAES courses must submit written approval from their administrative officers when requesting a change from credit to audit.**

GRADES

Grades are due to be submitted within three weeks of the end of the semester or within three weeks of the last class, as applicable. Grades will be posted and available for students to view in the online student portal.

Grades are assigned on the following scale:

A–Excellent
B–Good
C–Fair
D–Poor
F–Failure
I–Incomplete*
AUD–Auditor

Pass/Fail

*"I" indicates that the required coursework has not been completed. "I" may be changed to another grade if the student provides the instructor with a satisfactory explanation and arranges to complete the work within a reasonable time.

DROPPING COURSES AND REFUND POLICY

Students may drop courses themselves by logging into the Student Portal until the 4th week of the term.

Alternatively, the intent to drop a course at the FAES Graduate School **must be made in writing** to the Graduate School at **registrar@faes.org**. **Reporting withdrawal from a course to the instructor is not considered official**.

In addition, students may fill out a **Withdrawal Form**, which is available on our website at **www.faes.org/grad**. Students are welcome to submit the completed Withdrawal Form in person or by email to **registrar@faes.org**.

REFUND

To obtain a refund, a course must be officially dropped by the refund deadline, as indicated in the academic calendar. The intent to drop (withdraw from) a course at the FAES Graduate School must be made in writing to the Graduate School Office at **registrar@faes.org**. A Withdrawal Form is available on our website at **www.faes.org/grad**. Reporting withdrawal from a course to the instructor is not considered official.

Refund of tuition fees will be granted only in cases when the Graduate School is notified in writing and according to the published schedule for full-semester courses. For courses of shorter duration, please contact the Graduate School at **registrar@faes.org**.

Until end of 1st week	100% tuition, less $25.00 per course
Between 2nd and 3rd weeks	60% of tuition
4th week	40% of tuition
Between 4th and 5th weeks	Withdrawal will be granted without a refund
After 5th week	No refund and no withdrawal will be granted

Note: late fees are not refundable. Refunds or withdrawals will not be granted to students who do not have a clear financial record with FAES.

Refunds will be computed as of the date the written intent to drop is received in the Graduate School Office. In no case will tuition be reduced or refunded because of lack of attendance in classes, or because students failed to consult with the instructor, in advance of registration, in cases when the course description indicates that students must email the instructor for permission to enroll in the class.

SPONSORED STUDENTS

Students whose courses have been paid for by their employers need to coordinate in advance with their administrative officers or HR departments to determine whether they are liable to pay the prorated portion of the tuition in cases when they wish to drop a course.

Students who have been recipients of an FAES scholarship will have the prorated tuition withheld when refunds are to be paid due to dropping a course.

INVOLUNTARY WITHDRAWALS

Students are allowed to drop a course involuntarily for the following reasons (Note: Fees are non-refundable.):

- Illness of student or immediate family member (child, parent, spouse, or member of household)
- Death of student or immediate family member (see above).

FEES

Late Registration Fee	$10.00 late fee per course
Transcript Fee	$5.00 per transcript for official transcripts
Returned Check Fee	$25.00 fee per check

COURSES CANCELLED BY FAES GRADUATE SCHOOL AT NIH

FAES reserves the right to cancel a course due to insufficient enrollment. In such cases, students will receive a 100% refund of tuition and fees. Further, FAES reserves the right to limit registration, cancel, terminate or postpone courses, to combine classes, and to require the withdrawal of any student at any time for any reason that FAES deems sufficient.

OFFICIAL TRANSCRIPTS

Official transcripts can be requested in writing by filling out the Transcript Request Form at **www.faes.org/grad**.

Official transcripts are $5.00 per copy.

Please complete and submit the Transcript Request Form, along with complete payment information, and, if applicable, additional forms required by the receiving institution to the Graduate School Office. The easiest method to submit the Transcript Request Form is through email at **registrar@faes.org**.

The forms may be also delivered to the FAES Graduate School by mail or in person.

Transcripts are typically processed within one-two business days of receipt. Please allow two-three additional business days for processing if transcripts have been paid for by check.

Mailing Address for non-check payments
FAES Administrative Office, National Institutes of Health
10 Center Drive, MSC 1115, Bethesda, MD 20892-1115

*Mailing Address for payments made by check**
Foundation for Advanced Education in the Sciences (FAES)
PO Box 62861, Baltimore, MD 21264-2861

*Please allow two-three additional business days for processing if transcripts have been paid for by check.

UNOFFICIAL TRANSCRIPTS

Unofficial transcripts for academic records since Fall 2011 are available for downloading in the Student Portal OR they can be requested in writing by filling out the Transcript Request Form at **www.faes.org/grad** and by emailing it to **registrar@faes.org**.

Unofficial transcripts for courses taken prior to Fall 2011 can be requested in writing by filling out the Transcript Request Form and by emailing it to **registrar@faes.org**.

Unofficial transcripts are available at no cost.

Mailing Address for Unofficial Transcript Requests
FAES Administrative Office, National Institutes of Health
10 Center Drive, MSC 1115, Bethesda, MD 20892-1115

CLASSROOM ACCESSIBILITY

FAES is an equal opportunity provider and employer. We make every practical effort to ensure that our courses are accessible to students with special needs. Individuals with disabilities who need reasonable accommodation to participate in our classes should contact FAES in advance either through email at **registrar@faes.org** or by calling the Graduate School Office at 301-496-7976.

STUDENT PRIVACY

FAES Graduate School at NIH protects each student's education record following the Family Educational Rights and Privacy Act (FERPA) of 1974 of the federal government.

Students at the FAES Graduate School at NIH have the following rights:

- The right to inspect and review one's own education records within 45 days of the day FAES receives a request for access.
- The right to request to amend one's own education records if a student believes they are inaccurate or misleading.
- The right to limit the disclosure of personally identifiable information designated by FAES as directory information.

INCLEMENT WEATHER POLICY

FAES Graduate School classes are held in federal government facilities. Consequently, FAES follows the snow and dismissal procedures of the Office of Personnel Management (OPM). When government offices are closed early or all day due to hazardous weather conditions, or when hazardous weather conditions are probable for the evening hours, classes will not be held.

Cancellation information will be posted on the FAES homepage at **www. faes.org**, on our Facebook page as well as over the radio. FAES will aim to determine whether classes need to be cancelled by 1:00 PM on the day of inclement weather. If in doubt, students are welcome to send inquiries to **registrar@faes.org** or call 301-496-7976.

FALL 2015 SEMESTER SCHEDULE

July 6 – September 7	**Online Registration**
August 20	Open House
September 8	**Classes begin**
September 8 – September 30	Late Registration ($10.00 late registration fee per course)
October 9	Last day to drop/withdraw
November 13	Last day to change status (credit or audit)
December 11	**Classes end**

SPRING 2016 SEMESTER SCHEDULE

November 16 – January 31	**Online Registration**
January 14	Open House
February 1	**Classes begin**
February 1 – February 19	Late Registration ($10.00 late registration fee per course)
March 4	Last day to drop/withdraw
April 8	Last day to change status (credit or audit)
May 13	**Classes end**

HALF-SEMESTER OR SHORTER COURSES

Please check **www.faes.org/grad** or email **registrar@faes.org** for registration dates and add/drop deadlines. Generally, in case of shorter courses with start dates later in the semester, students can register until the first day of the classes.

FAES AND JOHNS HOPKINS UNIVERSITY CENTER FOR BIOTECHNOLOGY EDUCATION

advanced.jhu.edu/mbee/faes

The Foundation for Advanced Education in the Sciences (FAES) and Johns Hopkins University's Center for Biotechnology Education have entered into a partnership, translating into an exciting opportunity for you to get ahead in your academic and professional goals:

If you have successfully completed coursework for FAES' Advanced Studies in Technology Transfer, you will be eligible for advanced standing in Johns Hopkins University's Master of Biotechnology Enterprise and Entrepreneurship (MBEE), given that you have met the admission requirements and are accepted into the MBEE program. Those with advanced standing will be allowed to waive up to two elective courses in the MBEE program without replacement, allowing you to complete Technology Transfer coursework and the MBEE in fewer courses than if pursued separately. Interested students are encouraged to pursue this unique opportunity.

Johns Hopkins University's Center for Biotechnology Education, a world leader in science education and research, offers a number of graduate degrees and certificates designed for working professionals, including:

- MS in Bioinformatics
- MS in Biotechnology
- Master of Biotechnology Enterprise and Entrepreneurship
- MS in Regulatory Science
- Certificate in Biotechnology Education
- Certificate in Biotechnology Enterprise
- Post-Baccalaureate Health Science Intensive Program
- Post-Master's Certificate in Sequence Analysis and Genomics

Please visit us at biotechnology.jhu.edu to learn more about the admissions requirements for any of the programs above.

More about TECHNOLOGY TRANSFER:

The technology transfer profession employs more than 10,000 professionals in the U.S., with many practicing their trade in the greater Washington, DC area. Advanced Studies in Technology Transfer aims to serve the needs of scientists and engineers who wish to pursue this non-traditional career, as well as those of professionals who seek additional training. The program also opens the opportunity for you to build professional networks with respected practitioners of the field.

Evening courses in Technology Transfer provide an overview of patenting, licensing, collaborative agreements, and other fundamental intellectual property transactions.

More about MASTER OF BIOTECHNOLOGY ENTERPRISE AND ENTREPRENEURSHIP (MBEE):

For a biotechnology enterprise to be successful, it requires trained professionals who understand science and who are also skilled in the complexities of biotechnology commercialization. This unique program brings together a strong science foundation with biotechnology enterprise and entrepreneurship. This master's program is intended for biotechnology professionals who seek a career beyond the laboratory within an existing biotechnology group or organization or for those who seek to start a new biotechnology enterprise.

You can conveniently earn your MBEE degree part-time. Classes are offered in the evening at the Montgomery County Campus in Rockville, MD; as well as online. The degree may be completed completely online.

Specific course requirements for both FAES' Advanced Studies in Technology Transfer and Johns Hopkins University's MBEE can be found on the reverse.

FAES
FOUNDATION FOR ADVANCED EDUCATION IN THE SCIENCES

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Center for Biotechnology Education

FAES AND JOHNS HOPKINS UNIVERSITY CENTER FOR BIOTECHNOLOGY EDUCATION

advanced.jhu.edu/mbee/faes

Advanced Studies in Technology Transfer

You will be required to take a total of 15 credit units, with 12 units of in-class coursework, and a final independent project of three units.

REQUIRED CORE COURSES

TECH 513 Introduction to Technology Transfer
TECH 565 Biomedical Business Development for Scientists
TECH 607 Capstone Course in Technology Transfer

TECHNOLOGY TRANSFER ELECTIVES

TECH 503 Business Law Primer
TECH 505 Contemporary Issues in Technology Transfer
TECH 506 Researcher Commercialization Webinar Course: The Essentials
TECH 508 Food and Drug Law for Scientists
TECH 512 Global Bioethics
TECH 513 Introduction to Technology Transfer
TECH 521 Tools for Technology Transfer
TECH 522 Technology Transfer — Practical
TECH 525 Legal and Ethical Issues in Public Health and Biomedical Sciences
TECH 565 Biomedical Business Development for Scientists
TECH 566 Building a Biotechnology Company: Learn First-Hand From Industry Experts
TECH 567 International Strategic Partnering and Business Development
TECH 572 Marketing Strategies for Scientific Organizations
TECH 575 Business Finance and Accounting Principles for Scientists
TECH 579 Introduction to Negotiation
TECH 582 Intellectual Property and Patent Prosecution for Scientists
TECH 583 Patent Research for Non-Legal Practitioners
TECH 584 Translational Medical Product Development
TECH 586 International Research & Development & Innovation
TECH 587 Strategy Consulting for Tech Companies
TECH 588 FDA Regulation Product Development, and Intellectual Property – Medical Devices
TECH 607 Capstone Course in Technology Transfer

Master of Biotechnology Enterprise and Entrepreneurship

You will be required to complete 10 graduate courses, including a final practicum course to gain real-world experience. You may choose three electives across a broad range of courses, or you may choose a concentration in Bioscience Communications or Legal/Regulatory Science.

If you have advanced standing, you will be required to complete eight graduate courses: the seven courses listed below, and one elective course. If you wish to complete a concentration, additional electives may be required to meet the requirements of that concentration.

SEVEN REQUIRED COURSES

410.607 Proseminar in Biotechnology
410.627 Translational Biotechnology: From Intellectual Property to Licensing
410.643 Managing and Leading Biotechnology Professionals OR
410.689 Leading Change in Biotechnology
410.644 Marketing Aspects of Biotechnology
410.687 Ethical, Legal and Regulatory Aspects of the Biotechnology Enterprise
410.680 Managerial Finance for Biotechnology
410.804 Practicum in Biotechnology Enterprise and Entrepreneurship

FOR MORE INFORMATION

FAES Questions:
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Academic Program Manager/Program Lead
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registrar@faes.org

JHU Academic Questions:
Katherine Wellman, MS, MS, MBA
Program Coordinator, MBEE
301.294.7112
kmwellman@jhu.edu

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BIOCHEMISTRY

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

Mitchell Ho, Chair		
SPRING	BIOC 101	Biochemistry in Health and Diseases
FALL	BIOC 301	Biochemistry I
SPRING	BIOC 302	Biochemistry II
SPRING	BIOC 505	Cell Membranes and Intracellular Trafficking
SPRING 2017-ALT	BIOC 527	Lipid Metabolism in Physiology and Diseases (8 weeks)
SPRING	BIOC 532	Biological Importance of Modifications in DNA and Chromatin
SPRING 2017-ALT	BIOC 533	Molecular and Cellular Basis of Intercellular Communication

BIOC 101

Spring, 2 credits

Biochemistry in Health and Diseases

Mauro Tiso

This course is designed to provide a broad overview of basic biological chemistry and its relationship to human health and disease. Each class will cover a major category of the molecules of life and a human disease and/or health issue that relates to topics such as why we should eat fruits and vegetables, why milk is supplemented with vitamin D, why some people are lactose intolerant, or how insulin helps people with diabetes. Particular emphasis will be on the interactions between metabolic pathways, the basis of human diseases and current medical therapies. Lectures will be followed by group discussions of real-life case studies. By taking this course, students will gain fundamental knowledge in biochemistry and how the molecules of life control human health and wellbeing.

Learning objectives:

- Describe the major categories of the molecules of life
- Discuss how major metabolic pathways control human health
- Explain the "Central Dogma" of molecular biology and give examples of genetic diseases
- Prepare an original presentation about a disease of interest to discuss with the class.

Prerequisites: open to anyone with an interest in science and basic (high school- or undergraduate-level-) knowledge of chemistry and biology.

BIOC 301

Fall, 3 credits

Biochemistry I

Mitchell Ho*, Giovanna Grandinetti, Christine Krieger, Peter Morawski, Jennifer Symonds

BIOC 301and BIOC 302 provide a comprehensive survey of biochemistry at the graduate level. BIOC 301 will cover the structure and function of biological macromolecules as well as topics on metabolic pathways, including glycolysis, citric acid cycle and oxidative phosphorylation. The course will also cover current methods used in biochemistry and medicine. Course website is **http://tech.groups.yahoo.com/group/bioc300/.**

Learning objectives:

- Understand protein structure and thermodyanimcs
- Describe protein-protein interaction and structure-function relationships in biochemical systems
- Name structure and function of carbohydrates and lipids, aspects of central metabolism
- Identify nucleic acid biochemistry.

Prerequisites: organic chemistry or consent of the instructor.

BIOC 302

Spring, 3 credits

Biochemistry II

Mitchell Ho*, Giovanna Grandinetti, Christine Krieger, Peter Morawski, Jennifer Symonds

BIOC 302 is a continuation of **BIOC 301**. The two courses provide a comprehensive overview of biochemistry at the graduate level. The spring course will cover metabolism and biosynthesis of biological macromolecules such as glycogen, fatty acid, amino acid and nucleotide.

Learning objectives:

- Understand protein structure and thermodyanimcs
- Describe protein-protein interaction and structure-function relationships in biochemical systems
- Name structure and function of carbohydrates and lipids, aspects of central metabolism
- Identify nucleic acid biochemistry.

BIOC 505

Spring, 2 credits

Cell Membranes and Intracellular Trafficking

Tamas Balla

Membrane trafficking plays a fundamental role in several biological processes and the deregulation of the components regulating this process is the leading cause of several diseases ranging from cancer and immune-deficiencies to neurodegenerative and metabolic diseases. The course will consider modern concepts relating to the structure and function of cell membranes with an emphasis on human diseases. Starting from the physical properties of membranes, the course will examine membrane biogenesis, membrane dynamics, and intracellular trafficking. Examples will be drawn from specific membrane functions in the various organelles. Topics will include nuclear transport, ER to Golgi transport, endocytosis, carbohydrate and lipid trafficking.

Learning objectives:

- Understand principles that govern membrane biogenesis and membrane remodeling
- Become familiar with state of the art methods to study membrane dynamics
- Understand how changes in the biology of membranes can lead to disease states
- Gain insight in possible therapeutic interventions correcting membrane dysfunctions.

Prerequisites: CHEM 220 and BIOC 300 or equivalent.
In order to run this course, minimum 10 students need to register.

BIOC 527

Spring 2017, Alternate Years, 1 credit (8 weeks)

Lipid Metabolism in Physiology and Disease

Laura Allende*, Sujoy Lahiri

The functions of lipids have been largely underestimated by designating lipids as molecules providing only structural support and as molecules for energy storage and high-calorie values. But, the enormous diversity of lipids with respect to their molecular architecture, intra-cellular organization and roles in regulating variety of cellular and physiological events proves beyond doubt that our understanding of lipid biology has only just started.

The objective of this course is to address lipid biology in normal physiology and during pathological states. We will first introduce basic topics, such as categories and structures of lipids, cellular aspects of the synthesis degradation and transport of lipids within the cell and functions and regulation of lipid metabolism. We will then discuss lipid metabolic disorders including obesity, diabetes, cardiovascular disease and hereditary metabolic disorders. We will also talk about the relationship between lipids, nutrition and health including the benefits associated with their consumption. Each lecture will focus on certain aspects of the lipid metabolism often in relation to associated disease conditions. We will cover current concepts related to specific lipid functions, lipid-protein interaction, and disorders of lipid metabolism by discussing relevant published research papers.

Learning objectives:

- Describe the various classes of lipids which are relevant in human physiology
- Learn how lipids are digested, absorbed and metabolized in the organism
- Discuss the regulation of lipid biosynthesis in normal physiology
- Understand the causes and phenotypes of lipid hereditary metabolic disorders.

BIOC 532

Spring, 2 credits

Biological Importance of Modifications in DNA and Chromatin

Kevin Brick, Daman Kumari, Nadine Samara, Tiaojiang Xiao*, Zhuo Zhou

Chromatin modifications play important roles in many cellular processes including the regulation of gene expression, DNA repair, and the heterochromatin formation. This course will explore the various biological roles chromatin modifications play in eukaryotic cells. Topics that will be discussed include: histone and DNA modifications and the enzymes responsible for these modifications; mechanisms of chromatin remodeling and transcription regulation; the role of non-coding RNAs in chromatin structure and gene regulation; higher-order chromatin organization and the use of various chromosome capture conformation methods; and, chromatin structure and DNA damage repair. In addition, this course will introduce students to the genome-wide analysis of ChIP-seq and RNA-seq data using the Galaxy and UCSC web servers and other bioinformatics software tools.

Learning objectives:

- Understand the basic concepts behind epigenetics
- Understand why epigenetics is important to understanding human diseases
- Explain how epigenetic mechanisms work.

Prerequisites: general understanding of basic concepts in genetics and biochemistry.

BIOC 533

Spring 2017, Alternate Years, 2 credits

Molecular and Cellular Basis of Intercellular Communication

Connie Sommers, Lakshmi Balagopalan-Bhise

The objective of this course is to expose students to current knowledge and experimental approaches in the field of signal transduction as presented by invited expert lecturers who are at the leading edge in researching their respective systems. Emphasis will be given to molecular mechanisms and applications to human disease states. Among the signaling molecules to be considered are growth factors, hormones, cytokines, transmembrane receptors, G proteins, kinases and phosphatases, soluble intracellular messengers, ion channels, trans-acting factors and calcium-binding proteins.

Learning objectives:

- Discuss experimental approaches to signal reduction
- Identify molecular mechanisms and signaling molecules.

Prerequisites: M.D., Ph.D., prior course work (e.g. MEDI 211 or BIOC 301/302), or extensive experience in the field.

OTHER COURSES THAT MAY BE OF INTEREST

BIOF 312
Introduction to Perl

BIOF 429
Practical Bioinformatics

BIOF 518
Theoretical and Applied Bioinformatics

BIOF 450
Evolutionary Genomics and Computational Biology

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- **BioTech 47**: iPSC: Human Induced Ploripotent Stem Cells (hiPSC): Differentiation to Neural Lineages
- **BioTech 53**: Super Resolution Microscopy: Principles and Methods
- **BioTech 55**: Engineering with CRISPR, TALENS, and ZFNs
- **BioTech 56**: RNA-Seq

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NIH Trainees (Fellows, Postdocs, Postbacs)	$395	$495	$595

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BIOINFORMATICS

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

Ben Busby, Chair

FALL	BIOF 309	Introduction to Python
FALL, SPRING	BIOF 312	Introduction to Perl
FALL, SPRING NEW	BIOF 412	Advanced Perl
FALL	BIOF 429	Practical Bioinformatics (10 weeks)
SPRING NEW	BIOF 450	Evolutionary Genomics and Computational Biology
SPRING NEW	BIOF 509	Machine Learning and Object-Oriented Programming with Python
FALL	BIOF 518	Theoretical and Applied Bioinformatics
SPRING	BIOF 521	Bioinformatics for Analysis of Data Generated by Next Generation Sequencing
FALL NEW	BIOF 535	Fundamentals for Precision Medicine: Medical Population Genetics and Genomics (5 weeks)

BIOF 309

Fall, 2 credits

Introduction to Python

Naisha Shah*, Richard Burke Squires*, Jonathan Street

Python is a free, open-source and powerful programming language with capabilities that overlap with many proprietary software packages, such as Excel, MATLAB, and STATA. This course is intended for non-programmers who want to learn how to write programs that expand the breadth and depth of their daily research. Most elementary concepts in modern software engineering will be covered, including basic syntax, Object-Oriented programming, regular expressions, reading from and writing texts files, use of the Python debugger, and creating reusable code modules that are distributable to peers. The course will also focus on potential applications of Python to bioinformatics, including sequence analysis and data visualization.

Learning objectives:

- Gain basic understanding of elementary concepts ubiquitous in modern software engineering: object-oriented programming, regular expressions, reading from and writing to text files, and recursion
- Apply Python to important functions in bioinformatics, such as sequence analysis, machine learning and data visualization.

INDIVIDUAL LAPTOP IS NEEDED FOR EACH CLASS.

BIOF 312

Fall and Spring, 2 credits

Introduction to Perl

Andrei Mamoutkine

This course will introduce students to the Perl programming language and to general principles of computer programming. Class exercises will focus on using Perl to parse, analyze, and process large bioinformatics data sets, especially FASTA sequence data and BLAST results, as well as .bed files derived from RNAseq data. Topics will include fundamental elements of programming, such as variables, control structures, functions, elements of the Perl programming language used for as regular expressions and reading and writing to files, basic program design techniques, and the basic use of the Perl debugger.

Learning objectives:

- Perform basic Perl scripting
- Understanding of redefined variables, arrays, subroutines and regular expressions
- Discussion of how to use and manage files and directories from Perl scripts

- Perform running and interacting with external programs from Perl
- Analyze bioinformatics data sets.

Prerequisites: no prior computer programming experience is required.
INDIVIDUAL LAPTOP IS NEEDED FOR EACH CLASS.
Contact the faculty for links to free software on Windows PC. Unix or Mac should have a built-in Perl; with questions about how to check, please contact the faculty.

BIOF 412

Fall and Spring, 2 credits

NEW Advanced Perl

Andrei Mamoutkine

This course will start with a quick review of the basics of Perl programming language, such as specific variables, control structures and function. Then, it will cover advanced Perl knowledge in references, complex data structures, external files and packages, modules and objects, extended regular expressions. At the end of the course, students will be able to perform advanced level analysis and processing of large bioinformatics datasets.

Learning objectives:

- Gain deeper understanding of references, functions and regular expressions
- Discuss complex data structures
- Practice packages, modules, objects
- Use Bioperl, a specific language with thousands of pre-built functions and libraries designed for bioinformatics.

Prerequisites: BIOF312 Introduction to Perl or equivalent is strongly recommended; introductory course on any other high-level programming language (C/C++/Fortran) could be accepted.
INDIVIDUAL LAPTOP, INSTALLED WITH PERL, IS NEEDED FOR EACH CLASS.

BIOF 429

Fall, 2 credits (10 weeks)

Practical Bioinformatics

Medha Bhagwat

This course describes practical applications of publicly available bioinformatics resources for analysis of genomic, expression and proteomic data from a number of organisms. Emphasis will be placed on practical step-by-step procedures, although relevant theory will also be given in order to use the resources effectively. The course consists of ten classes, some of these are resource based, such as BLAST or Genome Browsers, and some are problem based, such as "Making Sense of DNA and Protein Sequences." Each class uses a paired-problems approach in which the first of two similar problems or problem sets is solved by the instructor and, in the second half of the class, the students tackle the second problem, or set of problems on their computers. The class topics are: how to access the bioinformatics data; sequence analysis: making sense of DNA and protein sequences; gene resources: from transcription factor binding sites to function; accessing and analysis of expression data; eukaryotic genome browsers; microbial genome analysis; identification of disease genes; correlation of disease genes to phenotypes and Next Generation Sequence Analysis.

Learning objectives:

- Learn to how to access genome, expression and protein data
- Analyze and make sense of genome, expression and protein data
- Apply the knowledge gained to own project.

Prerequisites: solid understanding of molecular biology.

This course is complimentary to the theoretical/applied material covered in BIOF 450 and BIOF 518.

BIOF 450

Spring, 3 credits

NEW Computational Biology and Evolutionary Genomics

Igor Rogozin

An enormously large series of complex and chaotic events have shaped the genomes of eukaryotes, prokaryotes and viruses. This course will address cutting-edge approaches to the computational investigation of these events, with an eye toward developments in translational systems biology. The course will begin by presenting the fundamentals of evolutionary genomics, including basic properties of genomes and comparative genomics, population genetics, and sequence-structure-function relationships. Experimental design and biological project integration will be a major theme of the course.

Specific lectures on statistical analysis, similarity searches, Next Generation Sequencing, epigenomics and other specialized topics, according to student interest, will supplement those given in the earlier part of the course.

Learning objectives:

- Perform statistical analysis and display data
- Learn applications of evolutionary genomics, including cancer genomics, evolution of immune systems and analysis of brain developmental problems
- Apply the skills acquired to complete a computational biology project.

BIOF 509

Spring, 2 credits

NEW Machine Learning and Object-Oriented Programming with Python

Naisha Shah*, Richard Burke Squires*, Jonathan Street

In this course, students will learn to leverage fundamental concepts of machine learning and object-oriented programming to further their research objectives. Examples will be drawn from bioinformatics and image processing. Examples from other fields can be requested.

Learning objective:

- Complete a short research project using machine learning and/or object-oriented programming.

Prerequisite: prior knowledge of basic Python is required, without exception, for this course. Prior to enrolling, students must either take FAES's BIOF 309 Introduction to Python course or must request written permission from faculty, upon submitting proof of existing prior use or knowledge of Python.

BIOF 518

Fall, 3 credits

Theoretical and Applied Bioinformatics

Igor Rogozin

The objective of this course is to give students an introduction into the theory and practice of a wide range of bioinformatic techniques and applications, enabling them to use these tools in their own research. This course will be divided into five modules: statistical approaches in sequence analysis; phylogenetic analysis of nucleotide and protein sequences; acquisition and analysis of sequence datasets, including EST and RNA-seq data; analysis of genomic datasets from an evolutionary perspective; and, prediction of protein secondary structure. Two or three of the five sessions in each module will be divided roughly 60 percent theoretical lecture and 40 percent learning to use relevant computational tools. The final session of each module will be split between a discussion of computational tools, a journal club, and a discussion of work on a project assigned for each module. By the end of the course, students should be able to acquire many types of sequence data, identify orthologous and paralogous genes, predict domains and motifs, identify alternative splicing, analyze genomic/protein alignments, and make a prediction of secondary protein structure from primary sequence.

Learning objectives:

- Introduce the theory and practice of a wide range of bioinformatic techniques and applications, enabling students to use these tools in their own research
- Search database searches using BLAST and hidden Markov models
- Predict gene structure and analyze domains and motifs
- Conduct phylogenetic analysis of nucleotide and protein sequences and identify orthologous and paralogous genes
- Analyze genomic and protein alignments, prediction of secondary protein structure from primary sequence.

Prerequisites: solid understanding of biology, computer science or mathematics, or BIOF 429.

BIOF 521

Spring, 3 credits

Bioinformatics for Analysis of Data Generated by Next Generation Sequencing

Ben Busby, Sijung Yun*

In this course, students will learn to analyze Next Generation Sequencing data, particularly for DNA-seq, RNA-seq, CHIP-seq, and DNA-methylation. The course will be divided between lectures and hands-on sessions. Lectures will cover background knowledge and survey various software programs. For hands-on sessions, we will primarily focus on the use of the Galaxy platform for analysis of raw data obtained from an Illumina's HiSeq-2000 and data available in the NCBI-SRA. Use of distributed and abstracted computing, such as Biowulf and cloud computing will be also covered. There will be a term project in which students will design projects relevant to their research.

Learning objectives:

- Learn to analyze Next Generation Sequencing data including DNA-seq, RNA-seq, and CHIP-seq in Graphical User Interface using Galaxy or in command line
- Write short scripts to do this analysis using command line resources.

INDIVIDUAL LAPTOP IS NEEDED FOR EACH CLASS.

BIOF 535

Fall, 1 credit (5 weeks)

NEW Fundamentals for Precision Medicine: Medical Population Genetics and Genomics

Ben Busby, Martine Zilversmit

In this course, students will learn to leverage fundamental concepts of population genetics and genomics, using public data sets housed at NCBI to further their research objectives. Topics covered will include sequence alignment, genetic variation, population structure, and phenotypic analysis.

Learning objective:

- Complete an individualized population genetics or genomics project with a public data set.

BIOLOGY AND GENETICS

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

Deborah Hinton, Chair

FALL	BIOL 101	Introductory Biology
SPRING	BIOL 102	Introduction to Genetics
SPRING	BIOL 232	Investigating Molecular Structures with Pymol and 3D-Models (4 weeks)
SPRING	BIOL 254	Non-Coding RNAs and MicroRNAs: Biology and Diseases (8 weeks)
FALL	BIOL 262	Research Tools for Studying Diseases
FALL	BIOL 313	Introduction to Recombinant DNA and Molecular Biology
FALL	BIOL 325	Human Neuroscience
FALL 2016-ALT	BIOL 327	Modern Developmental Biology
FALL	BIOL 331	Retrovirology: Are Retroelements Friends or Foes? (4 weeks)
SPRING	BIOL 332	Introduction to Nanomedicine (8 weeks)
SPRING NEW	BIOL 350	Foundations of Cellular Neuroscience
FALL NEW	BIOL 355	Principles of Biology of Bone and Other Connective Tissues
SPRING NEW	BIOL 375	Neurobiology of Addiction
FALL	BIOL 413	Genetic Engineering (7 weeks)
FALL 2015-Alt	BIOL 435	Current Trends in the Neurobiology of Mental Illness
FALL, SPRING	BIOL 450	Stem Cell Biology
FALL, SPRING	GENE 500	Introduction to Medical Genetics I and II
FALL 2015-Alt	GENE 505	Embryology, Developmental Biology and Human Malformations
FALL, SPRING	GENE 510	Genetic Counseling: Professional Topics Seminar
SPRING	GENE 514	Current Concepts in Clinical Molecular Genetics and Molecular Diagnostics
FALL 2016-Alt	GENE 518	Medical Genetics and Genomic Medicine: From Diagnosis to Treatment
SPRING 2017-Alt	GENE 644	Review of Medical Genetics

BIOL 101

Fall, 2 credits

Introductory Biology

Sukanya Suresh*, Yuanyuan Zhang

This is an introductory course to biology, covering contents in cell biology, molecular biology, genetics, and human physiology. The course will start with explaining how cells are organized and function to maintain our daily life. Next, the course will cover how DNA conveys the genetic information to determine our appearance and health. The principles of heredity will be also introduced to understand how personal traits are passed between generations. The second part of the course will focus on human physiology and nutrient metabolism, while highlighting the development of some common diseases, such as cancer, autoimmune disease, and obesity.

Learning objectives:

- Describe the structure of a cell and understand the central dogma of DNA
- Apply Mendel's principles of inheritance
- Recognize the major systems involved in human physiology
- Differentiate the metabolism of carbohydrate and fat
- Gain knowledge to be able to follow the recent scientific advancement against common diseases.

BIOL 102

Spring, 2 credits

Introduction to Genetics

Simona Rosu*, Alison Walters

This course will introduce students to fundamental concepts of genetics, including mechanisms of inheritance (Mendelian genetics, mitosis and meiosis, linkage), and the molecular basis of inheritance (DNA and chromosome structure, replication, recombination, gene regulation, mutation, DNA repair). In addition, we will cover methods and applications of genetics to fields such as developmental genetics, cancer genetics, genomics, and biotechnology. Course format will include lectures, problem solving, discussion and a short assignment analyzing a genetics-based technology/issue of the student's interest.

Learning objectives:

- Understand nomenclature and terms used in genetics
- Learn about molecular basis of genetics and mechanisms of inheritance
- Gain familiarity with a range of genetics techniques and how they are used to solve biological problems
- Apply knowledge of genetics to assess current advances in genetics, emerging technologies and potential impact on society.

Prerequisites: basic biology course useful, but not required.

BIOL 232

Spring, 0.5 credit (4 weeks)

Investigating Molecular Structures with Pymol and 3D-Models

Deborah Hinton

Manipulation of molecular structures both on the computer screen and by hand can bring deeper insights into structure/function relationships. In this short course (total of 8 hours), students will learn how to use Pymol to investigate structures and to prepare publication-quality graphics and movies. The analysis will be aided by the generation of models from a 3D printer to allow the student to manually feel what is seen virtually. The course will focus on the needs of molecular biologists/biochemists to understand structure and produce effective aids for presentations. Beginners will learn basic features of the program, while students who enter the class already familiar with Pymol will learn more advanced techniques, such as writing scripts and basic Chimera. The course will be performed as a 'hands-on' class.

Learning objectives:

- Understand the information contained in a PDB file: manipulate 3D chemical structures of biomolecules using point and click action
- Utilize the software for analysis of three-dimensional structures: recognition of binding sites, measurement of distances and angles, create basics scripts
- Produce paper-quality figures using Pymol and create movies based on simple movements: translations, rotation and zoom in and out
- Morph two structures one into the other one; understand structure/function relationships between the two proteins.

Prerequisites: no previous knowledge of Pymol is required, but students will need to bring a laptop with a 3-button mouse and have loaded Pymol onto the computer before class (students who need help with this should contact the instructors).

BIOL 254

Spring, 1 credit (8 weeks)

Non-Coding RNAs and MicroRNAs: Biology and Diseases

Aly Abdelmohsen Kotb , Jonathan Cohen, Lena Diaw*

This course will address the biology, function, and expression of non-coding RNAs, with an emphasis on microRNAs. It will also highlight the involvement of non-coding RNAs in human diseases. The objective of the course is to provide an overview and current scientific knowledge of this fast-emerging field. Classes will cover different aspects of non-coding RNAs and microRNAs, from the points of view of molecular biology, role in diseases and stem cells as well as current technologies and available databases.

Learning objectives:

- Learn the latest scientific findings in the field of Non-coding RNAs and MicroRNAs:
  1. MicroRNAs Biogenesis and Functions
  2. Long Non-coding RNAs Biology and Functions
  3. Detection Technologies and Databases of Non-Coding RNAs, in general, and microRNAs, in particular
  4. MicroRNAs, Extracellular Vesicles, and Disease Biology:
     - Microbiome
     - Immune Responses
     - Cardiovascular diseases and Diabetes
     - Stem Cells.

BIOL 262

Fall, 2 credits

Research Tools for Studying Diseases

Philip Ryan, Philip Y. Wang

This course is designed to help students gain an appreciation of essential scientific approaches and techniques in studying various human diseases and biological disorders. A variety of techniques are discussed, including molecular, cellular, biochemical, genetic, imaging, computational, and high-throughput screening approaches. Students will learn applications and recent advances for each approach as well as gain a historical perspective on the development of each technique. Emphasis will be placed on the appropriate application of each technique, with a focus on the exploration of the progression and therapeutic effects of treatments to various diseases. The course provides individuals of all backgrounds and levels of experience with the opportunity to become knowledgeable in a wide variety of scientific approaches in biomedical research.

Learning objectives:

- Introduce students to various approaches to biomedical and translational research
- Provide students with fundamental knowledge of various scientific techniques essential for conducting successful research
- Develop critical-thinking and problem-solving abilities and learn about practical applications of the research techniques covered in this course
- Learn about various diseases and how research leads to better therapeutic applications.

Prerequisites: undergraduate biology and chemistry.

BIOL 313

Fall, 2 credits

Introduction to Recombinant DNA and Molecular Biology

Soumyadeep Dey

This course will explore the fundamental concepts of recombinant DNA techniques and the most relevant and exciting findings that redefined our understanding of DNA, RNA, and protein. Emphasis will be on basic structure and organization of eukaryotic and prokaryotic genome, and molecular mechanisms of DNA replication, transcription, protein synthesis, and genetic regulation in different organisms. In addition, we will focus on rapidly evolving fields including chromatin structure and function, DNA-protein interaction dynamics, and regulation of gene expression by different types of RNAs. We will also introduce experimental approaches of creating recombinant DNA molecules, isolation of cloned genes, directed mutagenesis and protein engineering, transgenes, sequencing, and applications of recombinant DNA methodologies to gene therapy, vaccines, crops, and synthesis of other commercial products.

Learning objectives:

- Gain basic molecular biology knowledge of how genetic material (DNA and RNA) is the key to our survival and function and how this information is transferred over generations
- Understand how changes in this basic information encoded by the genetic material lead to changes in biological characteristics
- Master and use the most advanced tools and experimental techniques to study cell and molecular biology
- Describe how recombinant DNA techniques are used in modern applications in the lab or industry to develop cures for diseases and biotechnological advancements that affect daily life.

BIOL 325

Fall, 3 credits

Human Neuroscience

TBD

This course will review the major structures and neuronal pathways of the human brain, starting with those found in the spinal cord and moving to medulla, pons, cerebellum, midbrain, hypothalamus and thalamus, and finishing with the limbic system, basal ganglia, hippocampus and cerebral cortex. Brain development will be used as an aid in appreciation of structures and connectivity. A functional neuroanatomical description will be given to sensory (somatic and autonomic), motor, association, extrapyramidal, and limbic systems. Some consideration will be given to the relationship between cortical areas defined on the basis of cytoarchitectonics and areas of the human brain as parceled out by brain imaging techniques. The major differences in the anatomy of brains of humans as compared to other species more commonly used in research settings will be covered. The goal of this course is to educate those researchers doing animal and human brain research who want to become familiar with basic neuroanatomy, brain structure and function in primates.

Learning objectives:

- Develop a strong foundation in functional neuroanatomy
- Learn neuroanatomical facts vital to clinical practice
- Compare neuroanatomical regions in human and non-human primate species more commonly used in research setting (e.g., macaque monkey)
- Use modern software technology in classroom to visualize cerebral structures.

Prerequisites: BIOL 101 or equivalent.

BIOL 327

Fall 2016, Alternate Years, 2 credits

Modern Developmental Biology

Robert S. Adelstein, Susan Mackem, Yosuke Mukoyama*, Constance Tom Noguchi

This course covers the molecular mechanisms that regulate vertebrate embryonic development. Discussions range from conserved evolutionary processes to defects and genetic mutations in human development and disease. Specific topics include: cell-cell interactions; organogenesis; brain, cardiovascular and limb development; stem cell generation, maintenance and migration; cloning and genetic manipulations; epigenetic modification and system biology. Each class will include discussions of current literature, with emphasis on processes and mechanisms of development.

This course will survey the fundamentals as well as recent progress in vertebrate development, including stem cell biology. It will also cover cutting-edge techniques such as advanced genetic manipulations, high-resolution imaging and induced pluripotent stem cells (iPS). The experts will not only give a basic lecture about developmental biology but also introduce recent leading-edge and important findings is each topic during the lecture. The first half of the class will consist of a lecture based on a relevant chapter in the latest edition of Scott Gilbert's textbook, *Developmental Biology*. The second half of each class will be devoted to a presentation and discussion of important articles underlying vertebrate development.

This course is suitable for students preparing to pursue careers in research, medicine and/or health, fellows studying mouse models with developmental defects, and those wishing to expand their understanding of growth and development of complex organisms. Students will have opportunities to read, evaluate and critically discuss research articles.

Learning objectives:

- Expand on knowledge of elementary cell biology to include development of complex organisms and genetic origin of human disease
- Acquire understanding of developmental processes and resulting impact of genetic mutations
- Advance scientific communication skills toward critical evaluation of scientific literature.

Prerequisites: Biology 101 or college-level biology.

BIOL 331

Fall, 0.5 credit (4 weeks)

Retrovirology: Are Retroelements Friends or Foes?

Singh Parmit

Retroelements are virtually in every genome, with HIV being one of the most infamous retroviruses. However, did you know that it represents only one example of the retroelements shaping the human genome? The retroviruses and retrotransposons impact in many ways their host genomes, for bad or good. This course will offer an overview of how retroviruses and retrotransposons have been discovered, the different types of retro-elements, and how they achieve their life cycle. The course will also discuss how retroelements target their integration sites in the host genome in order to avoid damage of the host genes. In addition, we will describe recent findings in the application of human transposons and endogenous retroviruses in gene therapy.

Learning objectives:

- Understand transposons and retroviruses and how they can influence the host genome as well as how they can be regulated by their host genome
- Apply scientific publication analysis skills and knowledge learned during this course in higher education and research
- Identify the different types of retrolements and their integration pattern
- Understand how retroelements can be used as gene vectors to develop safer gene therapies.

BIOL 332

Spring, 1 credit (8 weeks)

Introduction to Nanomedicine

Don Ho, Barbora Piknova*, Laxminath Tumburu

This course will introduce students to the basic concepts of nanomaterials and nanotechnologies and their use in medicine. Use of nanotechnologies in current medical practice and current clinical trials as well as the long-term potential of nanomedicine will be presented. Potential toxicity of nanomaterials will be also discussed.

Learning objectives:

- Gain insight into the basics of nanomedicine
- Familiarize participants with basic concepts, use and difficulties of nanomedicine.

There are no prerequisites for this course. This course will be taught by junior faculty members.

BIOL 350

Spring, 3 credits

NEW Foundations of Cellular Neuroscience

Jeffrey Diamond

This course explores a wide range of cellular neuroscience, including: membrane biophysics and action potentials; ion channels; synaptic transmission and plasticity; dendritic integration and computation. Lectures also introduce techniques used to record and image activity and signaling in neurons,

as well as quantitative methods used to analyze experimental data. The course also features in-depth discussions of classic and current literature, with problem sets and exams to enhance and test understanding of lecture material.

Learning objectives:

- Develop conceptual and quantitative understanding of basic cellular physiology and biophysics
- Learn about electrophysiological and imaging techniques used in neuroscience experiments
- Gain a historical perspective on the study of ion channels, synapses and neurons.

BIOL 355

Fall, 2 credits

NEW Principles of Biology of Bone and Other Connective Tissues

Elena Makareeva, Lynn Mirigian

Bone and other connective tissues such as basement membrane, cartilage, tendons, ligaments, and skin are crucial for providing structural support and contextual cues that sustain proper function of other organs and tissues in the body. The purpose of this course is to provide students with a framework for understanding the extracellular matrix environment that surrounds cells and organs commonly studied in biomedical research.

This course incorporates fundamentals of biochemistry, biophysics, and cell biology for understanding the structure, function, pathology and repair mechanisms of bone and other connective tissues. The course will provide a review of common experimental techniques used to study bone pathology, properties of extracellular matrix and cell functions relevant to various diseases (i.e., osteoporosis, osteogenesis imperfecta, fibrosis, cancer) and applications of regenerative medicine.

Learning objectives:

- Master basic structure and function of connective tissues and how they relate to other organs
- Review common experimental techniques used in bone and connective tissue biology
- Demonstrate the role of connective tissues in diseases.

Prerequisites: some understanding of basic biochemistry and cell biology principles.

BIOL 375

Spring, 2 credits

NEW Neurobiology of Addiction

Nancy Diazgranados, Vera Spagnolo

The objective of this course is to introduce the behavioral and biological processes involved in the development of addiction. The course will focus primarily on drugs of abuse, but will also cover other types of addiction, such as food-related addiction. Leading scientists and clinicians will be recruited to provide lectures in their areas of expertise. Their lectures will focus on pathophysiology, pharmacology, neuroimaging and genetics. A wide range of techniques used to study addiction will be discussed including preclinical animal models, electrophysiology, neurochemistry, molecular biology, and clinical studies. Course materials will include recent scientific literature from the field.

This course is appropriate for postbaccalaureate students, graduate students, or upper-level undergraduates with previous college-level exposure to neuroscience.

Learning objectives:

- Understand the current knowledge on the neurocircuitry of addiction
- Gain an appreciation of the genetic variables that contribute to use of addictive agents and to the transition from use to addiction
- Learn about novel research strategies being developed to study addictions.

Prerequisites: college-level neurobiology and genetics recommended.

BIOL 413

Fall, 1 credit (7 weeks)

Genetic Engineering

James Pickel

In 2007, the Nobel Prize in medicine was awarded to Mario Capecchi and Oliver Smithies for their work on genetic modifications in mice using embryonic stem cells. Combined with recent advances in genomics, including genome editing using engineered nucleases, this technology has led to a revolution in biomedical science, linking genes to processes of disease and development that are generally similar in mice and humans. The principles of targeted genome editing, such as mechanisms of homologous recombination and double-stranded breaks reparation and the applications of targeted genome editing, from basic research to gene therapy, will be addressed in this course.

The objective of the course is to provide an overview, and systematic introduction to researchers who need to understand these technologies to investigate the function of interested genes. Classes will cover traditional knockout, conditional knockout and transgene, targeted gene editing with zinc-finger nucleases (ZNFs), targeted gene editing with transcription activator-like effecter nucleases (TALENs) and targeted epigenetic editing with engineered nucleases. These engineered nucleases make it possible to site-specifically change the DNA sequence and the epigenetic state as well. At the end of this course, students should be able to understand the principles behind these widely used technologies and design the targeted constructs for any gene they are interested.

Learning objectives:

- Provide overview and learn the principles of targeted genome editing
- Discuss applications of targeted genome editing from basic research to gene therapy
- Acquire ability to design targeted constructs for interested genome editing.

Prerequisites: college-level understanding of basic cell biology, molecular biology and genetics.

BIOL 435

Fall 2015, Alternate Years, 2 credits

Current Trends in the Neurobiology of Mental Illness

Carlos Zarate, Jr.

The objective of this graduate-level course is to provide an overview of the biological basis of major neuropsychiatric disorders as well as to explore the emerging methodologies (both basic sciences and clinical) utilized in the study of these brain disorders. A group of leading scientists and clinicians has been recruited to provide lectures in their areas of expertise. Disorders to be covered include: bipolar disorder; major depression; anxiety disorders; schizophrenia; autism, and substance dependence. Speakers will discuss the evidence supporting current theories related to each disorder, with particular emphasis on the limitations of current diagnostic systems and methodologies, the prospects for the greatest advances, and their individual contributions to the field. Additionally, specific lectures will focus on methodologies that are rapidly having a major impact on neuroscience research, as well as advancing our understanding of neural function, disease mechanisms, diagnostic systems, biomarkers, and drug discovery and development. Areas to be discussed will include: positron imaging tomography; magnetic resonance imaging (functional and structural); animal models; biochemical techniques; genetic and epidemiological analysis; statistical modeling. Students enrolled in the course will be expected to develop an understanding of the advanced techniques used to study these illnesses and pathways to develop new treatments.

Learning objectives:

- Demonstrate a familiarity with recent and groundbreaking novel research regarding the biological basis of major neuropsychiatric disorders
- Develop a broad knowledge of the scope and impact of mental illness through the synthesis of recent advances in etiology and treatment of pathophysiology
- Identify and describe the methodologies impacting neuroscience research, including positron emission tomography, magnetic resonance imaging, animal models, and genetics
- Discover real-world applications of material into future research, medical or graduate study pursuits
- Complete a final short-answer examination which incorporates material from all topics and guest speakers.

Prerequisites: familiarity with college-level neurobiology, biochemistry, and genetics.

BIOL 450

Fall and Spring, 1 credit

Stem Cell Biology

Suresh K. Arya

This course covers the new field of inquiry of stem cells, in recognition of the role that stem cells play in the post-embryonic phase of life. The course will also examine current understanding of the working of the stem cells in embryogenesis. This course will address, both from the theoretical and practical perspectives, the question of self-renewal, pluripotentcy, immortal strand synthesis as well as the nature and reasons for differential routes of differentiation into various tissue types. For example, the idea of 'context' will be discussed and the realization that the microenvironment (the stem cell nitch) plays an important role in fate determination. The class will also discuss the problems around whether induced pluripotent cells – a technical achievement – can be useful for tissue regeneration and therapeutics.

Learning objectives:

- Learn the origin and residence of stem cells in embryos and adult tissues
- Discuss the basis for self-renewal and pluripotency of stem cells and the regulation of stem cells in embryogenesis and their differentiation into adult tissues
- Survey the role of stem cells in human disease, with focus on cancer
- Consider the pros and cons of induced pluripotent stem cells in tissue regeneration and therapeutics
- Discover normal and cancer stem cell niche and fate determination.

GENE 500

Fall and Spring, 2 credits each semester

Introduction to Medical Genetics I and II

Suzanne Hart*, Maximilian Muenke

The objective of this two-semester course is to provide an introduction to clinical and human genetics for fellows and genetic counseling students who are preparing for subspecialty examinations of the American Board of Medical Genetics and for others who wish to learn about the expanding role of genetics in medicine. The first semester will introduce basic concepts of genetics, cytogenetics and molecular genetics. The second semester will include presentations on clinical topics emphasizing the diagnosis and management of patients with genetic disorders.

Topics to be covered in the fall semester include Mendelian and non-Mendelian inheritance, congenital malformations, dysmorphology, teratology, storage disorders and other inborn errors of metabolism, mitosis, meiosis, structural abnormalities and segregation, X chromosome inactivation, new advances in cytogenetic technology including FISH, the molecular organization, regulation and manipulation of genes.

In the spring semester, topics will include genetic polymorphism and disease susceptibility, DNA diagnosis, prenatal and pre-implantation diagnosis, multifactorial inheritance, population genetics, linkage analysis, oncogenes, tumor suppressor genes, the molecular basis of breast and colon cancer and relevant counseling issues, genetic disorders of specific organ systems, newborn screening, gene therapy, the consumer's view of genetic services and ethics and genetic technology. This course should impart basic principles of genetics as applied to medicine and provide an approach to a patient with a suspected genetic disorder.

Fellows and genetic counseling students who are preparing for subspecialty examinations of the American Board of Medical Genetics and others who wish to learn about the expanding role of genetics in medicine.

Fall Learning objectives:

- Appreciate organization of the human genome and tools used to investigate it
- Acquire skills to determine the most likely mode of inheritance of a trait, to interpret the results of linkage and association studies.

Spring Learning objectives:

- Appreciate the impact genetic disorders have on the various organ systems
- Acquire skills to develop a differential diagnosis and appropriate work-up for a given phenotype.

Prerequisites: graduate-level training or experience in the biomedical sciences or consent of the course instructor.

GENE 505

Fall 2015, Alternate Years, 1 credit

Embryology, Developmental Biology and Human Malformations

Leslie Biesecker

The objective of this course is to familiarize students with modern developmental biology and use this knowledge to understand common human malformations. The course will begin with lectures on the methodology and model systems of developmental biology, a review of preimplantation development and gastrulation, and embryogenesis/organogenesis. Subsequent lectures will focus on the development of several organ systems (e.g. central nervous system, cardiovascular, limb, urogenital, gut/respiratory, and craniofacial). These systems will be covered in two lectures each. A closing lecture on developmental pleiotropy will round out the course.

Learning objectives:

- Connect conceptually the apparently distinct disciplines of embryology, developmental biology and clinical medicine to appreciate mechanisms of normal and abnormal development
- Appreciate the role of evolution for understanding the mechanistic basis of malformations and as a basis for the study of these disorders in animal models
- Develop skills of integrating data from clinical, anatomic and molecular studies to form a comprehensive description of malformations.

Prerequisites: permission of the course instructor.

GENE 510

Fall and Spring, 4 credits each semester

Genetic Counseling: Professional Topics Seminar

Tuition: $600

Barbara Biesecker*, Lori Erby

The objective of this course is to address the psychological, clinical, social, and ethical issues in genetic counseling. This class offers a dynamic forum for discussion, focusing on genetics counseling research, policy and education and their impact on clinical practice. A diverse group of professionals present topics well suited for class discussions. Student-led case presentations and discussions highlight pertinent psychological, social and ethical issues in genetic counseling. Clients who have had personal experiences with a genetic condition or risk expose students to a variety of attitudes, reactions and experiences. Students enrolled in related graduate programs are encouraged to enroll to maximize the opportunity for exchange among disciplines. This course presents an opportunity to college graduates interested in genetic counseling to learn about the theoretical and practical aspects of the profession.

This is a required course for the graduate students enrolled in the JHU/NHGRI Genetic Counseling Training Program.

Learning objectives:

- Participate in dynamic discussions of provocative issues in the field of GC, with faculty input
- Facilitate appreciation for pursuing GC as a profession both for professional and pertinent issues in clinical work
- Foster ideas and model projects in GC research
- Learn directly from clients about their personal experiences with genetic conditions
- Promote interaction among graduate students to facilitate mentoring, strategizing and camaraderie.

Prerequisites: permission of one of the instructors.

GENE 514

Spring, 1 credit

Current Concepts in Clinical Molecular Genetics and Molecular Diagnostics

Suzanne Hart

The objective of this course is to provide a review of molecular diagnosis of common hereditary or neoplastic disorders for which DNA-based diagnosis is now in routine use. Topics include FGFR3 disorders, fetal blood typing, thrombophilias, hemochromatosis, fragile X syndrome, polyglutamine disorders, hereditary breast cancers, Charcot Marie Tooth and spinal muscular atrophy, PraderWilli and Angelman syndromes, mitochondrial diseases, Duchenne and Becker muscular dystrophy, cystic fibrosis, and Smith-Lemli-Opitz Syndrome. Sessions also include genetic risk prediction, using linkage and Bayesian analysis as well as DNA forensics and paternity testing.

The course is designed as part of the required curriculum for Clinical Genetics residents and fellows preparing for the Clinical Molecular Genetics boards given by the American Board of Medical Genetics.

Learning objectives:

- Appreciate the types of techniques used in molecular genetic diagnostic laboratories, including the limitations of each assay
- Acquire skills in calculating residual risks after molecular testing.

Prerequisites: GENE 500 and permission of the instructor.

GENE 518

Fall 2016, Alternate Years, 2 credits

Medical Genetics and Genomic Medicine: From Diagnosis to Treatment

Suzanne Hart, Maximilian Muenke*

The objective of this course is to discuss how advances in genetics have impacted genetic disorders, from their diagnosis to treatment, by building upon the foundations learned in GENE 500. Topics include Smith-Lemli-Opitz syndrome, Rasopathies, neurocutaneous syndromes, muscular dystrophies, cohesinopathies, connective tissue disorders, ciliopathies, and psychosocial and genetic counseling issues in the era of genomic medicine.

The course is designed as part of the required curriculum for residents, fellows and students preparing for the genetics certification boards given by the American Board of Medical Genetics and the American Board of Genetic Counseling.

Learning objectives:

- Appreciate how advances in genetics have impacted genetic disorders, from their diagnosis to treatment
- Acquire skills to conduct a dysmorphology examination.

Prerequisites: GENE 500 or permission of the instructor.

GENE 644

Spring 2017, Alternate Years, 2 credits

Review of Medical Genetics

Tuition: $600

Suzanne Hart

The objective of this course is to provide a review for candidates for the American Board of Medical Genetics Subspecialty examinations: clinical genetics, molecular genetics, biochemical genetics, cytogenetics, and genetic counseling. Topics to be covered include statistical and mathematical subjects in clinical genetics and population genetics, clinical cytogenetics, dysmorphology, ophthalmologic genetics, and general treatment and management of genetic diseases.

Learning objectives:

- Review the fundamentals of genetics and a variety of genetic disorders in preparation for the American Board of Medical Genetics certification examination
- Acquire skills to recognize and eliminate distractors on the certification exam.

Prerequisite: Board candidate for any subspecialty exam of the American Board of Medical Genetics.

OTHER COURSES THAT MAY BE OF INTEREST

BIOF 312
Introduction to Perl

BIOF 429
Practical Bioinformatics

BIOF 518
Theoretical and Applied Bioinformatics

BIOF 450
Evolutionary Genomics and Computational Biology

STAT 435
Genetic Epidemiology

CHEMISTRY, PHYSICS AND IMAGING

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Darón Freedberg, Chair

FALL	CHEM 101	General Chemistry I
SPRING	CHEM 102	General Chemistry II
FALL	CHEM 211	Organic Chemistry I
SPRING	CHEM 212	Organic Chemistry II
FALL	CHEM 244	Practical NMR Spectroscopy: Basic Methods for Characterizing Molecules
SPRING	CHEM 327	The Art of Drug Design and Discovery
FALL NEW	PHYS 225	Survey of Biomedical Physics

CHEM 101

Fall, 3 credits

General Chemistry I

Darón Freedberg

In this introduction to chemistry, we will emphasize a conceptual understanding and show how the chemistry learned here can apply to health-related situations. Our goal is to familiarize students with chemistry concepts and to provide the skills necessary to carry out lab work using these skills. We will also stress problem solving. **CHEM 101** will be taught at a chemistry-major level, and will provide the background for organic chemistry, biochemistry and other health sciences where chemistry is utilized.

Learning objectives: specific topics included cover:

- properties of matter
- elements & compounds
- conservation of mass
- symbols and formulae
- the periodic table
- covalent bonding
- gas laws
- solution properties.
- units of measurement
- homogeneous and heterogeneous mixtures
- states of matter
- stoichiometry
- electronic structure
- molecular structure
- acid base reactions

CHEM 102

Spring, 3 credits

General Chemistry II

Darón Freedberg

As in CHEM 101, we will emphasize a conceptual understanding and show how the chemistry learned here can apply to health-related situations. Our goal is to familiarize students with chemistry concepts and to provide the skills necessary to carry out lab work using these skills. We will also stress problem solving. **CHEM 102** will be taught at a chemistry major level, and will provide the background for organic chemistry, biochemistry and other health sciences where chemistry is utilized.

Learning objectives: specific topics included cover:

- chemical equilibrium
- pH
- reaction kinetics
- redox reactions
- solubility
- introduction to organic and biochemistry.

Prerequisites: CHEM 101 or equivalent.

CHEM 211

Fall, 3 credits

Organic Chemistry I

Darón Freedberg

This course will provide students with a solid foundation in organic chemistry through a systematic study of the chemistry of carbon compounds, including alkanes, alkenes, alkynes, alkyl halides, and aromatic compounds. These compounds will be discussed in relation to appropriate concepts of structure and bonding, stereochemistry, transition state theory, mechanisms, resonance and spectroscopy. The application of the above to synthetic organic chemistry will be emphasized. Considerations in biochemistry, medicine and pharmacology will be made. The first semester will be concerned primarily with structural bonding, stereochemistry, aliphatic compounds and mechanism. We will emphasize the application of the above topics to synthetic organic chemistry. We will also highlight connections between the fields of organic chemistry and biochemistry, medicine and pharmacology.

Learning objectives:

- Draw and interpret chemical structures
- Predict chemical properties based on structural information
- Predict products for chemical reactions
- Draw mechanisms for chemical transformations.

Prerequisites: general chemistry or consent of the instructor.

CHEM 212

Spring, 3 credits

Organic Chemistry II

Darón Freedberg

This is a continuation of CHEM 211, with the goal of providing a solid foundation in organic chemistry. This semester will cover alcohols, esters, carboxylic acids, amides, ethers, amines, aldehydes, and ketones with a brief overview of some biologically relevant structures such as carbohydrates, amino acids, DNA, RNA and lipids. We will continue to emphasize the application of the above topics to synthetic organic chemistry and to highlight connections between the fields of organic chemistry and biochemistry, medicine and pharmacology.

Prerequisites: CHEM 211 or equivalent.

CHEM 244

Fall, 3 credits

Practical NMR Spectroscopy: Basic Methods for Characterizing Molecules

Darón Freedberg

The goal of the course is to introduce and flesh out the concepts already familiar to students who may have studied them in organic chemistry. This course will focus on the use and application of basic NMR concepts and methods.

Learning objectives: We will cover:

- chemical shifts
- dynamic NMR
- two dimensional NMR
- couplings, data acquisition
- one- dimensional NMR
- NOEs

We will cover these with a practical and, generally, non-mathematical approach. These will then be applied to solving problems and choosing the best techniques for different types of molecules.

Prerequisites: one year of organic chemistry.

CHEM 327

Spring, 2 credits

The Art of Drug Design and Discovery

THIS COURSE WILL BE HELD AT NCI-FREDERICK

Joseph J. Barchi, Jr.

The objective of this course is to explore the fundamental principles of modern drug discovery with an emphasis on antiviral and anticancer drug design. A brief history of the discovery of hallmark drugs, such as penicillin, will serve as a backdrop for in-depth discussions on state-of-the-art techniques for target discovery and validation, lead discovery and lead optimization. Several classes of compounds with therapeutic potential will be discussed, such as peptides, carbohydrates, nucleosides and their analogs (mimetics). The latest methods in molecular modeling, high throughout screening and structure-activity relationships will be presented. The concept of "rational" drug design based on high resolution target structures derived from NMR and X-ray crystallography will be stressed. The course will benefit from guest lectures from outstanding researchers in specific fields of interest.

Learning objectives:

- Gain a solid working knowledge of modern drug discovery process
- Understand molecular basis for the mechanism of action of a variety of drug types
- Acquire chemical/biological insights necessary to apply what is learned to one's own research.

Prerequisite: organic chemistry.

This course is an elective for Advanced Studies in Technology Transfer.

PHYS 225 Fall, 2 credits

NEW Survey of Biomedical Physics

Alex Szatmary

The course will introduce students to the basic and applied physics concepts behind the functioning of a healthy human body, pathology, diagnosis, and therapy. Examples from cardiology include: blood flow through the heart being governed by fluid dynamics and the elasticity of the heart muscle and valves; hypertrophic cardiomyopathy is attributed to mutations affecting force-generating proteins, leading to disarray in cell alignment.

While the focus of the course is not on MCAT preparation, the physics concepts and techniques discussed will be a useful practice. This course is meant for students in medical and biological sciences. The topics covered in the course will be:

1) Force distribution and bodily motion
2) Respiratory system
3) Cardiovascular system
4) Eye and vision
5) Ear and hearing
6) Diagnostic x-rays
7) MRI imaging.

Learning objectives:

- Describe how force, flow, and waves govern physiological processes
- Calculate effects on physiology resulting from physical pathological changes
- Assess and discuss the benefits and limitations of therapeutic implantable medical devices
- Explain how diagnostic equipment works and determine whether data from instruments is physiologically relevant or is due to physical limitations of the measurement methods.

Prerequisites: knowledge of basic algebra and graphing.

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EPIDEMIOLOGY, STATISTICS AND MATHEMATICS

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Carolyn Hutter, Chair

FALL	MATH 127	Elementary Calculus I
SPRING	MATH 128	Elementary Calculus II
FALL NEW	MATH 335	Introduction to Mathematical Modeling
FALL, SPRING	STAT 200	Experimental Statistics I and II
FALL	STAT 317	Introduction to Epidemiology
FALL	STAT 321	Methodology in Clinical Trials
SPRING ONLINE	STAT 325 - O	Epidemiologic Research Methods (ONLINE)
SPRING NEW ONLINE	STAT400 - O	Introduction to Statistical Computing Using R (ONLINE)
FALL 2016 - ALT	STAT 435	Genetic Epidemiology
SPRING	STAT 456	Introduction to Tropical Medicine
FALL, SPRING	STAT 500	Statistics for Biomedical Scientists I and II
SPRING ONLINE	STAT 500 I - O	Statistics for Biomedical Scientists I (ONLINE)
FALL ONLINE	STAT 500 II - O	Statistics for Biomedical Scientists II (ONLINE)

MATH 127

Fall, 3 credits

Elementary Calculus I

Alan Barnett

This course is an introduction to calculus and is aimed at students who have not taken calculus in their previous education. The course will begin with a review of pre-calculus topics including functions and algebra, which are then used as the groundwork for exploring the core topics of limits, continuity, differentiation and integration. Where possible, problems considered in class will be of a biological nature and problem sets will be available to promote understanding.

Learning objectives:

- Understand the concept of functions, their limits and continuity
- Become reasonably familiar with differentiation and integration of functions
- May satisfy the minimum requirement for medical/dental schools, if taken together with MATH 128.

Prerequisites: knowledge of trigonometry, basic algebra and graphing are required.

MATH 128

Spring, 3 credits

Elementary Calculus II

Alan Barnett

This is a continuation of MATH 127. Topics will include application of differentiation and integration to life sciences, differential equations, functions of many variables, partial derivatives, constrained and unconstrained optimization.

Learning objectives:

- Understand the concept of differential equations and multivariate functions
- Learn how to solve differential equations.

Prerequisites: MATH 127 or equivalent course.

MATH 335

Fall, 2 credits

NEW

Introduction to Mathematical Modeling

Daniel Kerner, Gary Knott

The course provides a survey of mathematical modeling in biomedicine. Beginning with an introduction to mathematical and statistical models and their computer implementations, it covers specific models from chemical kinetics, thermodynamics, spectroscopy, and physiology Topics include: floating-point arithmetic; programming; the MLAB mathematical modeling system; and, topics in statistics, linear algebra, and multivariate calculus.

The course will also include demonstrations and homework using the MLAB Mathematical Modeling system, which will be provided to students.

Learning objectives:

- Study and discuss the concept of mathematical modeling
- Learn the statistics of error in data and the estimation of parameters
- Review some classical models: compartmental, circuit, chemical kinetics
- Learn the software for mathematical modeling.

Prerequisites: introductory college calculus and physics, or equivalent math/science background. Knowledge of statistics and chemistry will be helpful. (Prerequisites may be waived with the permission of the instructors.)

Software will be provided; Windows PC or OSX Mac (or Linux system) access is required.

STAT 200

Fall and Spring, 3 credits each semester

Introduction to Experimental Statistics I and II

Dong-Yun Kim

This course introduces statistical concepts and essential techniques that are frequently used in biomedical data analysis. The emphasis will be equally divided between solid understanding of basic principles and their applications. R software is introduced and used for demonstration throughout the course.

Topics covered in the first semester: probability and random variables; mean and variance; distribution theory; point estimation and confidence interval; R introduction.

Topics covered in the second semester: test of statistical hypothesis; one- and two-sample tests; power and sample size calculation; analysis of variance (ANOVA); nonparametric tests; linear regression; analysis of categorical data; permutation and bootstrap; data analysis using R.

Learning objectives:

- Understand basic principles of probability and statistics
- Use appropriate statistical tools to analyze data for research.

Prerequisites: working knowledge of algebra II; one semester of calculus is preferred.

STAT 317

Fall, 3 credits

Introduction to Epidemiology

Carolyn Hutter

The objective of this course is to provide an introduction to the principles and methods of epidemiology, defined as the study of the distribution and determinants of disease in populations. Lectures, problem sets, and outside reading will cover ecologic, case-control, cohort and experimental studies. Topics to be discussed will include study design, measures of disease risk, sources of bias, methods of controlling for extraneous factors, principles of screening, and interpretation of data. Illustrations will include classic and contemporary examples in acute and chronic disease.

Learning objectives:

- Calculate measures of disease risk and association
- Summarize steps involved in investigation of an infectious disease outbreak
- Describe and compare epidemiologic study designs
- Define bias and confounding
- Critically evaluate epidemiology studies as presented in journal articles and the popular press.

Prerequisites: STAT 200 or STAT 500 or equivalent.

Satisfactory completion of this course permits students to apply for transfer of credits into the George Washington University Master of Public Health Program.

This is a required core course for the Advanced Studies in Public Health.

STAT 321

Fall, 3 credits

Methodology in Clinical Trials

Yves Rosenberg

The objective of this course is to learn the concepts and methodology used in the design and conduct of randomized clinical trials. Topics to be covered will include description of main types of trial designs, principles of randomization and stratification, issues in protocol development (defining objectives and endpoints, blinding, choice of control), recruitment and retention, data collection and quality control issues, monitoring, and analyses of trials reports. Textbook material will be frequently supplemented by material from the literature. Guest lecturers will give lectures on power and sample size calculations, life table analysis, quality of life and cost evaluation. Examples from the cardiovascular, pulmonary and cancer areas will be used when appropriate. The course is intended for biomedical researchers desiring exposure to the clinical trial area.

Learning objectives:

- Acquire a fundamental understanding of methodological principles and concepts in clinical trials
- Describe essential elements of clinical trials and use this knowledge to contribute to successful conduct of a clinical trial as a researcher and collaborator
- Read critically clinical trials literature.

In order ro run this course, minimum 10 students need to register.

STAT 325 - O

Spring, 3 credits, ONLINE

ONLINE Epidemiologic Research Methods

Robert Hirsch

The objective of this course is to provide a deeper understanding of epidemiologic research methodology that can be used to interpret critically the results of epidemiologic research. This understanding will result from investigating conceptual models for study designs, disease frequency, measures of association and impact, imprecision, bias, and effect modification. The course will emphasize the interpretation of research, even when the design or execution of the respective research is less than ideal.

Learning objectives:

- Be able to distinguish design options in the conduct of epidemiologic research
- Learn about choices for measures of disease frequency, association, and impact
- Understand the origin of selection, information, and confounding biases and its effect on research results
- Know the origin of imprecision and its effect on research results
- Recognize the origin of effect modification and its effect on research results.

Prerequisites: STAT 200 or STAT 500 and STAT 317.

STAT 400 - O

Spring, 3 credits, ONLINE

NEW ONLINE Introduction to Statistical Computing Using R

Dong-Yun Kim

This online course will introduce modern statistical computing using R language. Topics include: visualization of data; random sample generation; resampling techniques, such as permutation tests and bootstrap; Monte Carlo integration, and nonparametric smoothing. Basic data management and exploratory data analysis will be also covered. This course takes an informal, hands-on approach with extensive use of graphics and computer programming that can be readily applied to solve practical problems that arise in empirical research. Familiarity with R is a plus, but not essential because the R basics are covered in detail.

Learning objectives:

- Understand modern statistical techniques such as data visualization and simulation based inference
- Gain working knowledge of how to use appropriate statistical tools to analyze data for research.

Prerequisites: A semester of calculus and an introductory statistics course is expected. Some computer programming experience preferred.

STAT 435

Fall 2016, Alternate Years, 2 credits

Genetic Epidemiology

TBD

This course surveys epidemiological approaches used to uncover genetic risk factors for common diseases. The course will focus on the design and implementation of genetic epidemiology studies and their clinical and public health applications. We will explore basic concepts of inheritance, molecular genetics, and population genetics, such as linkage disequilibrium, population stratification and others. We will also discuss common epidemiological methods used in genetic epidemiology, such as family-based and genetic association studies and will exercise how to critically interpret published literature in the field. We will be discussing these and many other issues surrounding this fascinating and relatively young field of epidemiology that is rapidly growing to bridge the gap between epidemiological practice and genetic knowledge.

Learning objectives:

- Understand basic concepts of genetic epidemiology
- Become familiar with methodologies used in human genome epidemiology
- Acquire skills needed to interpret literature and demonstrate understanding of how concepts learned in class are applied in research.

Prerequisites: introductory courses in epidemiology and/or biostatistics. No knowledge of genetics is required, but background in biological sciences will be helpful.

STAT 456

Spring, 2 credits

Introduction to Tropical Medicine

Nazzarena Labo

The objective of this course is to provide an introduction to the epidemiology of tropical diseases. The course will begin with an overview of key aspects of methods in epidemiological research. We will then discuss the epidemiology of major infectious diseases in tropical areas, such as malaria, dengue fever, filariasis, among others. Epidemiological studies related to the course will be discussed regularly. The course is aimed at students interested in learning more about the epidemiological research applied to tropical diseases. Experience in public health/epidemiology, albeit helpful, is not necessary.

Learning objectives:

- Acquire the fundamentals of key methods in epidemiological research
- Learn to read and interpret related epidemiological studies
- Review basic biology of major infectious diseases prevalent in tropical areas
- Discuss epidemiology of major infectious diseases in tropical areas.

Prerequisites: college degree; basic knowledge in microbiology is recommended.

STAT 500

Fall and Spring, 3 credits each semester

Statistics for Biomedical Scientists I and II

Deven Shah

The objective of this course is to provide an overview of statistics through a series of integrated lectures on analysis and interpretation of medical research data to biomedical researchers and clinicians who are interested in interpretation of the results of statistical analyses. Emphasis is on ideas and understanding rather than mechanics. Topics covered in the first semester include the foundation of statistical logic and the most commonly encountered statistical procedures in medical research. The second semester expands on the material covered in the first semester by looking at assumptions, extensions, and alternatives for common procedures. STAT 500 is a full-year course. Material covered in the first semester is necessary to satisfactorily undertake the second semester.

Those who will be routinely engaged in computing statistical procedures should consider STAT 200.

Learning objectives:

- Enable biomedical researchers to critique statistical analysis of classical biomedical and clinical research problems
- Understand the probability basis of statistical estimation and hypothesis testing
- Interpret statistical software printout from popular programs such as SAS, Excel, etc.
- Compute sample sizes for classical statistics hypothesis.

This is a required core course for the Advanced Studies in Public Health.

STAT 500 I - O

Spring, 3 credits, ONLINE

ONLINE Statistics for Biomedical Scientists I

Robert Hirsch

The objective of this course is to provide an overview of statistics for biomedical research workers and clinicians who are interested in the interpretation of the results of statistical analyses. This is a series of integrated lectures, readings, and exercises on analysis and interpretation of medical research data using Excel. Emphasis is on ideas and understanding rather than mechanics. Topics covered include the foundation of statistical logic, interpretation of the most commonly encountered statistical procedures in medical research, and selection of an appropriate method to analyze a particular set of data. The second semester expands on the material covered in the first semester. STAT 500 Online is a two-semester course. Material covered in the first semester is necessary to satisfactorily undertake the second semester.

Those who will be routinely engaged in computing statistical procedures should consider STAT 200.

Learning objectives:

- Understand the role of chance in biomedical research
- Become knowledgeable about processes of estimation and statistical inference
- Learn about the statistical methods used most often in biomedical research
- Select appropriate statistical approach to analyze a set of biomedical research data
- Use Excel to analyze biomedical research data.

STAT 500 II - O

Fall, 3 credits, ONLINE

ONLINE Statistics for Biomedical Scientists II

Robert Hirsch

The second semester expands on the material covered in the first semester. STAT 500 Online is a two-semester course. Material covered in the first semester is necessary to satisfactorily undertake the second semester. The objective of this course is to provide an overview of statistics for biomedical research workers and clinicians who are interested in the interpretation of the results of statistical analyses. This is a series of integrated lectures, readings, and exercises on analysis and interpretation of medical research data using Excel. Emphasis is on ideas and understanding rather than mechanics. Topics covered include the foundation of statistical logic, interpretation of the most commonly encountered statistical procedures in medical research, and selection of an appropriate method to analyze a particular set of data.

Those who will be routinely engaged in computing statistical procedures should consider STAT 200.

Learning objectives:

- Learn the statistical aspects of processes of planning and execution of biomedical research
- Know the assumptions of statistical methods, how to evaluate them, and responses to concerns
- Learn more complicated statistical methods than those presented in STAT 500-I
- Be able to build multivariable models and learn how they contribute to causal inference.

OTHER COURSES THAT MAY BE OF INTEREST

BIOF 312
Introduction to Perl

BIOF 518
Theoretical and Applied Bioinformatics

BIOF 450
Evolutionary Genomics and Computational Biology

PBHL 521
Cancer Screening

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

Suzanne Epstein, Chair		
FALL	GENL 098	Argentine Tango 101: Learn and Dance! (7 weeks)
FALL	GENL 099	Argentine Tango 201: Learn and Dance! (7 weeks)
FALL, SPRING	GENL 195	Mindfulness and Stress Reduction (9 weeks)
FALL, SPRING	GENL 319	Concepts in Science for MCAT Preparation
FALL, SPRING NEW	GENL 319-PSY	Concepts in Psychology for MCAT Preparation (7 weeks)
FALL, SPRING	GENL 322	GRE Review (7 weeks in fall; 8 weeks in spring)
FALL NEW	GENL 350	Introduction to Psychology and Biopsychology
SPRING	GENL 511	Boot Camp for University Teaching

GENL 098

Fall, 1 credit (7 weeks)

Argentine Tango 101: Learn About It and Dance!

Mirjana Nesin, Joshua Rigley*

Course will introduce students to a beautiful dance with multiple benefits on the physical, emotional and social aspects of life. For thousands of dancers worldwide, Argentine tango is a lifelong passion and hobby. Course will consist of practical (dance technique) and theoretical (history, tango culture, music, etc.) parts. Students will learn basic aspects of three related dances: tango, milonga and vals. The ultimate goal of the course is to enable students to attend social dances—milongas. At the end of the course, students will be invited to attend a local milonga.

Learning objectives:

- Dance posture, axis, balance, 'tango walk', basic steps and figures; improvisation through nonverbal communication between leader and follower
- Musicality: interpreting music (rhythm and melody) thorough body motion.

Prerequisites: none; students should bring comfortable shoes with leather soles.

GENL 099

Fall, 1 credit (7 weeks)

Argentine Tango 201: Learn About It and Dance!

Mirjana Nesin, Joshua Rigley*

Argentine tango provides a vast opportunity for improvisation and self-expression. Similar to learning languages or sports, tango dancers improve by taking classes and practicing for years. This course will further refine students' tango technique and introduce more complex concepts and figures. On alternating weeks, students will learn new material and participate in guided practice. The ultimate goal is to enable students to comfortably dance at milongas and attend more advanced classes by local and guest teachers.

Learning objectives:

- Learn new elements such as sacadas, barridas, boleos, ganchos, etc.
- Integrate combination of elements into dance
- Deepen communication between leader and follower
- Refine interpretation of tango music.

Prerequisites: Tango 101, or equivalent experience in dancing tango; comfortable shoes with leather soles.

GENL 195

Fall and Spring, 2 credits (9 weeks)

Mindfulness and Stress Reduction

LOCATION: Shanti Yoga Center for Harmony, Bethesda

Rezvan Ameli

This experiential and participatory course will introduce students to the practice of mindfulness, with focus on guided instructions and cultivation of mindfulness, gentle stretching and movement, group dialogue and home practice. Mindfulness is a set of timeless practices most fully articulated by the Buddha 2,500 years ago. Interest in mindfulness and its beneficial effects on health and wellbeing have greatly blossomed in the West in recent years. The application of mindfulness in medicine and stress reduction has also vastly increased.

No prior experience with meditation and reflective practices is required. This class can complement, but is not a substitute for, medical, psychological, and/or psychiatric treatment. If you have any concerns about the appropriateness of this course for your well-being, please consult your care provider. In case of serious conditions or disability, please contact the course instructor prior to registration to evaluate whether you would benefit from participation at this time.

First eight weeks will consist of eight 2.5-3 hour sessions. In week nine, there will be a full-day retreat.

Learning objectives:

- Learn and practice a number of mindfulness techniques and their application, such as mindful breathing, body scan, mindful walking, and mindful eating
- Acquire skills necessary to apply mindfulness practices into daily life
- Understand the importance of taking steps towards developing a regular mindfulness practice
- Experience the impact of practicing mindfulness on reducing stress.

GENL 319

Fall and Spring, 2 credits

Concepts in Science for MCAT Preparation

Salina Gairhe (chemistry), Nermi Parrow (biology)*, Kara George Rosenker (organic chemistry)

This review course prepares students for the Medical College Admission Test (MCAT). For a complete description of MCAT exam prerequisites and eligibility, please visit **www.aamc.org**. If you have not completed the prerequisites for taking the MCAT and have questions about this course, please contact the instructors. This course extends beyond a review of general biology, chemistry, and physics. It also reviews problem-solving, critical-thinking and writing skills, as well as scientific concepts and principles required for the study of medicine. The course provides students with rigorous coursework and extracurricular assignments to expand their foundational knowledge and increase practice in using that knowledge specifically for critical analysis and problem solving. It enables students to devote time to reviewing relevant material for MCAT preparation.

The course has 14 units; one will be covered each week. Each unit covers a portion of Physical Sciences, Verbal Reasoning and Biological Sciences. This is a systematic review, covering each unit in an organized way, using a PowerPoint slide format and in-class problem solving. Homework will be presented in the multiple-choice format of the MCAT and is suitable for class, group, and individual instruction. Students will be expected to identify topics that are unfamiliar and to use their graduate textbooks and notes as applicable.

Learning objectives:

- Review major disciplines and concepts for each MCAT section
- Understand basic scientific concepts and principles as they pertain to living organisms
- Apply foundational knowledge to solving problems presented in MCAT format
- Critically analyze discipline-specific text passages and arguments.

GENL 319 – PSYCH

Fall and Spring, 1 credit (7 weeks)

NEW Psychology for MCAT Preparation

Emily Webber

This course will cover concepts tested on the psychology and sociology portion of the MCAT. It is designed for students who have no background in the subject and want to do well on this portion of the test. Instruction will cover a review book from the Princeton Review. Specifically, the course will cover strategy for the following portions of the MCAT: biological foundations of behavior; interaction with the environment (attention, cognition, consciousness, etc.); learning and memory; personality; motivation; psychological disorders; self and group identity.

This course will also complement the skills of researchers working in neuroscience, mental health, addiction or physiology.

Learning objectives:

- Understand the basic structure of the nervous system
- Learn how the brain receives, processes and sends signals
- Become familiar with basic psychology principles
- Complete practice questions.

GENL 322

Fall and Spring, 1 credit (7 weeks/8 weeks)

GRE Review

Uri Manor

This review course will prepare students for the Graduate Record Examinations (GRE) General Test. We will cover the Quantitative, Verbal, and Analytical Writing portions of the General Test, with a primary focus on test content. Brief discussions of test-taking strategies will be covered and practice problems will be performed in class. Students will be provided with a variety of math, verbal, and analytical writing practice material for homework. The lectures will be interactive, with student participation strongly encouraged.

Learning objectives:

- Refresh knowledge on math concepts, verbal reasoning and analytic writing
- Sharpen skills for and gain confidence in GRE test-taking
- Improve GRE general test score.

GENL 350

Fall, 2 credits

NEW Introduction to Psychology and Biopsychology

Emily Webber

This course will cover the basic concepts of psychology and biopsychology. Topics will include: foundations of biopsychology (anatomy, synaptic transmission, research methods); the sensory and motor system; development of the nervous system; biopsychology of motivation (hunger, eating, hormones, sex, sleep, addiction); and, disorders of cognition and emotion.

Learning objectives:

- Understand the basic structure and function of the nervous system
- Learn how sensory and motor systems produce behaviors
- Become familiar with the development of the nervous system
- Engage material on the biopsychology of motivation
- Understand how damage or disease cause alterations in cognition and/or emotion.

GENL 511

Spring, 2 credits

Boot Camp for University Teaching

Don Ho, Barbora Piknova*, Laxminath Tumburu

This course is designed for researchers and other professionals interested in teaching at colleges and universities. Specific topics include systematic and proven methods of developing dynamic lectures, laboratory activities and student-centered learning. Templates for constructing syllabi, lesson plans, lecture schedules and novel ways to appeal to a wide variety of learning styles will be provided. Opportunities will be given to develop and present sample lectures on nanomedicine.

Special attention will be given to help build individual strategies for applying for college and university faculty positions, thus increasing future employment options.

Learning objectives:

- Practice lecturing on unfamiliar topic in front of a real class
- Understand different components of a teaching portfolio
- Receive help to assemble a starting teaching portfolio.

Prerequisites: graduate degree.

IMMUNOLOGY AND MICROBIOLOGY

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

John Finerty, Chair

FALL	IMMU 325	The Human Microbiome: New Concepts in Health and Disease (7 weeks)
FALL	IMMU 403	Basic Principles of Immunology and Hypersensitivity
FALL	IMMU 419	Cancer Immunotherapy and Vaccines
FALL	IMMU 521	Molecular and Cellular Mechanisms of Immunity I
SPRING	IMMU 522	Molecular and Cellular Mechanisms of Immunity II
FALL	MICR 317	Introduction to Molecular Virology
SPRING	MICR 418	Emerging Infectious Diseases
FALL	MICR 424	Mycology: From Medicine to Miscellany
SPRING	MICR 432	Human Virology

IMMU 325

Fall, 1 credit (7 weeks)

The Human Microbiome: Our Unseen Partner in Health

Ping Chen, Jessica Pierce*, Marlena Wilson

Ever wonder whether the latest headlines about 'good bacteria' are true or just hype? Come learn about the science behind the news and discover how the human microbiome is shaping our understanding of health, disease, and medical treatments. Topics will include the current technologies being used to study the microbiome, as well as microbial diversity in the gut and other sites. Special focus will be given to the study of mucosal immunity and immune tolerance as the immune system plays an integral role in interactions with the microbiome. The impact of our modern diet on the microbiome will also be considered, especially current trends such as the paleo diet. We will explore how dysbiosis of the microbiome contributes to human diseases, such as obesity, diabetes, and cancer. Students will discuss how knowledge of the microbiome impacts our usage of probiotics, prebiotics, and antibiotics, and evaluate new potential microbiome-based therapeutics.

This course is designed for postdoctoral fellows, postbacs, graduate students, and other individuals who are interested in expanding their understanding of the microbiome and probiotics in health and disease. By the end of the course, students should have an appreciation for the microbiome and its associated health benefits, including the impact of diet and dietary supplements. Probiotics will be distributed at the first class.

Learning objectives:

- Identify important constituents of the human microbiome
- Describe the technological methods used in microbiome analysis
- Critique the effects of antibiotics and diet on the microbiome
- Assess the effects of probiotics and prebiotics on human health and disease
- Evaluate the contribution of the microbiome in various human disease states.

Prerequisites: general knowledge of biology or consent of instructor.

IMMU 403

Fall, 2 credits

Principles of Immunology and Hypersensitivity

John Finerty, Rimas Orentas*, Hans Spiegel

The focus of this course is to enable students to understand a biologic system which protects from infection, cancer, yet can induce autoimmune diseases. Known as the immune system, it is controlled by a person's immunogenetics and determines resistance to infection, induction of autoimmune disease and allergies. Distinctions between the functions of innate/natural and adaptive immune systems will be discussed throughout the course. Further, the major roles of intestinal microbiota and inflammatory reactions in the induction of chronic diseases e.g. infection and cancer will be

included. The description, function and origin of cellular subsets, e.g. macrophages, B and T cells, serum proteins (immunoglobulins) and cell-surface receptors, will be discussed. While normality is the usual, mutations within the immune system and resulting immune deficiencies and pathologies will be highlighted.

Learning objectives:

- Distinguish functions of innate/natural and adaptive immune systems
- Understand the role of immunogenetics and gene rearrangements
- Describe the role of inflammation during infection, autoimmunity and cancer
- Map how cytokine activity affects cell signaling and cell function
- Learn resistance to infection, induction of allergies, autoimmunity and cancer immunology.

Prerequisites: college degree.

IMMU 419

Fall, 2 credits

Cancer Immunotherapy and Vaccines

Howard Streicher, Elad Sharon

In the 200 years since Edward Jenner introduced the vaccination for small pox, vaccines have become indispensable to modern life. Stunning achievements have been made with new technologies, including conjugated vaccines. However, attempts to apply vaccine therapy based on principles learned from infectious disease to cancer immunotherapy have had limited success. Over the past decade, new therapies have led to the successful application of basic immunologic principles to treat human malignancies. The development of adoptive T cell transfer and the use of monoclonal antibodies to turn on an inhibited or exhausted immune system are the type of radical innovation that is generating a remarkable series of clinical results. New concepts are emerging to explain how even large tumors can be eliminated or controlled for long periods of time.

The course will discuss the highly successful vaccines for prevention of infectious disease and cancer, including HPV and hepatitis B in contrast to partially successful ones for malaria, hepatitis, HIV, tuberculosis. The course will emphasize the remarkable accomplishments of the past five years in molecular and immune biology, a detailed review of emerging therapies using adoptive T cell transfer and immune check point inhibitors, prospects for new agents, and the application of biomarkers and bioinformatics in this rapidly developing area. Throughout, the intent of the course is to provide an underlying framework for how the human immune system functions in infectious diseases, tumor immunity and in autoimmunity.

Student participation will be strongly encouraged.

Learning objectives:

- Understand the principles that support the highly successful vaccines for infectious diseases
- Gain an understanding of the rapidly emerging results in basic and clinical studies using innovative therapies for human malignancies
- Develop theoretical and practical framework for studying the human immunology of infectious disease, malignancy, and autoimmunity.

Prerequisites: familiarity with basic immunology is recommended.

IMMU 521

Fall, 2 credits

Molecular and Cellular Mechanisms of Immunity I

B. J. Fowlkes, Pierre Henkart*, Joy Williams

The objective of this course is to survey recent advances in immunology for students who have already had a basic immunology course. It is a series of lectures by NIH researchers covering lymphocyte development and function, the genetic and biochemical basis of Immune receptors and effector molecules. The course will also cover, along with antigen processing and recognition by T cells. The course includes lectures on signal transduction by immune receptors and regulation of immunologically important genes. Grades will be based on take-home mid-term and final exams as well as on a short review-style paper on a topic related to the course.

Learning objectives:

- Survey recent advances in immunology
- Discuss lymphocyte development and interactions, signal transduction, genetic and biochemical basis of immune receptors and effector molecules.

Prerequisites: previous immunology course or working knowledge of basic immunology. IMMU522 is designed as a follow-up.

IMMU 522

Spring, 2 credits

Molecular and Cellular Mechanisms of Immunity II

Scott Durum

The objective of this course is to survey recent advances in basic immunology for students who have already had a basic immunology course. The course is designed as a follow-up to the Fall semester course, IMMU 521. It is a series of lectures by NIH researchers covering basic science and clinical aspects of adaptive and innate immunity to viruses, parasites and bacteria. AIDS, primary immune deficiencies, autoimmunity, allergy and asthma will be discussed. Lectures on cytokines and their receptors will include interleukins, interferons, chemokines, the TNF family, TGFs and virokines. Regional immune systems of the skin and bowel will be discussed. Bone marrow transplantation and immunotherapy of cancer will be covered.

Learning objectives:

- Learn advanced immunological concepts from world authorities at NIH
- Apply these concepts to research projects, medicine and management
- Identify fundamental mechanisms of innate and adaptive immunity
- Learn advanced principles of host defense against pathogens and the relationship with commensals
- Understand the bases of autoimmunity and immunodeficiency.

Prerequisites: previous immunology course or working knowledge of basic immunology, IMMU 521, or equivalent.

MICR 317

Fall, 2 credits

Molecular Virology

Suresh K. Arya*, Cristina Bergamaschi

This course provides an introduction to the molecular virology of virus infection and progeny virus production and spread. It details molecular mechanisms of virus entry, replication, transcription, translation, and propagation in the host. Starting with the molecular structure of select viruses, the course will focus on strategies used by various viruses for successful infection and propagation, including molecular mechanism of host defense and its evasion by the viruses. Select viruses important to human health (e.g., influenza virus, papillomavirus, HIV) will be considered in detail, highlighting recent advances in the understanding of their biology and pathogenesis. The lectures will include discussion of current strategies for vaccine development and viruses as vectors for gene transfer in functional genomics and gene therapy.

Learning objectives:

- Acquire fundamental and practical knowledge of virology from the molecular perspective
- Revisit the question of whether viruses are living organisms throughout the course
- Discuss how viruses infect a host, and the molecular determinants of infection and pathogenesis
- Identify gaps in our knowledge of virology and discuss how to fill those gaps
- Discover how the study of viruses is helping usher in the age synthetic biology.

Prerequisites: background in biochemistry/molecular biology and microbiology, or consent of the instructor.

MICR 418

Spring, 3 credits

Emerging Infectious Diseases

Robert Hall

Emerging infectious pathogens are predators that exploit changes in human biology, behavior, and the environment to overcome public health measures and host defenses. Domestic examples include influenza, hantavirus, monkeypox, dengue, and West Nile virus. Hospital-acquired infections, usually multidrug resistant, take the lives of over 90,000 Americans annually. Vaccine-preventable diseases reemerge in populations at both ends of the wealth spectrum, such as tetanus or rabies among the world's poorest children, measles or mumps among conscientious objectors. In South America, dengue fever, schistosomiasis, leishmaniasis, and persistent childhood diarrhea feature prominently. In Sub-Saharan Africa, co-infections and drug resistance increasingly frustrate the struggle against malaria, tuberculosis, salmonellosis and HIV/AIDS. In East Asia, the recent origin of novel influenza viruses, SARS, and multidrug resistant gonorrhea, is a particularly interesting nexus of economic transformation, societal upheaval, and government policy. Additional complications include an arising pandemic of hepatitis C, promiscuous drug-resistant genetic elements, rolling waves of HIV, and implications of climate change.

In this class, we will survey a wide range of pathogens whose emergence relates to contemporary human, microbiological, and environmental factors. We will see how microbes have overcome medical marvels that took 150 years to develop. Common themes will be developed from almost 50 examples of today's emerging infectious diseases.

Learning objectives:

- Understand where, how, and why infectious diseases emerge
- Discuss over 50 emerging infections in the context of U.S. and global health
- Get to know the impact of infectious disease and disease control on human genetics, behavior, and society
- Explore how infectious disease molds human science, art, and society
- Gain insight into important new research topics in infectious disease.

Prerequisites: interest in the interface of science and medicine, and for credit students, willingness to make one class presentation on an emerging infectious disease chosen from a list.

Students interested in acting as a TA, please email instructor at emerginginfections@verizon.net.

MICR 424

Fall, 3 credits

Mycology: From Medicine to Miscellany

Robert Hall*, Martin Livezey

The Kingdom Fungi is one of the great divisions in biology: a vast diversity of species interwoven into the ecology of almost every niche on Earth. Fungi carry profound importance to human health and disease, medicine and biotechnology, healthy ecosystems and sustainable agriculture. Despite their ecological, social, and economic significance, the fungi remain profoundly mysterious and poorly understood. Fungi, therefore, offer a cornucopia of opportunities for discovery and research. In this class, we develop and apply an understanding of fungal biology by studying the symbiotic and parasitic relations of fungi to plants, humans, other animals, and other organisms. We will also conduct a socio-scientific survey of the human experience of fungi from neolithic brewing and traditional medicines to modern food and medical biotechnology.

Students interested in acting as a TA, please email instructor at microbiologist@verizon.net.

Learning objectives:

- Appreciate the fundamental role of fungi in the ecology of plants, insects, and other organisms
- Understand fungal infectious diseases of humans
- Discuss the role of fungi in medical biotechnology, drug discovery, and research into archaic conserved biomolecular processes
- Classify and identify fungi (mushrooms, etc.) in the field
- Describe remarkable roles played by fungi in human societies throughout the ages.

MICR 432

Spring, 2 credits

Human Virology

Suresh K. Arya*, Cristina Bergamaschi

This course will begin with the description of diseases that turned out to be caused by viruses, such as cancer and AIDS, from antiquity to the present. This will lead into the methods of discovery of viruses, their general properties, mode of infection and propagations, genetics and evolution, viral pathogenesis, and host defense. This will be followed by consideration of select viruses and diseases they cause in organ systems, such as respiratory tract, nervous system, blood-born infections, sexually transmitted infections.

Learning objectives:

- Acquire fundamental and practical knowledge of virology and human viral infections
- How do viruses infect some hosts and not others, and what are the diverse mechanisms of infection viruses employ?
- Why do some infections become epidemic, while others remain self-limiting?
- Illustrate viral reproduction strategies and host-defense strategies
- Identify gaps in our knowledge of virology and why it is so difficult to control viral infections.

Prerequisites: college graduate; knowledge of biology or consent of the instructor.

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

Clark K.L. Lum, Chair

FALL	CHIN 101	Introduction to Chinese I
SPRING	CHIN 102	Introduction to Chinese II
FALL	ENGL 105	Fundamental English Conversation I
SPRING	ENGL 108	Fundamental English Conversation II
FALL	ENGL 205	Intermediate English Conversation I
SPRING	ENGL 207	Intermediate English Conversation II
FALL	ENGL 302	Advanced English Conversation I
SPRING	ENGL 304	Advanced English Conversation II
FALL	ENGL 305	Advanced English Writing I
SPRING	ENGL 306	Advanced English Writing II
FALL, SPRING	ENGL 308	Pronunciation of American Standard English
FALL NEW	FRCH 101	French for Beginners I
SPRING NEW	FRCH 102	French for Beginners II
FALL	SPAN 101	Spanish for Beginners I
SPRING	SPAN 102	Spanish for Beginners II
FALL, SPRING NEW	SPAN 208	Spanish for Healthcare Providers

CHIN 101

Fall, 3 credits

Introduction to Chinese I

Clark K. L. Lum

This beginners' course is an introduction to the essential fundamentals of the Chinese language in reading, writing, and speaking for students with limited knowledge and training in this language. Mandarin and traditional characters are used. Pronunciation is based on Yale and Pinyin romanization. This course is based on *Speak Chinese, Character* textbook. Handout teaching materials are provided to cover gaps in textbook information. CHIN102 has been designed as a follow-up.

Learning objectives:

- Learn essential fundamentals in reading and writing, such as recognition of radicals and significs, and stroke order of characters, as well as in speaking, such as phonetics framework
- Acquire 300-500 characters
- Become familiar with basic sentence structure and modest speaking vocabulary and efficiency
- Gain knowledge that could be applied towards better understanding of scientific journals and cultural appreciation.

CHIN 102

Spring, 3 credits

Introduction to Chinese II

Clark K. L. Lum

This course is designed to broaden and deepen the essential fundamentals of the Chinese language in reading, writing, and speaking for students with some fundamental knowledge and training in Chinese. Mandarin and traditional characters are used. Pronunciation is based on Yale and Pinyin romanization. This course is based primarily on *Read Chinese, Book One*. Supplemental reading materials will be used. Handout teaching materials are provided to cover gaps in textbook information. Course is interwoven with relevant common adages, proverbial sayings, pithy sentences derived from Chinese classics, books of history, novels and other literary works.

Learning objectives:

- Learn essential fundamentals in reading and writing, such as recognition of radicals and significs, and stroke order of characters, as well as fundamentals in speaking, such as phonetics framework
- Acquire 800-1,000 characters
- Gain familiarity with essential basic sentence structure and improved speaking vocabulary and expression
- Improve reading efficiency
- Understand better scientific journals, newspaper articles, and increase cultural appreciation.

Prerequisites: CHIN 101 or equivalent.

ENGL 105

Fall, 3 credits

Fundamental English Conversation I

Fran Miller

This course is designed to assist students who have already studied English, but whose ability to express ideas through oral communication is limited. The core emphasis of the course is on improving rhythm, intonation, stress, and individual vowel/consonant sounds, with the goal of developing good conversational skills. This process will help participants to express ideas clearly in spoken English and to improve communication both in the workplace and in daily life. Idiomatic usage, useful vocabulary, and sentence structure will be also covered to help students to communicate orally more effectively and fluently.

Discussions of American culture and customs will be also incorporated to develop language skills. To enhance learning and personalized practice, the course will take advantage of online learning tools and computer programs.

Learning objectives:

- Converse with general clarity using pronunciation and intonation patterns that allow for overall intelligibility
- Demonstrate effective word choice, vocabulary, idioms, grammar, and sentence structure
- Articulate ideas clearly in conversation
- Develop effective listening skills and respond appropriately to other speakers.

ENGL 108

Spring, 3 credits

Fundamental English Conversation II

Fran Miller

This course is a continuation of ENGL 105.

ENGL 205

Fall, 3 credits

Intermediate English Conversation I

Fran Miller

The goal of this course is to enable intermediate learners of English to understand and speak English more accurately, confidently and fluently. New vocabulary and idioms will be embedded in oral exercises, conversation models, pair work activities and listening texts. Students will learn to listen for details and to summarize not only workplace lectures, but also conversations they hear in everyday situations in the cafeteria, on the bus and at social gatherings. The oral topics studied are very current and motivate students to speak with confidence. Fascinating discussions and debates will be developed and facilitated. Students will improve on accents, rhythm, intonation, and stress patterns. Individual weekly student oral reports will be analyzed and evaluated to assist students in improving their spoken English. To enhance learning and personalized practice, the course will also take advantage of online learning tools and computer programs.

Learning objectives:

- Increase active conversational skills to intermediate level by improving accent, vocabulary, and grammar
- Build confidence by improving conversational skills
- Increase professional and personal success at a U.S. workplace and in daily life.

Prerequisites: ENGL 108 or equivalent.

ENGL 207

Spring, 3 credits

Intermediate English Conversation II

Fran Miller

This course is a continuation of ENGL 205.

Prerequisite: ENGL 205 or equivalent.

ENGL 302

Fall, 3 credits

Advanced English Conversation I

Fran Miller

This course incorporates methodologies to improve students' ability to communicate effectively in spoken English. Accent reduction techniques through proper usage of vowel and consonant sounds, stress and intonation are emphasized, so students can be understood more easily in both the workplace and everyday life. Extensive oral idiomatic usage and vocabulary building are incorporated into the program. Advanced conversation and listening selections for English comprehension and expression improvement will be utilized. Discussions, debates and improvisations will be conducted at the advanced level. American cultural topics will be explored. Weekly oral reports will be thoroughly analyzed. To enhance learning and personalized practice, the course will also take advantage of online learning tools and computer programs.

Learning objectives:

- Reduce foreign accent and increase conversational skills to the advanced level
- Improve ability to debate ideas
- Improve ability to summarize meetings, events and articles at the advanced level
- Move up more quickly the professional ladder.

Prerequisites: ENGL 205 or 207 or equivalent or permission of instructor.

ENGL 304

Spring, 3 credits

Advanced English Conversation II

Fran Miller

This course is a continuation of ENGL 302.

Prerequisites: ENGL 302 or permission of the instructor.

ENGL 305

Fall, 3 credits

Advanced English Writing I

Fran Miller

This course is designed for non-native English speakers who need improvement in communicating their ideas correctly in writing. The course will tackle a great variety of grammatical forms, structures and writing techniques in order to guide the students in how to convey ideas in writing clearly and accurately. By the end of the semester, students will be able to analyze and practice writing interoffice reports, emails, and letters, with the goal of acquiring writing skills for various target audiences. To enhance learning and personalized practice, the course will also take advantage of online learning tools and computer programs.

Learning objectives:

- Improve ability to convey ideas in written English by using correct grammar in written English
- Enhance and polish English writing skills
- Facilitate comprehension of ideas and thoughts in written words for colleagues, business associates and friends.

Prerequisite: contact instructor for details.

ENGL 306

Spring, 3 credits

Advanced English Writing II

Fran Miller

This course is a continuation of ENGL 305.

Prerequisite: ENGL 305 or equivalent; contact instructor for details.

ENGL 308

Fall and Spring, 3 credits

Pronunciation of American Standard English

Katherine Grossman

The goal of this course is to help students become more confident and effective communicators in spoken English. It will help them identify and improve the areas of their speech that are unclear. Intermediate and advanced speakers of English as a second language can still struggle to be understood by native speakers. Whether students give presentations of their work, informally chat with their colleagues, or speak to potential employers, communicating clearly in English is critical. This course will focus on stress and intonation, as well as vowels and consonants in American Standard English. We will also spend time on listening skills, idiomatic language, collocations, and conversational skills. The instructor and fellow students will provide feedback on both the speaker's pronunciation and presentation skills, such as voice projection and eye contact. Since a student's native language influences his or her accent in a foreign language in specific ways, an individual screening will identify the areas for each student to work on independently.

Learning objectives:

- Modify pronunciation of spoken American English to increase comprehensibility in personal and professional environments
- Gain confidence in speaking English
- Identify weaknesses that cause communication breakdowns
- Apply knowledge of features of spoken American English to improve communication skills.

MAXIMUM SIZE OF CLASS IS 10 STUDENTS.

Prerequisites: ENGL 205 or 207 or equivalent or permission of the instructor.

FRCH 101

Fall, 3 credits

NEW

French for Beginners I

Bénédicte Chabirand-Randall

This introductory French course will focus on oral and written communication, listening and reading, pronunciation, grammar, as well as French culture and francophonie. Lessons will be based on immersion into authentic situations and will include conversation, role-play and short composition.

Learning objectives:

- Greet and talk about oneself (identity, interests, profession); locate places in a town and understand an itinerary; make travel reservations
- Understand and use basic grammatical structures, including present tense
- Write a short text.

FRCH 102

Spring, 3 credits

NEW

French for Beginners II

Bénédicte Chabirand-Randall

This course is a continuation of FRCH 101. Students will expand their use of vocabulary and grammar as well as oral and written expression and comprehension skills.

Learning objectives:

- Tell the time and ask hours of operation; discuss daily activities using reflexive verbs; conduct phone conversations; tell events in the past
- Understand and use imperative, future tense, and past tense
- Write a short letter.

SPAN 101

Fall, 3 credits

Spanish for Beginners I

Humberto Segura

This course introduces the fundamental elements of the Spanish language within a cultural context. It will emphasize the development of basic listening, speaking, and reading skills. Other competencies such as comprehension, pronunciation and reading will be also practiced in the class. Class time covers vocabulary-building, language drills and communication activities to introduce students to Hispanic culture.

Learning objectives:

- Express orally and in writing basic ideas in Spanish in simple present tense
- Identify some high-frequency words and expressions and use them at a rudimentary level
- Understand basic reading texts written in simple present tense.

SPAN 102

Spring, 3 credits

Spanish for Beginners II

Humberto Segura

This course is the continuation of the SPAN 101 course. It aims to introduce students to the Spanish language, with emphasis on basic communication skills. Other competencies such as comprehension, pronunciation and reading will be also practiced in class. Class time will cover vocabulary-building, language drills and communication activities to introduce students to Hispanic culture.

Learning objectives:

- Express orally basic ideas in Spanish in simple past, present and future tenses
- Identify some high-frequency words and expressions and use them at a rudimentary level
- Understand basic reading texts written in simple past, present and future tenses.

Prerequisites: SPAN 101 or equivalent. Audio program is available.

SPAN 208

Fall and Spring, 3 credits

NEW Spanish for Healthcare Providers

Humberto Segura

This course is designed to help health providers improve communication skills with Spanish-speaking patients. It will help health professionals to build competence in interviewing, examining and treating patients. It includes conversation, role-play situations in the context of different common medical situations. Students will learn the names of body parts, action verbs, and useful phrases typically used in a medical setting. It includes basic Spanish concepts and correct pronunciation.

Some basic knowledge of Spanish is helpful, but anyone who wants to increase their verbal skills will benefit from this course.

Learning objectives:

- Learn to greet and get accurate detailed personal information from patients
- Discuss the parts and relationships of the body-organs, muscles, etc.
- Understand and use vocabulary describing pain and discomfort
- Communicate about basic ailments and illness
- Pronounce Spanish medical vocabulary and develop Spanish phrases that can be used in own role/workplace.

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

John Tisdale, Chair		
SPRING	MEDI 234	Personalized Medicine: Genome and You (8 weeks)
SPRING	MEDI 302	Introduction to Acupuncture (8 weeks)
FALL	MEDI 309	Introduction to Molecular Medicine
FALL NEW	MEDI 339	Introduction to Cancer Biology
SPRING	MEDI 345	Human Anatomy
SPRING NEW	MEDI 425	Genetic Polymorphism Affecting Human Cognition (4 days)
FALL NEW	MEDI 502	Introduction to Traditional Chinese Medicine: A Complex Systems Approach to Health Management, Disease Management and Disease Prevention (4 weeks)
SPRING 2017-ALT	MEDI 507	Inborn Errors of Metabolism

MEDI 234

Spring, 1 credit (8 weeks)

Personalized Medicine: Genome and You

Christine Happel, Jaira Ferreira de Vasconcellos

The Human Genome Project has ended. What can we do with all this information? This course will explore the world of genetics and the possible uses in personalized medicine. Many alleles of genes can be linked to diseases. New disease genes are being discovered all the time. A genetic counselor determines one's predisposition for genetic diseases and passing on diseases by determining if one's genes fall in the right or wrong category. With tests available for many debilitating diseases, real-world examples of how genome studies and DNA technologies can be used for personalized medicine will be discussed. The course is intended to bridge the gap between basic biomedical research and its practical applications. Students will also learn how to read and evaluate scientific articles on general topics as well as from a basic research perspective.

"It is time to harness your double helix for health and learn what this paradigm shift is all about," Dr. F. Collins.

Learning objectives:

- Assess how The Human Genome Project has advanced technology in science research
- Translate research and technology into the delivery of healthcare
- Translate basic science research to benefits for the general public
- Discuss implications in privacy and policy laws for personalized medicine in the age of Affordable Care Act
- Present coherently case studies encompassing the previous objectives, including caveats for use of current technologies.

MEDI 302

Spring, 0.5 credit (8 weeks)

Introduction to Acupuncture

Ashley Xia

Acupuncture is an ancient disease treatment method practiced for more than two thousand years. Recent scientific studies have confirmed its effectiveness in disease management, especially pan management. The objective of this course is to provide an overview of Chinese acupuncture, including its history, basic theory, clinical practice, and recent clinical and basic research on the effectiveness and potential mechanisms of acupuncture. Challenges of clinical trials of acupuncture will be discussed, such as placebo effect and non-acupoint specific effect. Different designs for clinical acupuncture study will be also explored.

This course is designed for a broad range of audiences, including healthcare professionals, such as doctors, nurses and practitioners of complementary/alternative medicine, scientists interested in the research of complementary/alternative medicine, patients or their family who wish to enhance their understanding of acupuncture or Chinese medicine.

Learning objectives:

- Understand basic concepts of Chinese medicine and acupuncture
- Observe basic technique for needling and moxibustion
- Learn locations of the most frequently used acupuncture points
- Understand the challenges in clinical study of acupuncture.

Prerequisites: basic medical knowledge.

MEDI 309

Fall, 2 credits

Introduction to Molecular Medicine

Mauro Tiso*, Patrick Weitzel

The objective of this course is to introduce students to the molecular basis of human diseases and current medical therapies, providing a bridge between medicine and biochemistry. The course is designed to cover fundamental concepts of molecular biology, genetics and basic biochemical principles and use these principles to analyze commonly occurring health-related problems. Each lecture will be set in the context of a major disease or a public health concern, such as obesity, diabetes, cardiovascular diseases, cancer, infectious diseases, HIV/AIDS, Alzheimer's and other neurodegenerative diseases. Presentation, analysis and group discussion of clinical cases selected to exemplify the subject topic will be integral part of the lectures. An historical perspective of how molecular medical knowledge and recent technological developments that have been instrumental in medical treatments will be also presented. The course overall differs significantly from a comprehensive biochemistry or biology course and is addressed to students of the health sciences or prospective medical students.

Learning objectives:

- Identify interactions between metabolic pathways and human diseases
- Describe recent advances in medical applications of biotechnology and genetics
- Discuss health issues in relation to molecular mechanisms of the cell
- Prepare an original presentation about a disease of interest to the class.

Prerequisites: open to everyone who has a basic (undergraduate) knowledge of biology and/or chemistry.

MEDI 339

Fall, 2 credits

NEW Introduction to Cancer Biology

Sundaresan Venkatachalam

This course will cover the genetic basis of cancer, initiation and progression of cancer, signal transduction, tumor microenvironment and metastasis. Additional topics will include cancer genomics, epithelial to mesenchymal transition, adhesion, angiogenesis, targeted therapies and animal models. This course will also have a journal club component which will enable students to read and discuss a scientific journal article related to the course.

Learning objectives:

- Identify cancer biology terms and apply terms and information in text book to case studies
- Discuss/present a scientific paper in detail (background information, experimental design, findings).

MEDI 345

Spring, 2 credits

Human Anatomy

Helen Gharwan, Nazzarena Labo*

Human anatomy will be taught using a systemic approach and emphasizing the connection between function and structure as it relates to physiological conditions and diseases. To this end, lectures will integrate elements of embryology and histology. Modern imaging methods will be introduced as well. Selected topics of topographic anatomy will also be examined, including head/neck and pelvis. A midterm and final exam will be offered to allow students to assess their comprehension of the material.

This course is suitable for advanced undergraduates and/or postbaccalaureate students planning a career in medicine and biomedical research and will be taught at a level of complexity that is similar to courses offered at most medical schools. Other biomedical researchers who seek to better understand the structural underpinning of normal and pathologic functions of the human body may also find the course useful.

Learning objectives:

- Master principles of human anatomy using a systemic approach
- Revise fundamentals of embryology and general micro-anatomy (histology)
- Learn macro-anatomy, including musculo-skeletal, nervous, cardiovascular, respiratory, digestive, urogenital and endocrine systems
- Acquire ability to understand how anatomical systems interact and how structural and functional characteristics of tissues, organs and systems are intimately interdependent
- Describe topographic anatomy of selected regions.

Prerequisite: college degree; basic knowledge of cell biology.

MEDI 425

Spring, 0.5 credit (4 days)

NEW Genetic Polymorphisms Affecting Human Cognition

Harker Rhodes

The study of relationships between human genotype and cognitive phenotypes are in their infancy, but even at this early stage there are a number of very well-documented correlations between specific genetic polymorphisms and cognitive phenotypes, such as risk of alcoholism, cognitive outcome after traumatic brain injury, and, particular personality phenotypes.

The course will review some of the classic papers describing specific genetic effects on cognitive phenotypes, but the focus of the course will be on the underlying molecular biology and genetics rather than the nuances of psychological testing.

This course will not address the thorny questions of how to precisely define and measure cognitive phenotypes or, once the phenotypes are defined, how to assess the genetic contributions to their variability. Rather, students will discuss the molecular biology of specific genetic polymorphisms which are commonly studied in the context of the biological reasonableness of some of these results.

Learning objectives:

- Summarize the molecular biology of the commonly studied polymorphisms of the serotonin transporter, DRD2 and DRD4, COMT and DAT (SLC6A3), BDNF, and MAOA
- Discuss the difference between broad-sense vs. narrow-sense heritability and illustrate by example the dependence of heritability on environment
- Incorporate candidate gene polymorphisms as co-variates into their ongoing research and future grant applications to increase study power and to avoid both false-positive and false-negative results due to population stratification and Simpson's paradox.

Prerequisites: undergraduate course in molecular biology or equivalent.

MEDI 502

Fall, 0.5 credit (4 weeks)

NEW Introduction to Traditional Chinese Medicine: A Complex Systems Approach to Health Management, Disease Management and Disease Prevention

Ashley Xia

Traditional Chinese Medicine (TCM) has been practiced for more than two thousand years. It contains practices of herbal formulation, acupuncture, Tai Chi, Qigong as well as diet and other behavior interventions guided by the basic theories of TCM. With measurable effectiveness on improving disease conditions and disease prevention, TCM plays significant roles in health management, disease management and disease prevention in China and many counties in Asia.

The objective of this course is to introduce the basic concepts of TCM, including its history, its theory and clinical practice, and recent research results. Comparisons between conventional medicine and TCM will be presented to facilitate the understanding of the unique perspectives of TCM. Agent-Based Modeling (ABM) and dynamic modeling approaches will be used to illustrate the complex systems features in TCM theory.

Learning objectives:

- Learn basic concepts and theories of TCM
- Discuss the differences between conventional medicine and TCM
- Understand TCM from the complex systems perspective to explore the TCM's approach to health management, disease management and disease prevention.

Prerequisites: basic medical knowledge.

MEDI 507

Spring 2017, Alternate years, 3 credits

Inborn Errors of Metabolism

William Gahl*, Meral Gunay-Aygun

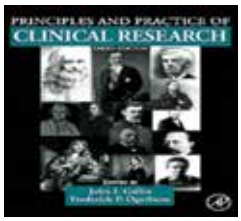
The objective of this course is to learn the principles and practice of human biochemical genetics. Topics to be covered include amino acidopathies, organic acidoses, disorders of carbohydrate metabolism and lipid metabolism, lysosomal storage diseases, peroxisomal diseases, purine and pyrimidine disorders, and a variety of other inborn errors of metabolism. Students will research a topic and present the lectures. The faculty will add to the class by offering experience, and when possible, presenting individual cases. Several quizzes are planned and student participation will be strongly encouraged.

Learning objectives:

- Recognize the signs and symptoms of biochemical disorders of man
- Understand the principles of diagnosing and treating inborn errors of metabolism based upon knowledge of human biochemical pathways
- Prepare for managing patients with biochemical disorders and for taking the American Board of Medial Genetics examination in Biochemical Genetics.

Prerequisites: graduate degree; this is an advanced course, largely geared toward Ph.D.s and M.D.s.

Introduction to the Principles and Practice of Clinical Research



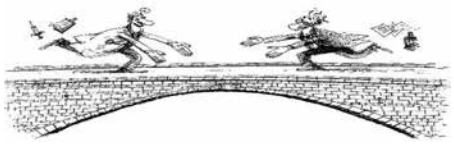
John I. Gallin
Laura Lee Johnson
Frederick P. Ognibene

The objective of this course is to provide an overview of the principles and practice of clinical research to individuals who are interested in learning how to effectively conduct clinical research studies. The course is divided into modules and contains information on ethical, legal, scientific, regulatory, biostatistical and other practical issues important for the conduct of clinical research. The format consists of didactic lectures, practical experiences, such as a mock Institutional Review Board (IRB), and case studies. To view the topics from last year's curriculum, please go to the course syllabus/ schedule at: **http://www.cc.nih.gov/training/training/ippcr/info.html**.

For registration and further information visit: http://www.cc.nih.gov/training/training/ippcr.html

Demystifying Medicine

Tuesdays: January through May
4:00pm - 6:00pm
Building 50 Conference Room (unless otherwise noted)



THE COURSE: Demystifying Medicine Series, jointly sponsored by FAES and NIH, features the presentation of patients, pathology, diagnosis and therapy in the context of major disease problems and current research. Primarily directed toward Ph.D. students, clinicians and program managers, the course is designed to help bridge the gap between advances in biology and their application to major human diseases. Each session includes clinical and basic science components presented by NIH staff and invitees. Students, fellows and staff are all welcome.

SIGN UP: Register through the course email list. To subscribe to this email list, send an email message to this address: **Listserv@List.nih.gov**. Substituting your name for Jan Doe's, the body of your message should say: Subscribe DeMystifyingMed Jan Doe. Alternatively, you may sign up for Demystifying Medicine through the **ListServ website**, and enter your name and email address.

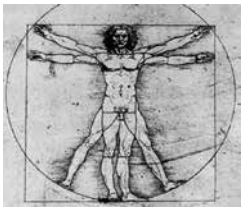
COURSE INFORMATION: For most up-to-date information about time and location for 2015, please check the Demystifying Medicine website: **http://demystifyingmedicine.od.nih.gov/**

Recommended reading, PowerPoint notes and other information will be distributed through the: Demystifying Medicine website and email list. Registrants who attend at least 10 sessions and pass a computerized final exam will receive a certificate. Classes will be available at **http://videocast.nih.gov**.

Please contact Dr. Win Arias at ariasi@mail.nih.gov for further course information. For additional information, sign language interpretation, or accommodations for disabilities, please contact the Federal Relay 1-800-877-8339.

FAES ENDOCRINOLOGY UPDATE AND BOARD REVIEW COURSE AT NIH

October 12-16, 2015



The objective of this course is to provide an up-to-date, state-of-the-art review of clinical endocrinology, emphasizing pathophysiology, diagnosis and treatment. The course is intended both for physicians preparing for the Endocrinology Subspecialty Board Examination and physicians certified in endocrinology who wish to keep abreast of recent advances.

The course objectives are twofold: to encourage an organized, efficient and cost-effective approach to the clinical, laboratory and radiologic diagnosis of endocrine disease, with emphasis on recent advances; and, to stimulate awareness of new approaches to treatment, including the indications, risks and benefits relative to alternative therapies.

Up to 37.75 CME hours available.

For more information, contact FAES Conferences and Training Management Services Center at training@faes.org or call 301-496-7975 or visit www.faes.org.

PHARMACOLOGY AND TOXICOLOGY

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

Frank Pucino, Chair

FALL	PHAR 328	FDA Perspective on Drug Development
SPRING	PHAR 400	Pharmacology
FALL	PHAR 401	Medical Pharmacology
FALL	PHAR 500-I	Principles of Clinical Pharmacology I
SPRING	PHAR 500-II	Principles of Clinical Pharmacology II
SPRING	PHAR 511	Current Concepts in Pharmacology and Therapeutics
FALL	TOXI 303	Introduction to Toxicology
SPRING	TOXI 504	Toxicology: Principles and Practice

PHAR 328

Fall, 2 credits

FDA Perspective on Drug Development

Hanan Ghantous*, Mark Seaton

This course will cover drug development from the FDA perspective. The FDA's roles and responsibilities related to the various components of the Investigational New Drug (IND) phase of drug development will be covered in detail, including Chemistry, Manufacturing and Controls (CMC), Pharmacology/Toxicology, Biometrics, Clinical trials, Statistics and Inspection. In addition, a comparison of the development of biologic drugs versus small molecule drugs will be presented. Discussion of pediatric testing and the use of juvenile animal studies in this respect will be also included. The New Drug Application (NDA) process will be discussed in terms of product label development. Aspects of the post-approval phase of drug development will be covered, in addition to OTC products and drug shortage issues. Finally, attendees will have the opportunity to discuss case studies, labels, analyze data and make approval decisions.

Learning objectives:

- Understand drug development from the FDA perspective, including data analysis, label review, and final approval decisions
- Participate in case studies of real-world drug development scenarios
- Apply knowledge gained in this course to positions in industry and government.

Prerequisite: college-level biological sciences.

This course is an elective for Advanced Studies in Technology Transfer.

PHAR 400

Spring, 3 credits

Pharmacology

Salina Gairhe, Tanchun Wang*, Sudhir Yanpallewar

The objective of this course is to present the pharmacological basis of therapeutics by discussion of the principles of drug action and the mechanism of action of representative agents. The initial portion of the course will be devoted to an exploration of concepts such as pharmacokinetics, drug metabolism, dose-response relationships, and resistance, and toxicity. Subsequent portions of the course will focus on the chemistry, mechanism of action and pharmacologic action of drugs affection the autonomic and central nervous systems, the cardiovascular, and renal systems, pathogenic microbes, cancer and hormones. A review of the relevant physiology of each organ system will be presented.

Learning objectives:

- Provide basic scientific concepts and principles that will serve as the foundation for understanding the pharmacology of specific drugs
- Introduce comprehensively fundamental pharmacology and uses of the major classes of clinically important drugs.

PHAR 401

Fall, 3 credits

Medical Pharmacology

Suneet Shukla*, Tristan Sissung

The objective of this course is to provide students with a comprehensive introduction to the fundamental pharmacology, scientific principles of drug action, the mechanisms by which drugs mediate their pharmacological effect and the basics of drug development and approval processes. The first half of the course will be to understand basic scientific concepts and principles that will serve as the basis for understanding the pharmacology of specific drugs. The second half will focus on the introduction to major physiological systems of human body such as nervous system, endocrine system, the pharmacology and clinical use of the major class of clinically important drugs, chemistry, mechanism of action and pharmacologic action of drugs affecting these systems, pathogenic microbes, viruses and cancer.

Learning objectives:

- Understand basic concepts in pharmacology
- Identify the basics of clinical studies, drug development and approval processes
- Describe drug action and understand the mechanisms of individual drug action at the cellular, organ and body level
- Acquire fundamental knowledge of central concepts in chemotherapy
- Comprehend the basis of drug action in the context of disease treatments.

Prerequisites: basic concepts in biology, chemistry, and biochemistry.

PHAR 500-I

Fall, 2 credits

Principles of Clinical Pharmacology I

Juan Lertora

Fall - This course provides a basis for understanding the scientific principles of rational drug therapy and contemporary drug development, with emphasis on pharmacokinetics, methods for drug analysis, drug metabolism, and pharmacogenetics. Topics include the physiologic and pathophysiologic factors involved in drug absorption, distribution, metabolism and elimination, determinants of variability in drug responses, inter- and intra-patient variability in pharmacokinetics and pharmacodynamics, and drug interactions. This course also provides an introduction to common pharmacokinetic and pharmacodynamic modeling approaches.

Learning objectives:

- Understand the basis for drug dose selection to optimize efficacy and minimize toxicity
- Recognize the environmental and genetic causes of individual variability in drug response
- Know the concept of drug elimination clearance
- Avoid toxicity in patients with impaired kidney and liver function.

Prerequisites: calculus.

PHAR 500-II

Spring, 2 credits

Principles of Clinical Pharmacology II

Juan Lertora

Spring - This course includes the topics of drug transport mechanisms and their relevance in pharmacokinetics and drug metabolism, dose response and concentration response analysis, biological markers of drug effect, and adverse drug reactions. In addition, emphasis is given to optimizing and evaluating the clinical use of drugs as well as drug therapy in special populations (children, elderly adults, pregnant and nursing women). A special course module focuses on the processes of drug discovery and development, and the regulatory role of the FDA.

Learning objectives:

- Understand the dose-response relationship in pharmacology
- Distinguish clinical endpoints, biomarkers and surrogate end points for drug efficacy
- Learn the fundamentals of drug discovery and drug development
- Understand FDA regulations that guide drug development for use in humans.

Prerequisites: PHAR 500 (fall semester) and calculus. Students who have not taken PHAR500-I in the fall can only be enrolled upon submission of written authorization from the faculty Juan Lertora (lertoraj@mail.cc.nih.gov).

This course is an elective for Advanced Studies in Technology Transfer.

PHAR 511

Spring, 3 credits

Current Concepts in Pharmacology and Therapeutics

Fredrick Lombardo, Frank Pucino*

This course is intended to serve as a review for physician assistants, nurse practitioners, nurses, pharmacists and other allied healthcare professionals challenged by the ever-increasing complexity of pharmacotherapy. Instruction will be provided in current pharmacologic principles of drug use, and their role in the diagnoses, prevention and treatment of disease. Theoretical and practical issues of pharmacology will be discussed to assist practitioners with therapeutic selection, and safe and effective use and evaluation of drug therapy. Pharmacogenomic, pharmacokinetics and pharmacodynamic concepts will be emphasized for many of the major pharmacologic classes of drugs used in clinical medicine. The lecture material will be reinforced through case presentations and student participation.

Learning objectives:

- Describe physiologic, pharmacodynamic and pharmacokinetic principles important for therapeutic selection of medication
- Compare and contrast drug classes used in the management of disease
- Design, monitor and evaluate patient-specific pharmacotherapy
- Determine a pharmacotherapeutic approach for disease management in special patient populations (e.g., children, the elderly, pregnancy, lactation, organ dysfunction)
- Develop an appreciation for pharmacogenetic variants associated with safety and efficacy of drug therapy.

This course is an elective for Advanced Studies in Technology Transfer.

TOXI 303

Fall, 2 credits

Introduction to Toxicology

Vera Spagnolo

Toxicology is the study of the adverse effects of chemical, physical, or biological agents on living organisms and the ecosystem, including the prevention and amelioration of such effects. Knowledge of toxicology is essential in the areas of drug development, medicine, environmental, occupational and public health, as well as in chemical and pharmaceutical industries.

The objective of this course is to introduce students to the general principles of toxicology, various classes of toxic agents, and the organ and biochemical systems that these agents affect. The course will also focus on the prevention and management of toxicity from several agents. During the course, we will review several events of human and companion animal toxicity that are reported in the media as well as a range of drug study failures due to unexpected toxicity, with the aim to examine why this occurred and how the decision making process could be improved.

This is a great course for those contemplating graduate study in the fields of toxicology or pharmacology, or for those who work with toxicologists or pharmacologists in a regulatory or research setting, or for the layperson interested in learning more about toxicology.

Course material will include the text listed above as well as recent scientific literature from the field. Class time will primarily include instructor-led lectures, but will also provide for student-led presentation of journal articles.

Learning objectives:

- Understand basic toxicant mechanisms of action and how these are communicated with dose-response results from toxicity testing
- Compare acute and chronic exposure scenarios and discuss risk assessment, prevention and management
- Gain insight into the crucial issue of acceptable safety margins
- Evaluate critically and discuss current events relevant to the field of toxicology
- Integrate the knowledge acquired throughout the course in an in-depth case study and presentation of a human drug overdose/toxicity.

Prerequisites: undergraduate biology and chemistry.

TOXI 504

Spring, 3 credits

Toxicology: Principles and Practice

LOCATION: Howard University

Fred Lombardo, Arvind K.N. Nandedkar*

The objective of this course is to provide a survey of general topics in toxicology including but not limited to: pertinent experimental designs; factors altering toxicity; environmental toxicology; risk assessment; occupational, pesticide, drug toxicology; carcinogenesis, mutagenesis, and teratogenesis; mechanisms of toxicity; target organ toxicology, clinical toxicology, evidence-based forensic toxicology and entrepreneurship concepts in the practice of toxicology. Students will learn to: appreciate the breadth and principles of toxicology; read and understand articles on toxic effects; evaluate significance results of toxicity testing and apply principles of toxicology in a practical setting.

Learning objectives:

- Obtain survey of general topics in toxicology
- Receive guidance in writing toxicological reports
- Learn about application of toxicity testing in a practical setting.

Prerequisite: college-level biology and chemistry.

ADVANCED STUDIES IN PUBLIC HEALTH

Shortly after I took up appointment with the Radiation Epidemiology Branch at the National Cancer Institute (NCI), I desired to know more about epidemiologic research. So, I enrolled in FAES classes. These classes helped to satisfy my heart's desire and provided the needed insight and knowledge to do my work better, as well as to understand the technical content of the Branch/ Division's seminars and presentations. The courses I enjoyed most were social and behavioral sciences as well as environmental epidemiology. They helped me to understand the importance of the social milieu as a determinant of public health outcome, which has motivated me to explore opportunities, including further studies on how to help improve the health infrastructure in my home country Nigeria.

Epidemiology Program Specialist, National Cancer Institute

WHAT IS PUBLIC HEALTH?

With a focus on protecting and improving the health of entire communities while they are still healthy, public health addresses the needs of human populations rather than of individual patients after they become ill. The field of public health can be distinguished by this proactive, preventive approach and a focus on the community as its patient. To learn more about public health, visit **http://www.apha.org**, or **http://www.101careersinpublichealth.com**, or **http://publichealthbuyersguide.com/.**

ADVANCED STUDIES IN PUBLIC HEALTH

FAES Graduate School at NIH offers a unique Advanced Studies in Public Health, developed to broaden the perspective and enhance the skills of current health sciences professionals as well as to give a competitive edge to those who are considering a career in public health. The program is designed to build competencies in the five core disciplines of public health, as defined by the Association of Schools of Public Health (ASPH):

- epidemiology
- biostatistics
- environmental health sciences
- health policy and management, and
- social and behavioral sciences.

The program culminates in a **Capstone Project** through which students will be required to demonstrate their understanding and mastery of core disciplinary knowledge and the practice of public health.

GENERAL REQUIREMENTS

The Advanced Studies in Public Health is open to persons with a Bachelor's degree or above. Courses are offered in the evenings, generally on the NIH campus in Bethesda, making it convenient for working professionals and postgraduate/postdoctoral fellows to acquire expertise in public health and enhance current employment position or to take the first step on a career path in public health.

Students are required to complete a 21-credit curriculum comprised of seven required courses. The Advanced Studies in Public Health can be completed in two years, although students can complete the requirements at their own pace.

Students planning to pursue a Masters of Public Health degree at an accredited university or college are responsible for contacting the institution to determine if credits earned for FAES courses can be transferred under the university's transfer policy.

OUTCOMES

Upon completion, students will be able to:

- Apply statistical reasoning and methods to address, analyze, and solve problems in public health, healthcare, biomedical, clinical and population-based research
- Describe and explain patterns of disease and injury in human populations and apply this study to the control of health problems
- Understand and describe environmental factors, including biological, physical and chemical factors that affect the health of a community
- Explain and describe factors that affect the delivery, quality and costs of healthcare for individuals and populations; understand from a managerial and policy perspective the structure, process and outcomes of health services, including the costs, financing, organization, outcomes and accessibility of care
- Describe and explain behavioral, social and cultural factors related to individual and population health and health disparities; understand how programs and policies in public health and health services promote and sustain healthy environments and healthy lives for individuals and populations.

REQUIRED COURSES

STAT 317	Introduction to Epidemiology
STAT 500	Statistics for Biomedical Scientists (Fall and Spring)
PBHL 501	Environmental Health Sciences
PBHL 512	Social and Behavioral Sciences
PBHL 517	Health Policy and Management
PBHL 607	Capstone Project in Public Health

COURSES OFFERED BY OTHER DEPARTMENTS THAT ARE REQUIRED COURSES FOR ADVANCED STUDIES IN PUBLIC HEALTH:

STAT 317	Introduction to Epidemiology
STAT 500	Statistics for Biomedical Scientists

As a basic research scientist, the advanced studies helped me to extend my professional experience, building solid foundations in the core disciplines of public health. I also had the chance to apply my scientific knowledge and experience to global and public health topics. I expect this experience to serve as a first step for transitioning from basic research to careers in public health.

Visiting Fellow, National Institute of Diabetes and Digestive and Kidney Disease

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

Stephen Marcus, Chair

FALL	PBHL 500	Introduction to Global Health
SPRING	PBHL 501	Environmental Health Sciences
SPRING	PBHL 512	Social and Behavioral Sciences
FALL	PBHL 517	Health Policy and Management
FALL	PBHL 518	Introduction to Program Evaluation for Planning, Improvement, and Measurement of Public Health
FALL	PBHL 521	Cancer Screening (8 weeks)
SPRING	PBHL 522	Research Methods and Design
SPRING	PBHL 533	Non-Communicable Diseases in Global Health
SPRING NEW	PBHL 535	Methods in Randomized Behavioral Clinical Trials
SPRING	PBHL 555	Introduction to HIV/AIDS Research
SPRING NEW	PBHL 581	Econometric Analysis in Evaluation of Biomedical Research Outcomes (8 weeks)
SPRING NEW	PBHL 582	Analyzing Research Literature for Planning and Evaluation of Public Health Programs (8 weeks)
SPRING	PBHL 591	Advanced Seminar in the Evaluation of Research
FALL, SPRING	PBHL 607	Capstone Project in Public Health

PBHL 500

Fall, 2 credits

Introduction to Global Health

Tilda Farhat, Marion Koso-Thomas

Global Health is described as *"an area for study, research and practice that places a priority on improving health and achieving equity in health for all people worldwide"* (Koplan J, 2009. Lancet. 373:1993).

During the course, a broad snapshot of global health will be presented, providing students with insight into the challenges currently facing global health. Participants will also gain an understanding of why tackling global health issues is such an important endeavor with the potential to reduce poverty, build stronger economies and promote peace. Students will not only be exposed to the major communicable and non-communicable diseases posing a profound effect on health (especially within the developing world) but will also learn how socioeconomic and demographic differences can influence the burden of disease. A number of other critical underlying factors including environmental, behavioral, and cultural influences will be also presented. Through the use of case reports from around the world, the course will explore how research findings are transferred into policy and practice. Students will be encouraged to understand that solving global health problems requires the input of multiple disciplines. To emphasize this point, speakers will be drawn from diverse fields, including the sciences, ethics, economics, and diplomacy. An interactive group exercise will be part of the course.

Learning objectives:

- Demonstrate a thorough understanding of the transitions and socioeconomic determinants of population health across the globe through a comparative analysis of the etiology and prevalence of communicable and non-communicable diseases and trauma/injury conditions
- Describe in detail two or more variables that interact to influence the health status of a population, including environmental, behavioral, and cultural effects
- Articulate the importance and necessity of multidisciplinary teams to solve global health problems.

PBHL 501 — Spring, 3 credits

Environmental Health Sciences

Pertti Hakkinen*, Sally Valdes

Environmental health is the branch of public health that deals with the human health effects of exposure to chemical, physical, biological, and psychosocial agents in the community, workplace, and home. Environmental health as a discipline includes the fields of medicine and epidemiology as well as ecology and environmental policy. Environmental health scientists focus on recognizing, studying, and mitigating the impacts of chemical, physical, and biological agents as well as understanding how human behavior and actions (and inactions) impact the environment. The field of environmental health is multidisciplinary and relies on team science approaches. The course surveys the essential scientific components and control strategies of major environmental health problems.

Learning objectives:

- Understand residential, occupational, and other environmental agents and exposures that can affect human health
- Understand methodologies and approaches for assessing, preventing, controlling, and communicating environmental risks
- Describe current legislation and regulations relevant to environmental health issues
- Understand subpopulations, such as children and pregnant women, and environmental justice and equity
- Understand resources for keeping up with environmental health issues, research, legislation and regulations.

This is a required course for Advanced Studies in Public Health.

PBHL 512 — Spring, 3 credits

Social and Behavioral Sciences

David Clark

The social and behavioral sciences in public health address the behavioral, social and cultural factors related to individual and population health and health disparities over the life course. Research and practice in this area contributes to the development, administration and evaluation of programs and policies in public health and health services to promote and sustain healthy environments and healthy lives for individuals and populations.

Learning objectives:

- Identify the causes of social and behavioral factors that affect health of individuals and populations
- Identify critical stakeholders for the planning, implementation and evaluation of public health programs, policies and interventions
- Describe the role of social and community factors in both the onset and solution of public health problems
- Discuss merits of social and behavioral science interventions and policies
- Apply evidence-based approaches in the development and evaluation of social and behavioral science interventions.

This is a required course for Advanced Studies in Public Health.

PBHL 517 — Fall, 3 credits

Health Policy and Management

Caroline Coleman, Chris Hafner-Eaton*

Health policy and management is an interdisciplinary field of inquiry and practice concerned with the delivery, quality and costs of healthcare for individuals and populations. This definition assumes both a managerial and a policy concern with the structure, process and outcomes of health services, including the costs, financing, organization, outcomes and accessibility of care.

Learning objectives:

- Describe main components, issues, legal and ethical bases of organization, financing and delivery of health services and public health systems in the U.S.
- Discuss policy process for improving the health status of populations
- Identify and apply principles of program planning, development, budgeting, management and evaluation in organizational and community initiatives
- Apply “systems thinking” for resolving organizational problems
- Demonstrate leadership skills for building partnerships.

This is a required course for Advanced Studies in Public Health.

PBHL 518 — Fall, 3 credits

Introduction to Program Evaluation for Planning, Improvement, and Measurement of Public Health

Amanda Greene

Government agencies and private organizations have implemented multiple health programs. Usually, labor, and resources are spent developing and implementing these programs. But, how do we know if public needs are being addressed? How can we tell if it works? If it does work, how well does it work? If it does not work, what is the reason for it? Can it be fixed? The answers to these questions are at the heart of program evaluation. This has led to

program evaluation rapidly gaining visibility and prominence as an objective basis for program and policy decision-making. This course will introduce students to program evaluation approaches and methodological tools that can be used to evaluate public health programs and research.

Learning objectives:

- Explain major concepts, approaches, and key elements of program evaluation and how to apply these to public health practice and research
- Identify standards for conducting good program evaluations, (i.e., utility, feasibility, propriety, and accuracy)
- Describe five aspects of health program evaluation - its relevance, progress, efficiency, effectiveness, and impact
- Identify evaluation design techniques and how these compare to methods used in traditional research
- Design a basic program evaluation plan that includes measurable program objectives, evaluation questions, logic model, timeline, evaluation measures, budget, and a plan to enhance utilization of findings.

PBHL 521

Fall, 1 credit (8 weeks)

Cancer Screening

Pamela Marcus

Cancer screening aims to detect disease at a stage when it is asymptomatic and curable. This course will introduce students to the theory and practice of cancer screening in the United States. Students will learn to draw conclusions about the benefits and harms of screening for cancer given available evidence from epidemiologic studies and clinical trials. Issues surrounding screening for breast, colorectal, lung, cervical, and prostate cancer will be covered; other cancers will be covered if time permits. Class sessions will include instructor lectures as well as student-led discussions.

Learning objectives:

- Learn about the methodology used to assess cancer screening tests and how to interpret cancer screening data
- Identify potential benefits and harms of cancer screening
- Become familiar with the evidence in favor of and against population-based screening for breast, colorectal, lung, cervical, and prostate cancer, as well as the controversies that surround mass screening for these diseases.

PBHL 522

Spring, 3 credits

Research Methods and Design

Anna McCarrey

Government agencies and healthcare organizations that implement health programs require scientific information concerning public health outcomes. This course is designed for those in health and social sciences who desire basic statistics training and the ability to conduct a research project from conception to write-up. It aims to reveal what lies behind the basic science of public health from the research perspective. This is a practical course that assists students through the theoretical and methodological processes of study design, measurement, data gathering, survey instrument development, statistical analysis, and result write-ups. The last hour of each class will be allocated for students to work on their projects, with the instructor present to assist and answer questions.

Learning objectives:

- Propose a research project in the health sciences, with a clear hypothesis
- Design a survey instrument that is reliable, valid, and appropriate for the study
- Collect and analyze data for the research project
- Summarize statistical findings in a scientific article.

PBHL 533

Spring, 2 credits

Non-Communicable Diseases in Global Health

Linda Kupfer*, Collene Lawhorn, Callie Raulfs-Wang, Jason Sreedhar

Chronic non-communicable diseases (NCDs) present an urgent and growing global public health concern worldwide. NCDs, chiefly cardiovascular diseases, cancers, chronic respiratory diseases and diabetes, account for nearly 36 million deaths annually (2/3 of all global deaths). These diseases share four risk factors: tobacco use, physical inactivity, harmful use of alcohol, and unhealthy diets. Unchecked, the World Health Organization (WHO) projects that NCDs will rise by 17% in the next decade, with the greatest increase in the low- and middle-income countries (LMICs), which currently carry 80% of the NCD deaths. In LMICs, the dual epidemic of infectious diseases and NCDs poses a daunting challenge to the existing weak health systems. This course will focus on the rising burden of NCDs in LMICs. The course will include presentations by implementers who have worked in LMICs and have on-the-ground health care experience. Using case studies, we will discuss NCD prevention and control interventions that have been implemented in LMICs and think about how these interventions could be modified to be used in low-resource settings in the U.S.

Learning objectives:

- Describe the economic and health burden of NCDs in LMICs and discuss how modifiable and non-modifiable risk factors interact to drive the rise in NCDs
- Explore how existing healthcare platforms and resources in LMICs currently address the rising burden of NCDs and how they can be strengthened/re-oriented/leveraged
- Explore outstanding gaps in research and implementation of evidence-driven NCD prevention, care and treatment in LMICs.

PBHL 535

Spring, 3 credits

NEW Methods in Randomized Behavioral Clinical Trials

Peter Kaufmann

The objectives of this course are to present the methods for conducting rigorous randomized clinical trials that involve behavioral interventions. Lectures will present the principles of ethical clinical research, clinical trial design, methods and advantages of randomization, selection of primary and secondary outcome measures, selection of control groups, methods for recruitment, adherence, and quality assessment, development of protocols and monitoring of clinical trials including adverse events. Textbook material will be supplemented by material from the literature. Some lectures will be delivered by guest lecturers specializing in topics, such as dissemination research and adherence. Examples will be drawn from the literature on major mental disorders, drug addiction, health psychology and other areas. The course is intended for individuals interested in behavioral research and non-pharmacological interventions.

Learning objectives:

- Acquire a fundamental understanding of methodological principles and concepts in clinical trials
- Understand the particular requirements for minimizing bias in clinical trials involving behavioral interventions
- Collaborate in conducting rigorous clinical trials in general and trials of behavioral interventions in particular
- Evaluate the clinical trials literature.

Prerequisites: STAT 500 or equivalent or consent of the instructor.

PBHL 555

Spring, 2 credits

Introduction to HIV/AIDS Research

Anissa Brown*, Cynthia I. Grossman

HIV/AIDS remains one of the greatest research and public health challenges facing our nation and the world. This course will provide a complete overview of the current state of the science in all aspects of HIV/AIDS research. This interactive seminar-style course will include the following topics: basic science, including virology, etiology and pathogenesis; cure, prevention, and treatment; behavioral and social science; vaccines, and epidemiology. Course presentations and discussions will examine the current scientific and ethical issues facing HIV/AIDS clinical research.

Learning objectives:

- Demonstrate a comprehensive overview of the state of the science in all aspects of HIV/AIDS research
- Describe the distribution and determinants of HIV/AIDS
- Identify issues in the clinical practice of HIV/AIDS
- Understand the challenges and opportunities in establishing an AIDS-free generation
- Describe the impact of HIV/AIDS on special populations.

PBHL 581

Spring, 1.5 credits (8 weeks)

NEW Econometric Analysis in Evaluation of Biomedical Research Outcomes (8 weeks)

Sue Hamann

The public funding of biomedical research in the U.S. is highly complex and involves thousands of people and billions of dollars. At NIH, we say that our role is to make "important discoveries that improve health and save lives." In the current political and economic environment, we are asked to describe and justify our work using rigorous methods of systematic inquiry that produce actionable results, including econometric analyses of research outcomes. Challenges and opportunities exist in meeting the demand. In this introductory class, students will learn the foundations of econometric analysis and applications to the evaluation of biomedical research and public health programs.

Learning objectives:

- Master the basic ideas of economic modeling
- Distinguish among different types of cost studies in regard to applications, methods, and utility
- Explore regression analysis as a major econometric tool
- Apply knowledge gained to evaluation of publicly.

Prerequisites: graduate courses in statistics and program evaluation will be helpful. Access to regression analysis software is recommended.

PBHL 582

Spring, 1.5 credits (8 weeks)

NEW Analyzing Research Literature for Planning and Evaluation of Public Health Programs (8 weeks)

Amanda Greene

Knowledge of what is in the research literature is crucial when planning new programs and evaluating the findings of completed and ongoing biomedical and public health programs. The amount of labor and resources needed to gather and analyze the literature varies based on why this is needed, what questions you are trying to answer, and when the results are needed. To answer the why, what, when, and how questions, this course will focus on conducting environmental scans of published and gray literature, components of a systematic review of literature, use of bibliometrics, and other tools to understand the influence of research findings.

Learning objectives:

- Explain major approaches to learning from published research, including environmental scans, gap analysis, systematic reviews, meta-analysis, and bibliometrics
- Describe traditional and non-traditional sources of published and gray literature
- Identify standards for conducting systematic reviews of the literature
- Conduct a review of research literature
- Understand the utility and challenges of using bibliometrics to measure program dissemination.

PBHL 591

Spring, 3 credits

Advanced Seminar in the Evaluation of Research

Sue Hamann

The public funding of research includes many discrete components: setting research priorities; securing funds; funding research infrastructure; selecting and funding meritorious projects; conducting research; monitoring research progress; communicating research findings; training researchers. In this survey course, we will review theories, methods, and practices in program and policy evaluation as they relate to research, particularly publicly funded biomedical research. The full range of the evaluation hierarchy (needs assessment and program planning, feasibility and implementation evaluation, process evaluation, and outcome and impact evaluation) will be considered as we develop a comprehensive framework for the evaluation of federally funded biomedical research.

Learning objectives:

- Apply methods for systematic reviews of literature to a specific body of knowledge
- Employ methods of data synthesis to develop a comprehensive framework for the evaluation of research
- Explore the application and utility of the framework in their workplaces.

Prerequisites: formal graduate-level coursework in program or policy evaluation, or considerable work experience in program or policy evaluation.

PBHL 607

Fall and Spring, 3 credits

Capstone Project in Public Health

Stephen Marcus

The Capstone Project is the culminating experience of the Advanced Studies Program in Public Health. This culminating experience allows the student to demonstrate the acquisition of skills and the integration of knowledge across all coursework in the Advanced Studies Program. This is achieved by demonstrating mastery of selected public health competencies. Between five and 10 of these competencies are selected, at least one from each core discipline, and up to five additional ones from either discipline-specific or interdisciplinary/ cross-cutting competency lists (see **http://www.asph.org/document.cfm?page=851**), to serve as specific learning objectives as well as evaluation criteria for the Capstone Project.

The Capstone Project is a mentored course. The student will be required to spend approximately one day per week for the duration of the semester at an appropriate professional setting to put classroom learning into practice.

Many different models or types of projects are possible. Examples include: 1) design, conduct, and analyze data from an original research or evaluation study; 2) conduct secondary data analysis of existing data; 3) conduct a policy or regulatory analysis; 4) perform administrative or managerial functions within the healthcare delivery system; 5) developing an outreach or community-based health program; or 6) work on an educational or health campaign for a professional association, nonprofit association, or advocacy group.

Learning objectives:

- Synthesize and integrate knowledge acquired in coursework and other learning experiences
- Apply theory and principles in a situation that approximates some aspect of professional practice
- Demonstrate proficiency in selected competencies
- Determine, through examination by Capstone Project Mentor and Chair of Department of Public Health, whether the body of knowledge in the Advanced Studies Program has been mastered.

PRIOR TO ENROLLMENT, STUDENTS MUST CONSULT WITH THE DEPARTMENT CHAIR OF PUBLIC HEALTH.
This is a required course for Advanced Studies in Public Health.

OTHER COURSES THAT MAY BE OF INTEREST

BIOF 518
Theoretical and Applied Bioinformatics

BIOF 450
Evolutionary Genomics and Computational Biology

IMMU 419
Cancer Immunotherapy and Vaccines

MICR 418
Emerging Infectious Diseases

STAT 321
Methodology in Clinical Trials

STAT 322
Intermediate Epidemiology

TECH 586
International Research & Development & Innovation

TOXI 303
Introduction to Toxicology

ADVANCED STUDIES IN TECHNOLOGY TRANSFER

WHAT IS TECHNOLOGY TRANSFER?

Technology transfer is a term used to describe a formal transfer of rights to use and commercialize new discoveries and innovations resulting from scientific research to another party. Universities typically transfer technology through protecting new innovations, by use of patents and copyrights, then licensing them. The major steps in this process include the disclosure of innovations, patenting the innovation concurrent with publication of scientific research, and licensing the rights to innovations to industry for commercial development (**www.autm.net**). The technology transfer profession employs more than 10,000 professionals in the U.S., with a fairly large number practicing their trade in the greater Washington, D.C. area.

ADVANCED STUDIES IN TECHNOLOGY TRANSFER

FAES Graduate School at NIH developed a unique Advanced Studies in Technology Transfer to serve the needs of scientists or engineers who wish to gain expertise in patenting, licensing, collaborative agreements and other fundamental intellectual property transactions and to provide additional training to professionals already in the field.

The program culminates in an independent **Capstone Project** through which students will be required to demonstrate their knowledge of the theory and practice of technology transfer by completing a project of their design and choice at the NIH or in the regional community.

NIH is the nation's leader in health research and one of the world's foremost medical research centers. After the landmark legislations in the 1980s, NIH also led the nation in technology transfer and spawned, from its research, the development of a number of lifesaving drugs, vaccines and medical devices (**www.ott.nih.gov**). Research scientists and technology transfer professionals at NIH work together to ensure that basic results in the lab get successfully transplanted to the marketplace as useful biomedical products.

GENERAL REQUIREMENTS

The Advanced Studies in Technology Transfer is open to persons with a Bachelor's degree in science or engineering. Courses are offered in the evenings, making it convenient for working professionals and postgraduate fellows to seek additional training or gain expertise and experience in patenting, licensing, collaborative agreements, and other fundamental intellectual property transactions. The course instructors are leading practitioners in the field, so students can simultaneously gain the necessary knowledge and build professional networks.

The program comprises a 15-credit curriculum which may be completed in approximately two years, although students can complete the requirements at their own pace.

REQUIRED COURSES

TECH 513	Introduction to Technology Transfer (or TECH 513A)
TECH 565	Biomedical Business Development for Scientists
TECH 607	Capstone Course in Technology Transfer

ELECTIVES

CHEM 327	The Art of Drug Design and Discovery
PHAR 328	FDA Perspective on Drug Development
PHAR 500	Principles of Clinical Pharmacology I and II
PHAR 511	Current Concepts in Pharmacology and Therapeutics

I was interested in leaving the bench, and I thought technology transfer would be a logical transition as it would allow me to take technology from the bench to the bedside. During the program, I enjoyed the course-work, professors and the classmates.

When I found out about the agreement between UMUC and FAES through which FAES credits could be transferred to UMUC, I decided to pursue my Master's degree in biotechnology at UMUC. I will graduate in May 2015. The classes from the Advanced Studies in Technology Transfer prepared me for the course-work I encountered at UMUC.

Biologist, National Cancer Institute

I took FAES's classes to explore alternative career possibilities besides bench science. I really enjoyed the coursework because it opened my eyes widely. I learned a lot about business development, patent law, finance, and negotiation skills. The advanced studies in technology transfer served as a stepping-stone for a new career. It helped me to land my current job as a technology transfer specialist in the Navy.

Technology Transfer Specialist, Naval Medical Research Center

The Advanced Studies in Technology Transfer at FAES has a strong curriculum to provide the knowledge and skills necessary for every aspect of technology transfer and commercialization. Faculty members are experts in the field and provide information using case studies, thus giving a feel of real-world situations. Both required and elective courses provided me with in-depth understanding and prepared me well to transition to the field of technology transfer. I would recommend this program to anyone willing to pursue technology transfer as a career.

Technology Transfer Liaison, The Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc.

TECH 503	Business Law Primer
TECH 505	Contemporary Issues in Technology Transfer
TECH 506	Research Commercialization Webinar: The Essentials
TECH 508	Food and Drug Law For Scientists
TECH 512	Global Bioethics
TECH 521	Tools for Technology Transfer
TECH 525	Legal and Ethical Issues in Public Health and Biomedical Sciences
TECH 562	How to Get a Job in Technology Transfer
TECH 566	Building a Biotechnology Company: Learn First-Hand From Industry Experts
TECH 567	International Strategic Partnering and Business Development
TECH 572	Marketing Strategies for Scientific Organizations
TECH 575	Business Finance and Accounting Principles for Scientists
TECH 582	Intellectual Property and Patent Prosecution for Scientists
TECH 583	Patent Research for Non-Legal Practitioners
TECH 584	Translational Medical Product Development
TECH 586	International Research & Development & Innovation
TECH 587	Strategy Consulting for Tech Companies
TECH 588	FDA Regulation Product Development and Intellectual Property-Medical Devices
TECH 607	Capstone Course in Technology Transfer (2nd time would count as an elective)

AGREEMENTS WITH AREA UNIVERSITIES

FAES has entered into a partnership with the **University of Maryland University College** to offer an exciting opportunity for students to get ahead with their academic and professional goals.

University of Maryland University College (UMUC), Graduate School of Management and Technology

Students who have successfully completed the Advanced Studies in Technology Transfer at FAES can transfer all 15 credits as a block to work toward an M.S. degree at UMUC Graduate School of Management and Technology. By completing only 21 more credits at UMUC, students can be awarded M.S. degrees (with a specialization in Technology Transfer) in Management or Technology Management or Information Technology or Biotechnology Studies. Students also have the opportunity to earn a Master of Business Administration (MBA) degree from UMUC by completing an additional 18 credits upon completion of the M.S. degree. To learn more, please visit **www.faes.org/grad.**

3-Day Scientific Management Workshop

TRAINING SCIENTISTS AS MANAGERS

Who Should Attend

- Postdoctoral Fellows
- Early Career Researchers
- New PI's
- Scientists in Industry Labs
- Anyone Desiring to Become a Manager

Training Dates

June 3-5
July 8-10
August 5-7
September 2-4
October 7-9
November 4-6
December 2-4

Registration Fee

$1,295

Discounted Rates:

$995 NIH Community

$495 NIH Students

FAES@NIH

At FAES, we understand that many scientific professionals, while extremely prepared in their scientific disciplines, may have had little or no experience managing labs and people. We also understand that scientists work within a strictly logical and systematic framework, and preparation to become a laboratory manager is oftentimes neglected in scientific training programs.

Therefore, FAES Training offers workshops to bridge the gap between science and business. Our workshops focus on helping scientists improve their emotional intelligence and interpersonal skills.

Day I: MANAGING PEOPLE

- Management vs. Leadership
- Employment Law Compliance for New Managers
- How-To Effectively Interview & Select Staff
- Employee Relations 101 (How-to coach, counsel, discipline and document employee behavior)

Day II: MAKING THE TRANSITION FROM INDIVIDUAL CONTRIBUTOR TO MANAGER

- Core Functions of Management
- Strategies for Effective Teamwork (effective delegation, conflict resolution, communication skills, and creative problem solving)

Day III: SELF-MANAGEMENT & PERSONAL MASTERY

- Introduction to Emotional Intelligence
- Managing Interpersonal Relationships
- Team Personality Assessment: MBTI

Register Today! www.faestraining.org

For more information: registration@faes.org

TECHNOLOGY TRANSFER

FOR CLASS DATES, TIMES, LOCATION, AND TUITION, PLEASE VISIT WWW.FAES.ORG/GRAD.

Steven Ferguson, Chair

SPRING	TECH 503	Business Law Primer
FALL, SPRING	TECH 505	Contemporary Issues in Technology Transfer
FALL, SPRING	TECH 506	Research Commercialization Webinar Course: The Essentials
SPRING	TECH 508	Food and Drug Law for Scientists
SPRING NEW	TECH 512	Global Bioethics
SPRING	TECH 513	Introduction to Technology Transfer
FALL	TECH 513A	Introduction to Technology Transfer - Issues and Processes
FALL	TECH 521	Tools for Technology Transfer
FALL	TECH 525	Legal and Ethical Issues in Public Health and Biomedical Sciences
SPRING	TECH 562	How to Get a Job in Technology Transfer (8 weeks)
FALL	TECH 565	Biomedical Business Development for Scientists
SPRING	TECH 566	Building a Biotechnology Company: Learn First-Hand From Industry Experts
FALL	TECH 567	International Strategic Partnering and Business Development
SPRING	TECH 572	Marketing Strategies for Scientific Organizations
FALL	TECH 575	Business Finance and Accounting Principles for Scientists
SPRING	TECH 582	Intellectual Property and Patent Prosecution for Scientists
SPRING	TECH 583	Patent Research for Non-Legal Practitioners
SPRING	TECH 584	Translational Medical Product Development
FALL	TECH 586	International Research & Development & Innovation
FALL	TECH 587	Strategy Consulting for Tech Companies
FALL	TECH 588	FDA Regulation Product Development and Intellectual Property - Medical Devices
FALL, SPRING	TECH 607	Capstone Course in Technology Transfer

TECH 503

Spring, 2 credits

Business Law Primer

Frederick Provorny, Sury Vepa

This course is intended for individuals who are looking to start or join a technology company, or work in technology transfer, or pursue any other technology-related occupation, but lack a legal background. This course seeks to provide an overview of and appreciation for contracts and other important legal subjects and skills necessary to start and operate a successful science and technology enterprise. This course provides the student with a working practical knowledge of certain essential substantive areas of the law and the ability to select, work with and use lawyers effectively. The focus is on the real-world legal considerations in forming and sustaining an innovative enterprise, reviews legal structures for a new venture, intellectual property, employment law, contracts, government regulations, and real and personal property. The course will use real-life examples and hands-on exercises. It is expected that students completing this course will develop both a familiarity with and a working knowledge of different phases of an innovative enterprise, from start-up phase through growth stage to exit strategies. This course is, thus, designed to complement a would-be entrepreneur's or science or technology professional's education background with practical applications of contracts and other legal concepts.

Learning objectives:

- Instill the importance of contracts and other legal subjects to scientists and others who lack a legal background
- Demonstrate how understanding and using the legal system can facilitate the successful commercialization of technology or the creation and nurturing of a successful start-up
- Use a practical approach, including the drafting of various types of agreements and other legal documents, to impart real-world experience
- Enable would be entrepreneurs to understand the various phases of a company's life cycle and the role that they may assume in each phase
- Hone verbal and written communication skills, including those needed to attract investors, customers and top employees, through individual and group writing assignments and presentations.

A minimum of 8 students is required so that the desired interaction can be achieved.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 505

Fall and Spring, 2 credits

Contemporary Issues in Technology Transfer

Fizie Haleem, Richard Leshuk, Steven Ferguson

Technology transfer these days finds itself at the intersection of science, law, policy and business issues – especially so here in the Washington, D.C. area. This course, given in partnership with the Technology Transfer Society and the Montgomery County Maryland Government, will focus on the ever-evolving locus of these issues through participation in two seminar series being given in the local area. The seminars will cover a variety of late-breaking or emerging issues in technology transfer through presentations and lectures given by some of the most prominent practioners or decision-makers in the field. There will be a particular emphasis on the economic development aspects of technology transfer in this course, especially given the field's historic origins from economic development legislation.

The course will be held off the NIH campus during afternoon or lunch-time hours: some parts of the seminar series will be given at the Montgomery County Department of Economic Development in Rockville on the second Wednesday of the month at 3:30pm, while, on the third Wednesday of the month at 12:00 pm, the class would be held at the offices of the Association of Public & Land Grant Universities (APLU) in Washington, D.C. by the Technology Transfer Society, D.C. Chapter. Additional sessions will be organized by the course instructors.

This course can be taken as an elective for up to two times towards completion of the Advanced Studies in Technology Transfer Program. There are no course prerequisites.

Learning objectives:

- Become acquainted with some of the new or emerging issues in business, law, policy and science that will change or guide future technology transfer
- Comprehend the economic development framework for technology transfer, especially those based upon federally funded programs
- Be able to assess and discuss the likely impact of a particular new business, law, policy or science change upon technology transfer and society in general.

This course is an elective for Advanced Studies in Technology Transfer. It can be taken for up to two times.

TECH 506

Fall and Spring, 2 credits

Researcher Commercialization Webinar Course: The Essentials

Steve Ferguson
National Center for Entrepreneurial Tech Transfer (NCET2)

This online webinar course is designed for researchers in research institutions (e.g., graduate students, postdocs, professional staff and faculty) and researchers in commercial companies (e.g., start-ups, SBIR-funded firms, research-based small businesses and Global 1000). It allows attendees to make an informed decision as to how to better plan their commercialization efforts, be it through employment, licensing, consulting, joint venturing, or startup creation.

The course itself will deal with commercializing successfully any type of research activity, whether focused on engineering, physical sciences or life sciences, and not specific to just NIH. The topics themselves will introduce the practical business and legal issues that researchers need to understand to commercialize their research. The course will start with the different ways to commercialize research, ranging from the traditional (i.e., employment and licensing) to the more entrepreneurial (i.e. consulting, joint venturing/strategic alliance and start-up company). These sessions will also deal with fundamental topics, such as intellectual property, licensing agreements, employment agreements and consulting agreements. The second half of the course will give an introduction to the advanced topics of creating and funding companies. The advanced topics deal with commercializing technology as a group, with the resulting complexities of understanding the relationships and expectations of the other team members in the company, whether they are other employees, founders, executives, board members, shareholders, investors or partners.

Learning objectives:

- Understand fundamental topics necessary to excel as a researcher at a university lab or founder of the next great public company
- Appreciate the different ways to commercialize research, ranging from the traditional to the more entrepreneurial
- Be able to make an informed decision as to how to better plan commercialization efforts of your science.

Each lecture is a webinar that can be viewed live or offline on at **http://center.ncet2.org/**. There will be expert guest speakers for each session.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 508

Spring, 2 credits

Food and Drug Law for Scientists

Rochelle Fink

The Food, Drug, and Cosmetic Act (FD&C Act) provides authority for the Federal Food and Drug Administration's (FDA) regulatory oversight over drugs, biologics, medical devices, foods, and cosmetics. The class will gain familiarity with the U.S. legal system and examine administrative procedures followed by the FDA. The course includes an overview of drug, biologic and medical device approval processes as well as the regulation of dietary supplements. Students will learn enforcement activities by the U.S. courts through private lawsuits and by the FDA, including searches, seizure actions, injunctions, criminal prosecutions, and civil penalties authorized under the FD&C Act as well as other statues such as Public Health Service Act.

Learning objectives:

- Become familiar with the U.S. legal system and FDA's regulatory oversight over drugs, biologics, medical devices, foods and cosmetics
- Learn about legal enforcement procedure, such as searches, seizure actions, injunctions, criminal prosecutions, and civil penalties.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 512

Spring, 2 credits

NEW Global Bioethics

Gladys White

The birth of bioethics as a field of study is generally identified as a mid-twentieth-century phenomenon that occurred largely within the United States. But, important issues of moral concern can only be meaningfully understood within a global context. The purpose of this interdisciplinary course is to conduct ethical analyses of a cluster of cutting-edge issues in order to understand the human values and policy issues at stake.

Key topics will include: international exchanges of human tissues; organs and body parts; whole genome sequencing and the personal genome map; public health ethics, including management of communicable disease, cross-border reproductive care; pharmaceuticals and the developing world; nanotechnology; human subjects' research; research using animals and sports ethics. Classes will be based on at least one important controversy and debates will be encouraged.

Learning objectives:

- Identify and describe some of the major issues in global bioethics
- Analyze the ethical dimensions and human values implications of these problems
- Synthesize relevant information across disciplines of philosophy, ethics and science in order to demonstrate an understanding of the relevant issues.

TECH 513

Spring, 2 credits

Introduction to Technology Transfer

Susan Ano, Steve Ferguson*

This introductory survey course is aimed at both scientists as well as new or would-be technology transfer professionals. Specific topics will include: the history, legislation and public policy that drive federal technology transfer; the role of the Office of Technology Transfer at NIH; the role of the Technology Development Coordinators at NIH; forms of intellectual property; the definition of a patentable invention and the definition of an inventor; the patent application process; licensing of inventions; patent litigation; infringement and interference; collaborative research; and, transactional agreements. Federal, state, international, academic, and small and large industrial perspectives will be also explored. Special topics will include biomedical technology development, third party considerations in natural products development, and technology assistance programs.

The course utilizes a number of outside expert speakers from the local technology transfer, business and legal communities. Students will be also able to see a number of role models for non-traditional careers in science.

Learning objectives:

- Develop a basic understanding of technology transfer and its role in the biological sciences
- Comprehend the basis and subsequent interaction of technology transfer in the overall development a process of moving new discoveries to the marketplace
- Gain a greater appreciation of technology-transfer-related career options that are available for scientists.

This course is required for Advanced Studies in Technology Transfer.

TECH 513A

Fall, 2 credits

Introduction to Technology Transfer – Issues and Processes

Richard Leshuk
Technology Transfer Society / Washington, D.C. Chapter

This introductory survey course is aimed at both scientists as well as new (or would-be) technology transfer professionals. Specific topics will include: the history, legislation and public policy that drive federal technology transfer; the role of the Office of Technology Transfer at NIH; the role of the Technology Development Coordinators at NIH; forms of intellectual property; the definition of a patentable invention and the definition of an inventor; the patent application process; licensing of inventions; patent litigation; infringement and interference; collaborative research; and, transactional agreements. Federal, state, international, academic, and small and large industrial perspectives will be also explored. Special topics will include biomedical technology development, third party considerations in natural products development, and technology assistance programs.

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This course is an elective for Advanced Studies in Technology Transfer.

TECH 521

Fall, 2 credits

Tools for Technology Transfer

Bruce Goldstein

Designed for technology transfer specialists new to the field or scientists and other individuals wanting to learn the nuts and bolts of technology transfer activities, this course will delve into the day-to-day tools utilized by professionals in the field. The course will begin with setting the context with an introduction to intellectual property law and, then, will turn to a focused review of the various types of agreements relating to collaborations, exchanges of materials, license agreements, and clinical trials along with the potential issues or problems they are designed to address. Finally, the field of technology transfer will be put into a broader context, with a look at its relationship to contracts, grants, and other forms of government/non-government interactions, in addition to customer-service techniques and negotiation tactics.

Learning objectives:

- Develop a working understanding of basic intellectual property law
- Comprehend the broad regulatory and business framework for technology transfer
- Assess the different tools available for transferring technology, with a focus on federal labs.

Prerequisites: TECH 513 Introduction to Technology Transfer is recommended, but not required.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 525

Fall, 3 credits

Legal and Ethical Issues in Public Health and Biomedical Sciences

Carol Spiegel

This course offers an overview of legal issues affecting biotechnology and other science-based industries and frames basic philosophical and ethical considerations regarding genetic data and manipulation. The course includes a discussion of intellectual property issues.

Learning objectives:

- Discuss ethical issues, the basis and influence of moral theories on resolving bioethical issues
- Survey the legal, medical and scientific aspects of current bioethical issues
- Learn about U.S. patent process and the interdependency of marketplace and laws which regulate it
- Explain how the principles of property and ownership relating to intellectual property and biological materials impact the development of new therapies and diagnostics
- Understand the impact of biotechnology on healthcare and the medical community.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 562

Spring, 1 credit

How to Get a Job in Technology Transfer (8 weeks)

Reid Adler*, Barry Datlof

This class will help you find a job in technology transfer and related areas such as translational research and business development. We will have speakers from industry, academia and government who make hires in this field. The course will focus on finding sources for jobs, applying for jobs, using social media, such as LinkedIn, and assessing one's own competitive strengths and weaknesses. The course is taught by wise old owls who have directed technology transfer programs at the NIH Office of Technology Transfer, the Dana Farber Cancer Institute, and the Holland Labs of the American Red Cross. Practical guidance in applying and interviewing will be also provided.

Learning objectives:

- Learn what it takes to get a job in tech transfer
- Decide if you are ready or need to enhance your skills and hone your portfolio and credentials
- Identify where to find jobs in this field and create your own job opportunities
- Nail the interview through preperation, presentation, and follow-up.

Prerequisites: TECH 513 Introduction to Technology Transfer is recommended, but not required.

TECH 565

Fall, 2 credits

Biomedical Business Development for Scientists

Steve Ferguson*, Michael Salgaller, Jeff Walenta

This course will take a practical, hands-on approach to business plan development, venture capital and technology transactions. Using current examples from the active technology portfolio of the NIH Office of Technology Transfer or an example of their own choosing, students will learn and participate in reviewing a scientific innovation and determining whether the discovery makes a realistic business proposal. The course will look at the history of venture capital and its relation to science and technology. The course will emphasize technology transfer issues (particularly from an NIH standpoint) related to real-world technology partnerships and venture capital investments. Issues related to legal considerations, including due diligence and licensing issues, will be also highlighted.

The course will be taught as a semester-long simulation in which students take on the various roles of entrepreneurs and investors in all aspects of science focused on venture capital dealings. Lectures by seasoned biotechnology executives and venture investors will provide for a real-world approach to learning. Students will be expected to develop a draft business plan by the end of the semester and present it to venture capital professionals as if asking for funding in a real pitch meeting. Student plans may be selected for use in marketing or commercialization efforts by the NIH Office of Technology Transfer.

Learning objectives:

- Develop an appreciation of the role of venture capital and other investors in the development of new biomedical technologies
- Understand and be able to complete the essential elements of a business plan
- Communicate effectively both orally and in writing to potential investors the commercial advantages of a new technology.

Prerequisites: basic or advance knowledge of science; no business credits required.

This course is required for Advanced Studies in Technology Transfer.

TECH 566

Spring, 2 credits

Building a Biotechnology Company: Learn First-Hand From Industry Experts

Steve Ferguson, Jim Hawkins, Jeff Walenta

This course will take a practical, hands-on approach to studying the strategy and dynamics necessary for the growth of a biotechnology company from a basic research effort located in a research institution to a fully financed, stand-alone, business operation prepared to place finished products in the life science marketplace and to generate a financial return for investors. There will be no formal lectures. Rather, through the use of a new panel of expert speakers each week—with specific experience in the week's topic—each week's discussion will build on the previous weeks' topics to arrive at a finished construct of a fully operational biotechnology company. There will be an emphasis on interactive discussion between class members and panelists. Panel members will offer first-hand observations, insights, and personal anecdotes concerning their experiences in building different aspects of a life science company. Discussions will include critical thinking and management decisions during times of technology challenge, financial adversity, and growth.

The course will include onsite visits and lectures relating to various sized biotechnology companies in the region. A variety of topics related to the biotech company will be examined, including intellectual property, entrepreneurship, professional advisors, different types of investors and fundraising, applied research and product development, regulatory considerations, manufacturing, sales and marketing as well as leadership and senior management. For a final grade, students will provide an oral presentation and complete a written summary of a chosen management topic. Student interaction with speakers is highly encouraged.

Learning objectives:

- Develop a working understanding of the structure and management of biomedical business firms
- Comprehend the critical thinking needed for management decisions during times of financial hardship and growth
- Be able to effectively interact with biotech stakeholders to discuss issues relating to finance, R&D, marketing, manufacturing and human resources.

Prerequisites: basic or advanced knowledge of science; TECH 565 is helpful, but not required.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 567

Fall, 2 credits

International Strategic Partnering and Business Development

Rita Khanna

This course will assess the growing global marketplace for innovative biomedical products and research, particularly in developing countries, with a focus on business plans, market development, venture capital, technology transactions, and relevant international partnerships. Using current examples from the technology portfolio of NIH and other organizations, the students will review scientific innovation and determine whether a particular discovery constitutes a realistic business proposal from an international perspective.

This course seeks to understand the content and nature of international S&T partnerships, including approaches taken by different institutions and the major forms and types of international agreements, particularly those involving NIH. The course will also look at sources of funding (venture capital, philanthropic and others) and its relation to innovation and the development of products. The course will examine technology transfer issues related to the new institutional frameworks, such as product development partnerships (PDPs), advanced market commitments (AMCs), and other partnerships. Students will be expected to assess a technology of their choice, and develop a draft executive summary of a new bio business concept, with a potential commercial advantage in the international market place, or write a research paper on one of the topics covered. Student efforts may be selected for use in commercialization efforts by the NIH Office of Technology Transfer, or in presentations to international business plan groups, or for publishing in an international journal. The course will provide a real-world flavor through guest lectures by representatives who play major roles in global markets and are affiliated with biotech/pharma industry and the public sector.

Learning objectives:

- Understand the growing marketplace for innovative biomedical products and research, particularly as they relate to developing countries
- Examine approaches taken by different institutions, including the NIH, and new institutional frameworks such as PDPs
- Assess sources of funding in relation to innovation and the development of biomedical products.

Prerequisites: basic or advanced knowledge of science; no business credits required.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 572

Spring, 2 credits

Marketing Strategies for Scientific Organizations

Barry Datlof

This course explores the role of marketing in science-based organizations that seek to reach their goals in technology development, product development, public health impact, or other societal needs. The course will start with a clarification of what constitutes marketing by providing the students with the basic concepts, terminology and practices of marketing. Next, the course will focus on the role of marketing in a research or scientific organization and the specific issues related to marketing technologies. Using a case-study approach, students will be provided with examples of conducting market analyses in the biomedical area. Students will use real-world examples of technologies to create an effective marketing strategy, with details of administering specific marketing programs. Additional topics will include start-up marketing, socially responsible marketing and marketing technologies in international markets, specifically in developing countries.

Students, in groups, will be asked to utilize key marketing concepts to develop a marketing plan for a biomedical technology, product or service that may be chosen for the technology portfolio of the NIH Office of Technology Transfer (OTT) or other biomedical organizations.

Learning objectives:

- Develop expertise in branding products and companies
- Use market research tools to develop strategies for real technologies
- Interact with guest lecturers to learn how people get to be marketers
- Understand the basics of marketing: Product, Price, Promotion, and Place.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 575

Fall, 2 credits

Business Finance and Accounting Principles for Scientists

Diana Ororbia-Knapton

Finance and accounting are the language of business, yet this language is not well understood by people in non-profit or scientific research institutions who work with for-profit companies. This course will give an overview of how companies keep score and how outsiders can understand the financial health of internal activities. The course will make extensive use of financial statements (Annual and Quarterly Reports) from well-known companies and use these reports to introduce principles of financial accounting. These principles will be tied into an understanding of: (1) how an individual can assess the financial stability and capabilities of a partner; (2) how financial issues can impact potential collaborations and deals with companies; (3) how financial issues directly impact agreements that class participants may be part of. The class will also look at the operation of financial markets and how the reported financial issues of a company interact with the broader financial markets. The understanding of financial markets may be of personal relevance to the class participants.

Students will make extensive use of publicly available financial information that may be found online. The class will have periodic assignments that will provide an opportunity for students to present their analysis in class.

Learning objectives:

- Develop basic understanding of accounting principles and financial statements as they apply to biotech and other life science companies
- Utilize transactions as the basis for building balance sheets, income statement and other financial statements for such firms
- Analyze the performance of public biotech and life science companies using standard financial tools.

Prerequisites: experience with or interest in collaborations or agreements with for-profit organizations.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 582

Spring, 2 credits

Intellectual Property and Patent Prosecution for Scientists

Lee Heiman

This course will provide a general review of the intellectual property (IP) ecosystem and a comprehensive analysis of the patenting process from a business perspective. IP is a currency that connects our global community, and this course explores how patents and other intellectual property spur innovation, new product development, and business growth. We also explore how one values and uses a protected technology, covering issues such as the place of technology in the research and development pipeline, and the effects of regulatory compliance. Using a historical approach to account for social, economic, and technological changes, students will gain greater knowledge of the history of the patent system, the evolution of U.S. patent law, the process of obtaining, defending, and attacking patents. Students will also review the many different ways that conflicts involving intangible property can be resolved.

Learning objectives:

- Understand invention, discovery, creative work, secret and how they can give a business advantage
- Gain a high-level understanding to distinguish between or obtain the four types of IP: patents, trademarks and service marks, copyrights, and trade secrets in the context of supporting business development
- Describe U.S. patenting process, both historically and in the context of the movement toward global harmonization through international IP frameworks
- Explore some common career options in the IP field: patent agents and attorneys, licensing professional, technology transfer professional, technology searcher, and patent examiner
- Draft a basic patent application.

This is an elective for Advanced Studies in Technology Transfer.

TECH 583

Spring, 2 credits

Patent Research for Non-Legal Practitioners

Joseph Hsiao

Patent research informs licensing, patent portfolio, research allocation, and other aspects of patent strategy. To effectively provide sound advice, individuals depend on high-quality patent research in order to develop, maintain and strategize their intellectual property portfolio. Actionable research drives internal legal and business decisions, including patent protection, licensing, enforcement, due diligence, and litigation strategies. This introductory course will provide scientists and research professionals with the tools, methodologies and analytical framework to conduct a sound patent. Students will learn, conduct, and evaluate patent research directed to a wide range of technical areas, including the life sciences. Students will be exposed to advanced patent research techniques and several leading patent research platforms in order to evaluate and critically analyze the quality of patent research results. Students will be tasked with understanding and performing exercises, such as patentability assessments, freedom to operate analyses and invalidity examinations. All students are required to have access to a laptop computer which can access the facility's wireless network. Students will receive temporary subscription access to Patbase, one the most relied-upon online patent databases available. For more information on this database, please visit **www.patbase.com**

Learning objectives:

- Get introduced to and understand basic legal requirements for patentability
- Understand and formulate strategies for conducting effective patent research
- Get familiar with using publically available and proprietary patent databases to conduct patent research.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 584

Spring, 2 credits

Translational Medical Product Development

Sabarni Chatterjee

To be competitive in industry, scientists must understand the intricate process of translating basic research into innovative, market-driven products. Further, these scientists must be able to navigate the complex pathways of intellectual property management and regulatory affairs of agencies such as the FDA. This course will provide life sciences students with the skills to integrate industry-relevant training and experience with basic science education. This course will explore the licensing, marketing and regulatory processes through which a bioscience product is developed and brought to commercialization.

Learning objectives:

- Acquire knowledge and tools of different aspects of medical product development
- Understand strategic considerations of medical product development.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 586

Fall, 2 credits

International Research & Development & Innovation

Luis A. Salicrup

This course provides a comprehensive overview of the policy and programmatic issues related to the support of research & development (R&D) and innovation internationally. It addresses U.S. domestic as well as international issues; it is concerned with governmental and non-governmental policies related to scientific innovation, including universities, techno-parks, and industries. R&D-based innovation is now seen to be connected to economic growth and development as well as to societal wellbeing. This course will examine the public policy and programs and the role of the federal government, national governments abroad, and international organizations in the R&D innovation system. Additionally, this course will equip participants who are either currently in the field of or are planning careers in global health, international R&D and scientific innovation with adequate background to be involved in policymaking and or national and international program management.

Learning objectives:

- Discuss the importance of R&D and its impact on science, technology and health systems internationally
- Understand the NIH model for enhancing R&D and technology commercialization process
- Discuss case studies related to technology transfer applicable to different countries
- Share international R&D activities and programs at NIH, other U.S. government agencies, international organizations, and institutions in different countries.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 587

Fall, 2 credits

Strategy Consulting for Tech Companies

Rosemarie Truman

For biotech and healthcare-related companies, the strategy consulting super elites are McKinsey, BCG, Booz Allen, and Bain. For scientists, getting an interview or a consulting position with these firms often remains elusive, given the rigorous recruiting process. This course will cover what strategy consulting is and what the super elites want; it will outline a path to position students to land a job. As part of the class, students will learn how strategy consulting works at these major firms. Students will also learn how to interface with tech clients directly as they will complete a practical, hands-on project. The class will cover the end-to-end consulting process of what it takes to land and deliver a deal. The strategy consulting firms look for those experts who understand the end-to-end approach from identifying a potential client to closing the deal and delivering the work product. The adage in consulting services is that the "client buys the practitioner," so students will also intimately understand what is important to the client. With its breadth and depth of activities, strategy consulting is different than any other type of consulting typically encountered by scientists. Strategy consulting can give the chance to scientists in a broad array of business.

Learning objectives:

- Understand the ins and outs of strategy consulting
- Perform due diligence and create a portfolio strategy for an organization
- Conduct a market assessment for a new product launch
- Chart a growth roadmap for a company
- Pitch the new strategy to the client.

Prerequisites: basic or advanced knowledge of the life sciences industry and clinical development. TECH 565 and 566 would be helpful, but are not required.

This course is an elective for Advanced Studies in Technology Transfer.

TECH 588

Fall, 2 credits

FDA Regulation Product Development and Intellectual Property-Medical Devices

Shrinagesh Koushik

This course offers an overview of the historical development of food and drug laws and regulations as they apply to drugs, biologics and medical devices, including radiological products. The curriculum will provide a brief overview of drugs, biologics and device development, with an introduction to marketing clearance and approval processes, regulations covering import, export, current good manufacturing practices, labeling, reclassification, adverse event /medical device reporting, tracking and postmarket surveillance, establishment registration and medical device listing, corrections and removals, and, finally, FDA inspection.

Learning objectives:

- Gain understanding of the history and development of food and drug laws and regulations as applied to drugs, biologics and medical devices
- Get introduced to processes, regulations, manufacturing practices, reporting, listing, inspection involved in medical device and product development.

This course is an elective for Advanced Studies in Technology Transfer Program.

TECH 607

Fall and Spring, 3 credits

Capstone Course in Technology Transfer

Steve Ferguson*, Frederick Provorny

This course is designed as a final course in technology transfer for those students seeking to complete the FAES Advanced Studies in Technology Transfer. Students will utilize the information and experience gained in the other technology transfer courses, along with scientific training, to complete a project of their design and choice at the NIH or in the regional community relating.

This course is customarily taken after a student has completed at least six previous courses in the technology transfer and has compiled a strong academic record. As part of the course, interested students will be identifying a research topic and a mentor who is familiar with their prospective inquiry and who is willing to provide guidance and oversee the project. Assistance is available to students in selecting a topic and locating a mentor. The research project must be independent of current work-related responsibilities, as determined by the project mentor. The mentor may be from the NIH, the local business community, a supervisor from the student's place of work, or any expert with appropriate credentials. Students are required to submit a formal proposal for review and approval by the course instructors. Student projects can include internships, but such are not specifically required. Students must meet with the course instructors periodically to discuss the project's progress. A written document, poster presentation, or similar result, must be completed and approved by the course instructors and project mentor for the student to receive credit.

Learning objectives:

- Identify an area related to technology transfer or technology development that is of strong interest to the student and merits further exploration and independent study
- Complete the project for a client or mentor that will focus on a practical experience outcome
- Utilize the project and practical experience obtained as part of a career development or transition strategy for future employment.

Prerequisites: permission of the instructor.

This course is required for Advanced Studies in Technology Transfer. This course may be taken two times.

COURSES OFFERED IN OTHER DEPARTMENTS THAT ARE ELECTIVES FOR THE ADVANCED STUDIES IN TECHNOLOGY TRANSFER

CHEM 327	The Art of Drug Design and Discovery
PHAR 328	FDA Perspective on Drug Development
PHAR 500	Principles of Clinical Pharmacology I and II
PHAR 511	Current Concepts in Pharmacology and Therapeutics

3-Day Fundamentals of Project Management for Scientists Workshop

Training Scientists for Tomorrow

COURSE OVERVIEW

Day 1: An Introduction to Project Management

- Project Management Terminologies
- The Role of the Project Manager
- Elements of a Successful Project

Day 2: The Project Management Lifecycle

- The Initiation Phase
- The Planning Phase
- The Execution Phase
- Project Control & Monitoring Phase
- Project Close-Out Phase

Day 3: Creating Project Management Tools

Upon completion of this workshop, you will be able to create:

- The Project Charter
- Work Breakdown Structure (WBS)
- Network Diagram / PERT Chart
- Project Schedule / Gantt Chart
- Budget Development

Registration Fee

$1,295

Discounted Rates:
$995 NIH Community
$495 NIH Students

Training Dates

Jun 17 - 19
Aug 19 – 21
Oct 21 – 23
Dec 16 – 18

This three-day Project Management Workshop provides an overview of the fundamentals of project management focusing on cost, scheduling, performance and scope.

This workshop helps participants learn how to create a project plan, manage and execute a project, and utilize several project management tools. This workshop draws upon relevant case studies, and prepares scientists to apply the learning for direct use in the lab.

Register Today! www.faestraining.org
For more information: registration@faes.org

FAES@NIH

BIOTECHNOLOGY (BIOTECH; TECH)

General Information

Registration for BioTech workshops occurs on a rolling basis; BioTech does not follow dates and deadlines posted on the academic calendar of the Graduate School.

BioTech is a series of daytime biotechnology training workshops that are directed by experts in the field and are team taught primarily by active researchers; they include lecture and hands-on laboratory exercises. Each participant receives a comprehensive binder containing all the materials presented in the workshop, along with laboratory protocols and reference materials.

Registration is on a rolling basis.

To register, visit http://faestraining.org, or email: training@faes.org or call: 301-496-7975.

2015/2016 Training Rates:	3-Day Classes $1,295	4-Day Classes $1,495	5-Day Classes $1,795
DISCOUNTED RATES:			
Academia, Government, Military Employees	**$895**	**$1,095**	**$1,295**
NIH ONLY Trainees (fellows, postdocs, postbacs)	**$395**	**$495**	**$595**

CEU credit: BioTech workshops provide CEU credit. Please not that 1 CEU = 10 contact hours.

Limited Enrollment: Each BioTech course has limited enrollment; please register in advance online at **http://faestraining.org**. Registration occurs on a first-come, first-served basis. The deadline for registration is one week before the first day of each BioTech course. If you are unable to register before the deadline, please email **training@faes.org** or call 301-496-7975 for space availability.

BioTech 1 Biotechnology Techniques

September 21-25, 2015

This lecture and laboratory course will provide the theoretical basis and the hands-on experience needed for the understanding and execution of those laboratory procedures that are widely used in biotechnology, molecular genetics, immunology, and biochemistry. While the subject matter will be discussed in the context of broadly stated research objectives, the emphasis will be on the techniques rather than on specific applications and strategies. Thus, the participants will acquire skills in the use of "generic" methods, and through an understanding of such methods, improve their effectiveness as workers in a contemporary research laboratory.

BioTech 2 Recombinant DNA Methodology

June 6-10, 2016

This lecture and laboratory course is designed to provide the novice with an introduction to recombinant DNA technology and genetic engineering. An approach emphasizing both principles and methodology provides the scientist with the essential fundamentals needed for gene cloning and analysis using traditional and advanced techniques and an appreciation of the strategies of recombinant DNA technology.

BioTech 4 Cellular Immunology: Principles and Methods

October 26-30, 2015

The objective of this course, through lecture and laboratory sessions, is to learn those research approaches which form the foundation of our understanding of the immune system, with particular emphasis on the cellular elements and their roles in the orchestration of the immune response. Because this field is contributing to novel therapies and is in a high state of flux, due attention will be given to new directions.

BioTech 7 Animal Cell Culture: Methods and Applications

May 9-13, 2016

This lecture and laboratory course is designed to introduce you to the practice of laboratory cell culture, covering topics such as laboratory set-up, safety, and aseptic technique. You'll also learn basic methods for passaging, freezing, and thawing cultured cells. Upon the successful completion of this course, you will have a basic understanding of the principles and practice of cell culture that you can immediately apply to your research projects.

BioTech 8 Immunochemistry and Monoclonal Antibody Production

December 14-18, 2015

The objective of this lecture and laboratory course is to provide investigators with information on approaches to the isolation, purification and characterization of antibodies and antigens. Special emphasis will be given to monoclonal antibody production, assay, and characterization.

BioTech 16 Expression, Detection and Purification of Recombinant Proteins in Prokaryotic and Eukaryotic Cells

October 14-16, 2015

The objective of this course is to provide the student with a good theoretical background as well as practical information and laboratory experience in the design, expression, detection and purification of recombinant proteins from a variety of expression systems involving prokaryotic and eukaryotic systems.

BioTech 18 Stem Cells

October 5-9, 2015

The emergence of stem cells as important tools for biomedical research prompts this offering of a 5 day, lecture-lab training course. The lectures will cover the importance, origin, and fate of diverse stem cells (hematopoietic, muscle, nerve, skin and embryonic) and the factors that control their differentiation. Special emphasis will be on isolation, identification, culture, and use of stem cells and their progeny.

BioTech 21 Mitochondrial Molecular Biology and Pathology Workshop

May 24-26, 2016

The purpose of this three day workshop is to provide a foundation of knowledge to those beginning to investigate mitochondrial function and biogenesis or those simply interested in understanding these essential subcellular organelles. Participants will learn about the important metabolic reactions occurring within the mitochondria and how nuclear and mitochondrial DNA lesions can result in a wide variety of mitochondrial disorders. The workshop will include a combination of lectures and hands-on laboratory experiments designed to familiarize the participants with the skills necessary to work with these organelles.

BioTech 22 Hybridization Techniques: Labeling, Detection and Applications

April 18-22, 2016

This four-day course is designed to introduce the participant to molecular hybridization and *in situ* hybridization techniques. The application of these techniques to current research questions in genetics and gene expression, molecular pathology, and pathogen detection and identification will be discussed. Probe application and detection systems will serve as the basis for both RNA and DNA *in situ* hybridization techniques to be addressed in lecture and laboratory. This course will be staffed by clinical and basic scientists familiar with the applications of hybridization techniques to the problems of human disease.

BioTech 25 Proteomics: Principles and Methods

September 28 – October 2, 2015

This lecture and laboratory course will provide an introduction to proteomics technology. Both principles and advanced methodologies will be discussed with an emphasis on protein identification tools, shotgun sequencing and bioinformatics technologies.

BioTech 26 PCR Methodology: Principles, Optimization and Applications

July 14-17, 2015

From its conception in 1983 to its modern day use in a myriad of clinical and research applications, the Polymerase Chain Reaction (PCR) has revolutionized modern molecular biology. This lecture and laboratory course will focus on the conventional Polymerase Chain Reaction and its applications in basic molecular biology research, genetics, and molecular pathology, including cancer and genetic diseases and identification of viral, bacterial and other pathogens.

BioTech 29 Laser Capture Microdissection (LCM): Methods for Microgenomic Analysis

July 27-31, 2015

Laser Microdissection systems allow for the procurement of specific populations of cells from tissue and cytology and live cell culture samples containing heterogeneous populations of cells. The specificity of analyses is therefore much more representative of the disease process being studied. This

approach to microdissection ensures that biological molecules, such as DNA, RNA and proteins, remain undamaged during the microdissection process. Downstream molecular analysis of these molecules produces accurate and assured results that have led to over 2,000 peer-reviewed publications by independent researchers. In this five-day training program, participants learn to prepare tissue specimens for microdissection, then select and acquire homogenous cell populations using the mmi-CellCut, Leica LMD, Arcturus XT, and PALM microdissection systems. Instruction emphasizes operation of these LM systems, appropriate tissue handling and sample preparation for subsequent DNA, RNA or protein analysis, and methods for proper molecular extraction.

BioTech 31 Vaccines: Development and Evaluation of Efficacy

February 16-19, 2016

Vaccines are used or developed for a wide range of diseases such as cancer, autoimmune diseases, allergies, and for the prevention of communicable and parasitic diseases. The purpose of this course is to provide an overview of a broad spectrum of vaccine related topics, from the design of vaccines to their delivery with adjuvants and by different delivery systems. The target audience is researchers with various scientific backgrounds and with interest in vaccine research, but also those dealing with regulatory aspects of vaccines who wish to acquire a scientific understanding of vaccines.

BioTech 33 Clinical Proteomics and Biomarker Discovery

August 10-14, 2015

The emerging field of Clinical Proteomics involves the discovery and identification of new biomarkers which may aid in diagnosis of disease, prediction of clinical outcome, and therapeutic efficacy. Technologies are now available which allow for rapid comparisons of protein expression profiles from complex biological samples, creating novel opportunities in biomarker discovery from a host of diseases. Successful biomarker discovery projects include the coordination of many different disciplines, such as biochemistry, proteomics, clinical chemistry and bioinformatics. In this course, the student will be exposed to the challenges facing researchers involved in biomarker discovery projects, as well as to the numerous analytical platforms that may be employed.

BioTech 34 Advanced Microarray Analyses and Pathway Integration

February 9-12, 2016

In response to the growing demand to learn how to extract the maximum information from the tremendous amount of data generated in a microrarray experiment, this course begins with a hybridized array and will spend extensive time on optimizing the scanning process and acquiring an informative scan. These data will then be analyzed using GeneSpring software to generate clustering associations. Finally, using microarray and protein interaction data, pathways defining gene interactions will be assessed using PathwayAssist software.

BioTech 35 Immunofluorescence and Confocal Microscopy

January 19-22, 2016

This four day day lecture and hands-on-laboratory course will focus on two important methods that are used extensively in biomedical research. Fluorescence microscopy is a useful tool for observing cellular morphology and function that is readily available and relatively simple to learn. Any specimens prepared for fluorescence microscopy can be analyzed in further detail and with improved resolution using confocal or laser scanning microscopy. Confocal microscopy is a powerful technique for examining 3-dimensional localization and dynamics of cellular components.

BioTech 37 Real Time and Quantitative PCR

July 20-24, 2015

Conventional PCR has revolutionized the detection and analysis of nucleic acids. However, one of its major limitations has been the inability to accurately quantitate the amount of product, which reflects the amount of starting material, due to differing plateau effects among multiple samples. The need to accurately determine quantitative changes in gene expression has led to the adoption of real-time RT-PCR as the method of choice not only for quantitative gene expression but also for validating results obtained from array analyses and other techniques that evaluate gene expression changes on a global scale. This lecture/laboratory course is intended for those who have a fundamental background in PCR and will address the basic chemistries of real time PCR and the many platforms available.

BioTech 38 Digital Imaging in Microscopy

December 9-11, 2015

Imaging of cells and tissue through the microscope in years past had embraced the use of film to capture pertinent events. Improvements in recent years have led to the insurgence of digital imaging techniques which allows for considerably more flexibility and accuracy in obtaining these images. Digital imaging effectively addresses the demands of high resolution, color accuracy, speed of acquisition, imaging flexibility and low cost, all of which are demanded by the field today.

BioTech 39 Epigenetics

December 1-4, 2015
April 12-15, 2016

Sequencing of the human genome was not the endpoint of our goal in understanding human genetics. The chemical modifications to DNA and histones and the chemical interactions involving the manufacture of proteins represents a second level of human genetics termed, epigenetics or epigenomics. Research has shown that epigenetic mechanisms provide an additional layer of transcriptional control that regulates how genes are expressed. Epigenetic abnormalities are associated with genetic disorders, cancer, autoimmune diseases, aging and pediatric syndromes, among others. This course will address the basic principles of epigenetics, the role of epigenetic mechanisms in normal development and human disease, and the development of epigenetically-effective drugs. The objective of the program is to provide a solid foundation of information enabling participants to design experiments when returning to their own research lab. Participating instructors are primarily active researchers from neighboring institutes and universities who have been publishing in these areas for several years.

BioTech 40 Protein Informatics

February 10-12, 2016

The logical next step after genome sequencing or proteomics analyses--and a necessary prequel to biomarker and drug target discovery--is to identify proteins of interest and their activities. This three-day course will combine lectures with computer labs to provide an introduction to the bioinformatics resources and methodologies commonly used for protein analyses. Course participants are expected to know the basic biology of proteins, and will leave with the ability to perform detailed analyses of protein sequences and structures.

BioTech 41 miRNA: Tools and Technologies for the Quantitative and Functional Analysis in Mammalian Cells

June 13-15, 2016

MicroRNAs (miRNAs) are evolutionarily conserved, endogenous, noncoding small RNAs that act as post-transcriptional gene regulators. miRNAs as gene regulators play a vital role in many biological processes. In addition to normal human development involving cell growth and proliferation, tissue differentiation, embryonic development, and apoptosis, human diseases are also impacted by miRNAs. Mutation, dysfunction, and/or dysregulation of miRNAs may give rise to diseases such as coronary artery disease, cancer, diabetes, AIDS, hepatitis, and obesity. In this hands-on training workshop, participants will learn the latest information about miRNA and the use of miRNA as a diagnostic tool.

BioTech 42 Junior Scientist Training Program (JSTP)

September 28, 2015 – May 16, 2016

Requirement
College graduates with a four-year degree in biology require more hands-on laboratory experience to effectively compete for research technician positions.

Goal
Provide a quality training program at the National Institutes of Health (NIH) that bridges the gap between the levels of laboratory skills biology graduates have acquired, to the proficiency level needed to effectively compete for a laboratory technician position.

Ideal Candidates
Post Bacs, fourth year biology majors, recent college graduates, or those in the sciences who need to strengthen their laboratory skills.

Method
Using the FAES's BioTech training resources at the NIH, selected students will attend a nine month workshop encompassing seventeen hands-on laboratory sessions (eighty-five contact hours) covering the latest relevant laboratory techniques in molecular biology. These selected methods have been identified by NIH scientists and private industry representatives to be techniques that research technicians would implement on a day to-day basis.

Participants would also be required to view online, selected lectures (approximately thirty hours) that are part of the current FAES BioTech curriculum offered at the NIH. These lectures, which are taught at a graduate level by local researchers, will cover many areas of biotechnology that will introduce and reinforce the subject matter given in the laboratory.

Participating researchers will be available to serve as mentors for interns who participate in the program.

BioTech 45 Bioinformatic Analysis of Next Generation Sequencing Data

July 14-17, 2015
December 8-11, 2015
April 5-8, 2016

This course will introduce students to bioinformatic analysis of next generation sequencing data, particularly for DNA-seq, RNA-seq, CHIP-seq, and epigenomics. The course will be comprised of lectures and hand-on sessions. Lectures will cover background knowledge and survey various software

programs. For hand-on sessions, command line tools will be presented and the galaxy web based platform will be used to analyze primary data. Cloud computing, genomic databases, and de novo assembly will be surveyed.

BioTech 47 iPSC II: Human Induced Pluripotent Stem Cells (hiPSC); Differentiation to Neural Lineages

March 7-11, 2016

Induced pluripotent stem cells (iPSC) represent enormous potential in that they are capable of differentiating into virtually any cell type in the human body. This 5 day hands-on training workshop will provide participants with the training and knowledge to help the researcher bring iPSC technology to the laboratory. Students will gain practical knowledge for developing new cell lines from different cell types. Lectures will discuss the expression of genes required for inducing pluripotency and methods of making (virus, RNA, plasmid) and maintaining iPS cells. Lectures on conditions needed for differentiating iPSC to neural, epithelial, and hematopoietic lineages will also be discussed. The emphasis of the course is placed on deriving iPSC and differentiation to the neural lineage. Labs will cover methods for making iPSC and picking iPSC colonies. *In situ* analysis of pluripotency on live cells will also be conducted.

BioTech 49 Making iPSC From Blood

October 19-23, 2015

Recent advances in generating iPSCs now allow for their derivation from blood. This recent advance enables basic and clinical researchers to reprogram a blood cell into an iPSC and then further differentiate into any cell type. This capability allows researchers to develop "disease in a dish" paradigms to investigate disease and therapy mechanisms.

In this one week workshop, participants will learn how to generate iPSC from blood samples using a non-integrating approach. Due to the length of this procedure (iPSC generation ~3-4 weeks etc.) starting material (CD34+ cells or mononuclear cells) will be provided for each investigator and only critical stages will actually be performed during the laboratory portion of the workshop.

In addition to learning how to culture cells and reprogram blood cells into iPSCs, we will also present some of the latest methodologies for directing differentiation of these iPSCs into different lineages. Therefore, this course will package together the essential methodology to take a CD34+ cell isolated from blood, reprogram this cell, and then direct differentiation into multiple different lineages.

BioTech 53 Super Resolution Microscopy

October 14-16, 2015

Super Resolution Microscopy represents a group of recently developed light microscopic techniques that are able to exceed diffraction-limited resolution (less than 200µm). This course will focus on three types of Super Resolution Microscopy, Structured Illumination Microscopy (SIM), Stochastic Optical Reconstruction Microscopy (STORM) and Stimulated Emission Depletion (STED). The course is designed for cell biologists with prior experience in light microscopy who wish to add super resolution microscopy to their research program. Participants will acquire both a theoretical understanding of super resolution microscopy and practical experience using state of-the-art super resolution microscopes.

BioTech 54 Making Cardiomyocytes from iPSCs

August 24-28, 2015

Often late stage clinical trials are terminated due to cardiotoxicity. There is a great need to develop proper screens that are predictive of human clinical response to medications. This course will cover numerous applications using cardiomyocytes. The lectures will cover cardiac development and cardiac diseases which provide the necessary background for this course in appreciating how stem cells can be differentiated from iPSCs and be used to develop "disease in a dish" models as well as screens to monitor specific cardiac phenotypes such as arrhythmia and cardiac toxicity. Lectures will also cover the methodology to drive differentiation of iPSCs toward cardiac lineages and the development of cardiac reporter lines that will be useful for screening applications.

BioTech 55 Engineering with CRISPR, TALENs, and ZFNs

November 2-6, 2015

Gene engineering provides the ability to manipulate gene expression in a desired cell type. In order to realize the full potential of stem cells, the development of tools to modify targeted genes is paramount. This course will provide an overview of three different engineering platforms including CRISPR, TALENs, and ZFNs. The first part of the course will cover the general principles of each of these technologies including design and assembly along with the platforms available and different costs associated with each of them. The second part of the course will transition into different applications including engineering in mice, disease modeling, generating iPSC reporter lines, and high throughput approaches.

BioTech 56 RNA Seq

August 3-7, 2015
November 16-20, 2015

RNA-seq or RNA sequencing is a new technology that utilizes the latest in next-generation sequencing approaches to obtain information about the presence/absence as well as the quantity of transcribed RNA (mRNA, rRNA, tRNA, or miRNA). Soon RNA-seq will be transplanting microarrays as the go-to procedure for analyzing the transcriptome of any genome. In this workshop, we will provide hands-on experience with RNA-seq - from the bench to the post-sequencing data acquisition (Illumina NextSeq) and analysis using the latest bioinformatics approaches. With a team of researchers from the NIH, area academic institutions and Illumina, we will cover examples of methodological approaches and applications of RNA-seq analysis to a variety of basic science and clinical biomedical research problems.

BioTech 57 Selected Topics in Cell and Molecular Biology

May 16-21, 2016

The goal of this six-day lecture/laboratory course is to provide graduate-level instruction on molecular and cellular biosciences. The course focuses on critical thinking and problem solving, using a collection of approaches and emphasizing how fundamental, highly-significant biological problems are solved. Focusing on four very distinct areas: stem cells, tissue culture, immunology, and proteomics and informatics, participants will obtain a firm foundation of the theoretical information while enhancing their laboratory aptitude.

BioTech 58 Transgenic Technology – Newly Redesigned!

See website for detailed description and topics covered.

January 11-15, 2016

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Who Should Attend

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At FAES, we understand that many scientific professionals, while extremely prepared in their scientific disciplines, may have had little or no experience managing labs and people. We also understand that scientists work within a strictly logical and systematic framework, and preparation to become a laboratory manager is oftentimes neglected in scientific training programs.

Therefore, FAES Training offers workshops to bridge the gap between science and business. Our workshops focus on helping scientists improve their emotional intelligence and interpersonal skills.

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- Management vs. Leadership
- Employment Law Compliance for New Managers
- How-To Effectively Interview & Select Staff
- Employee Relations 101 (How-to coach, counsel, discipline and document employee behavior)

Day II: MAKING THE TRANSITION FROM INDIVIDUAL CONTRIBUTOR TO MANAGER

- Core Functions of Management
- Strategies for Effective Teamwork (effective delegation, conflict resolution, communication skills, and creative problem solving)

Day III: SELF-MANAGEMENT & PERSONAL MASTERY

- Introduction to Emotional Intelligence
- Managing Interpersonal Relationships
- Team Personality Assessment: MBTI

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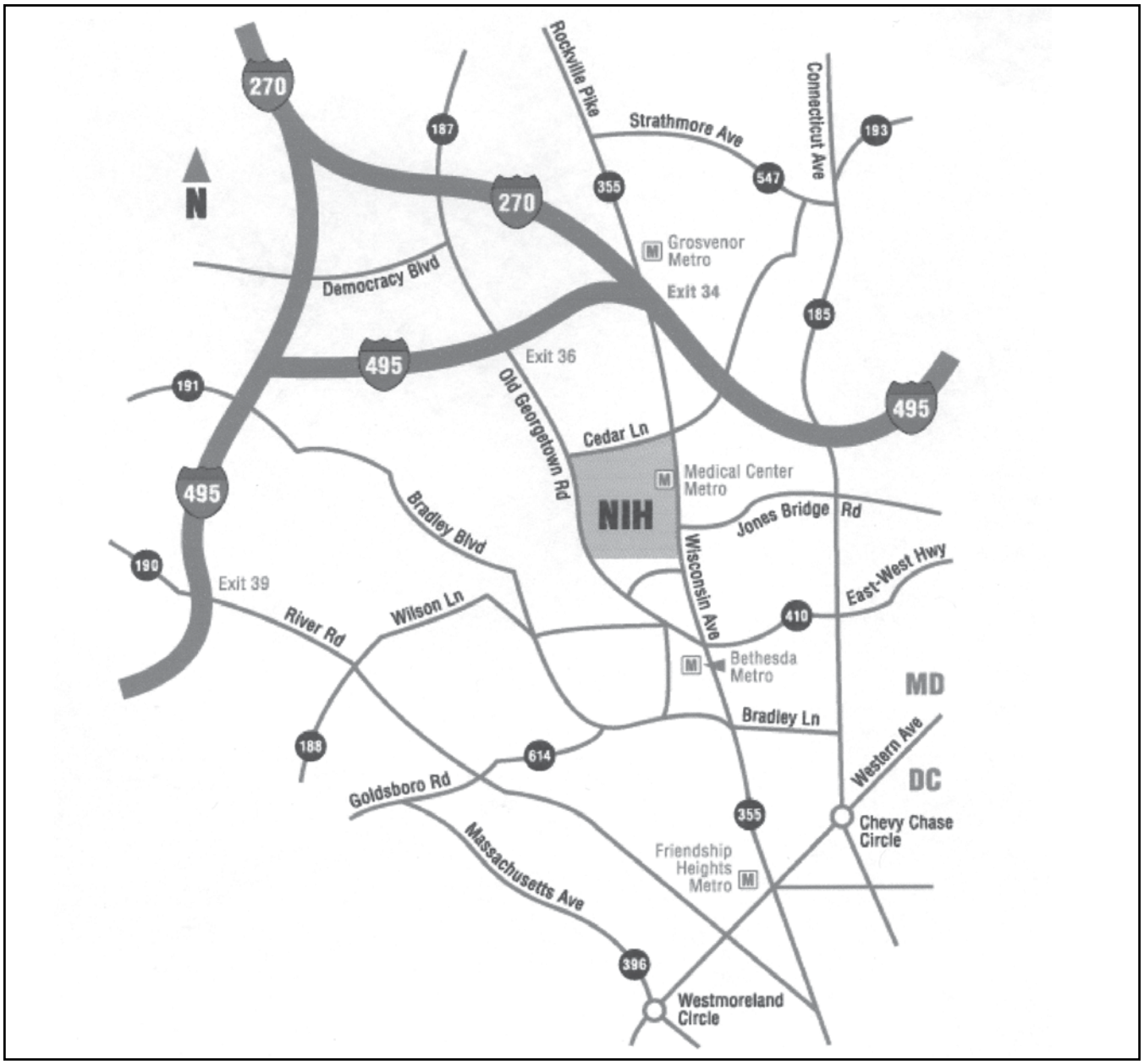
DIRECTIONS TO THE NIH MAIN CAMPUS

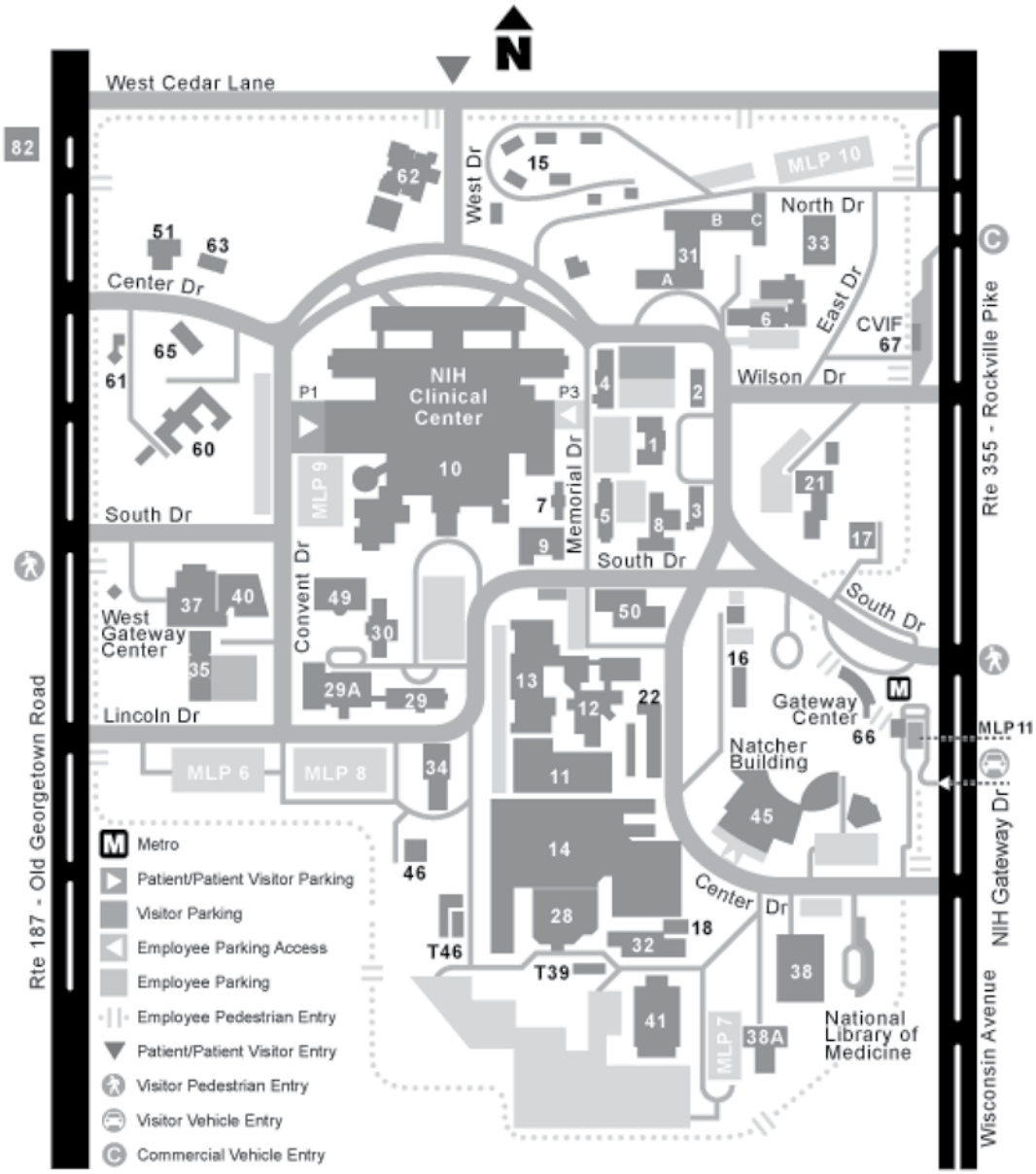
(9000 Rockville Pike, Bethesda, MD 20892)

From the Capital Beltway in Northern Virginia or Maryland:

- Take the Beltway (495) Westbound (Outer Loop) or Northbound (Inner Loop)
- Take exit 36 to Old Georgetown Road, South
- Turn left onto W Cedar Lane
- Yield right onto Rockville Pike
- Follow signs to the Main Visitor's entrance is on the right



NIH VISITOR'S MAP



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National Institutes of Health
9000 Rockville Pike
Bethesda, MD 20892

Main Entrance:
NIH Gateway Drive
Rockville Pike & NIH Gateway Drive

NIH Gateway Center

Vehicle Inspection:
5am – 10pm, Monday-Friday
After 10pm on weekdays, all day weekends and holidays, all visitor (patients, commercial, non-commercial) vehicles, motorcycles and bicycles must enter campus at the CVIF

Pedestrians:
24 hours, 7 days a week
West Gateway Center (Pedestrians Only)
Near Old Georgetown Rd & South Dr
6am - 12pm Monday - Friday

To learn more about visitor and security issues at the NIH, visit:
http://www.nih.gov/about/visitor/index.htm.

For questions about campus access, please contact the ORS Information Line at
orsinfo@mail.nih.gov
or
301-594-6677, TTY - 301-435-1908.

NIH VISITOR'S MAP WITH PERIMETER SECURITY

Information for Patients and Visitors to the National Institutes of Health

Street Address:
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Welcome to the NIH. Please take the time to read this bulletin. It contains important parking and security information you need when visiting the NIH campus.

General Visitor Parking Information:

Visitors (*other than patients*) parking at the ***Gateway Parking Garage (MLP-11)*** and in designated visitor parking lot:

Monday — Friday, 7am – 7pm: $2.00 per hour for the first three hours $12.00 for the entire day

Metered parking lots: Monday — Friday, 7am – 7pm $2 per hour

The NIH has implemented security measures to help ensure the safety of our patients, employees, guests and facilities. All visitors must enter through the NIH Gateway Center at Metro or the West Gateway Visitor Center. You will be asked to submit to a vehicle or personal inspection.

Visitors over 15 years of age must provide a form of government-issued ID such as a driver's license or passport. Visitors under 16 years of age must be accompanied by an adult.

Vehicle Inspections – All vehicles and their contents will be inspected upon entering the campus. Additionally, all vehicles entering certain parking areas will be inspected, regardless of any prior inspection. Drivers will be required to present their driver's license and may be asked to open the trunk and hood. If you are physically unable to perform this function, please inform the inspector and they will assist you.

Vehicle inspection may consist of any combination of the following: Detection Dogs Teams (K-9), Electronic Detection Devices and Manual Inspection.

After inspection, you will be issued a vehicle inspection pass. It must be displayed on your vehicle's dashboard while you are on campus. The inspection pass is not a "parking permit." It only grants your vehicle access to enter the campus. You can only park in designated parking areas. (See campus map.)

Personal Inspections – All visitors should be prepared to submit to a personal inspection prior to entering the campus. These inspections may be conducted with a handheld monitoring device, a metal detector and by visible inspection. Additionally, your personal belongings may be inspected and passed through an x-ray machine.

Firearms, explosives, archery equipment, dangerous weapons, knives with blades over 2 1/2 inches, alcoholic beverages and open containers of alcohol are examples of prohibited items on the NIH campus.

Visitor passes must be prominently displayed at all times while on the NIH campus.

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