Course Approval Form

For approval of new courses and deletions or modifications to an existing course.

registrar.gmu.edu/facultystaff/curriculum

Action Requested:

- [X] Create new course
- [ ] Inactivate existing course
- [ ] Modify existing course (check all that apply)
  - [ ] Title
  - [ ] Credits
  - [ ] Repeat Status
  - [ ] Grade Type
  - [ ] Prereq/coreq
  - [ ] Schedule Type
  - [ ] Restrictions
  - [ ] Other:

Course Level:

- [ ] Undergraduate
- [X] Graduate

College/School: College of Science
Department: School of Systems Biology
Submitted by: Diane St. Germain
Ext: 3-4263
Email: dstgerma@gmu.edu

Subject Code: BIOL
Number: 562
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term:

- [X] Fall
- [ ] Spring
- [ ] Summer

Year 2014

Title:
Current
Banner (30 characters max including spaces)
New: Personalized Medicine

Credits: (check one)

- [X] Fixed — or 3
- [ ] Variable — to

Repeat Status: (check one)

- [X] Not Repeatable (NR)
- [ ] Repeatable within degree (RD)
- [ ] Repeatable within term (RT)

Maximum credits allowed: 3

Grade Mode: (check one)

- [X] Regular (A, B, C, etc.)
- [ ] Satisfactory/No Credit
- [ ] Special (A, B C, etc. +IP)

Schedule Type: (check one) LEC can include LAB or RCT

- [X] Lecture (LEC)
- [ ] Lab (LAB)
- [ ] Recitation (RCT)
- [ ] Internship (INT)
- [ ] Independent Study (IND)
- [ ] Seminar (SEM)
- [ ] Studio (STU)

Prerequisite(s):
Advanced undergraduate coursework in Genetics and Molecular Cell Biology

Corequisite(s):
None

Instructional Mode:

- [X] 100% face-to-face
- [ ] Hybrid: ≤ 50% electronically delivered
- [ ] 100% electronically delivered

Restrictions Enforced by System: Major, College, Degree, Program, etc. Include Code.

Are there equivalent course(s)?

- [ ] Yes
- [X] No

If yes, please list

Catalog Copy for NEW Courses Only (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)
Please see attached for course description and syllabus	Justification – The course has been offered for the past 4 years in alternate spring terms as an elective for both BIOL and BIOS. Non-degree students are able to register also. Liotta and Petricoin share instructor FTEs for the course.

Indicate number of contact hours: Hours of Lecture or Seminar per week: 3 Hours of Lab or Studio: 0

When Offered: (check all that apply) [ ] Fall [ ] Summer [X] Spring

Approval Signatures

Department Approval Date

College/School Approval Date

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

For Graduate Courses Only

Graduate Council Member

Provost Office

Graduate Council Approval Date

For Registrar Office's Use Only: Banner_____Catalog_____

revised 11/8/11

Course Proposal Submitted to the Curriculum Committee of the College of Science

1. COURSE NUMBER AND TITLE:
BIOL 562 Personalized Medicine

Course Prerequisites:
BIOL 213 and 311, 482 or equivalent; or Permission of Instructor

Catalog Description:

This course covers basic principles of molecular medicine, including the definition and the need for individualized diagnostics and therapeutics. Students will study the application of proteomics, genomics and bioinformatics as they relate to individualized therapy, and review the major advances in these fields which have relevance to molecular medicine of the future.

2. COURSE JUSTIFICATION: The course has been offered for the past 4 years in alternate spring terms as an elective for both graduate level BIOL and BIOS students. Non-degree students are able to register also. Liotta and Petricoin share instructor FTEs for the course.

Course Objectives:
1. Understand the basic principles of molecular medicine
2. Understand the need for individualized diagnostics and therapeutics for patient-tailored medicine in terms of immune response, modulation of host factors, and systemic alterations.
3. Understand strategies for the treatment of different types of cancer in humans using applications of proteomics, genomics and bioinformatics to individualized therapy.
4. Learn how to comprehend, analyze and efficiently communicate research findings through PubMed article presentations and group discussions.

Course Necessity:
New elective course for Biology and Biosciences graduate students interested in Proteomics/Molecular Medicine

Course Relationship to Existing Programs:

Currently taught as BIOL 691 topics and used as elective for MS BIOL and PHD BIOS programs

Course Relationship to Existing Courses:
To be offered as an elective choice for students interested in Molecular concentrations in both MS and PhD programs. Currently no similar courses are offered at Mason.

3. APPROVAL HISTORY: none

4. SCHEDULING AND PROPOSED INSTRUCTORS:

Semester of Initial Offering: Spring 2010

Proposed Instructors: Lance Liotta and Emanuel (Chip) Petricoin, CAPMM faculty

5. TENTATIVE SYLLABUS: See attached.

Course Syllabus

BIOL 691 – Personalized Medicine

Instructors: Professor Lance Liotta MD PhD
Professor Emanuel Petricoin PhD

Office Hours:
- By appointment (Contact Ms. Peggy Hackett phackett@gmu.edu)
- Mondays 2-4 pm

Required Textbook: *Molecular Profiling, Methods and Protocols, (Methods in Molecular Biology)* Humana Press ISSN 1064-3745; e- ISSN 1940-6029

Week by week description of the course:

Week 1 - Instructor Petricoin
Course Introduction
Introduction to cellular proteomics and individualized therapy: Review of the major advances in these fields which have relevance to molecular medicine of the future.
Readings
Dietel M. and Sers C. Personalized Medicine a Review: Virchow Arch 2006, 448: 744-755.
Christofori G. New signals from the invasive front. Nature: 441, 2006 p444-450
Maitland M and Schilsky R. Clinical Trials in the Era of Personalized Oncology CA Cancer J Clin. 2011 Nov-Dec;61(6):365-81
Wulfkuhle et al: Technology Insight: pharmacoproteomics for cancer- promises of patient-tailored medicine using protein microarrays. Nat Clin Pract Oncol. 2006 May;3(5):256-68.

Week 2 - Instructor Liotta
Introduction Cancer Biology. Review of cancer medicine and the basics of cancer molecular biology and cancer metastasis. Discussion of basic principles of molecular medicine, including the definition and the need for individualized diagnostics and therapeutics. Application of proteomics, genomics and bioinformatics to individualized therapy.
Readings to accompany this session and to serve as a general foundation for the course:
Devita Principles and Practice of Oncology 2011
Chapter 2.
Loberg. R. et al The Lethal Phenotype of Cancer: The Molecular Basis of Death Due to Malignancy. CA Cancer J Clin. 2007;57:225-241

Week 3 - Instructor Petricoin
Introduction to Biomarkers. Review of protein and gene biomarkers for early diagnosis, prognosis, and individualized therapy
Introduction to genetics and genomics. Application of genetics and genomics to the prediction of disease.
Your readings should focus on:
Kaiser J. Its all about Me. Science 2007, 318 p1843
Breakthrough of the Year: Human Genetic Variation. Science, 2007, 318: 1842-1843

Week 4 - Guest Professor Alessandra Luchini
Nanotechnology
Introduction to the definitions and principles of nanotechnology. Microfabrication nanomachines, nanofluidics, application of nanotechnology to personalized therapy and the future of molecular medicine.
Your reading should focus on:

Craighead H. Future lab on a chip technologies. Nature 2006: 442: 387-393
Nanoparticle technology: addressing the fundamental roadblocks to protein biomarker discovery.Luchini A, Fredolini C, Espina BH, Meani F, Reeder A, Rucker S, Petricoin EF 3rd, Liotta LA.. Curr Mol Med. 2010 Mar;10(2):133-41.

Mid Term TAKE HOME Monday 2/20/12-2/23/12

Week 5 - Guest Professor Virginia Espina
Clinical chemistry and clinical pathology. Review of tissue and blood clinical chemistry principles. specimen collection, fixation, histologic examination and scoring, sources of bias in clinical research trials, definition of sensitivity, Laser Capture Microdissection, definition of precision and accuracy in clinical assays.
Your reading should focus on:
Laser Capture Microdissection: Arcturus XT infrared capture and UV cutting methods.
Gallagher RI, Blakely SR, Liotta LA, Espina V.
Methods Mol Biol. 2012;823:157-78.

Week 6 - Guest Professor Mariaelena Pierobon
Epidemiology Principles and Practice. Principles of epidemiology. Applications of epidemiology tools to bench to bedside translational research. Transformation of medicine by epidemiologic sciences. Reading assignments to be provided.

Week 7- SPRING BREAK

Week 8 - Guest Professor Paul Russo
Mass Spectrometry applied to biomarker discovery. Principles of mass spectrometry. Differences between MALDI and ES. Introduction to ETD. and MRM. Software and bioinformatics tools for scoring and identification of candidate protein sequences. Post translational modifications in proteins. Application of Mass Spectrometry to the discovery of biomarkers for human disease. Blood biomarkers. Bottom up versus Top down approach. Discovery versus validation. Correct design of a discovery and validation trial. Examples of recent findings related to cancer diagnosis.
Your reading should focus on:
Domon B. and Aebersold R. Mass Spectrometry and Protein Analysis. Science 2006, 312, 212-217.

Week 9 - Instructor Liotta
Next generation multiplex Assay Technology for Proteins. Immunoassay principles. Antibody validation, Protein arrays, Particle and bead assays, Biosensors, Plasmon Resonance, Flow Cytometry. Examples of applications to cancer diagnostics.
Your reading should focus on:
Garland SM, Smith JS. Human papillomavirus vaccines: current status and future prospects.Drugs. 2010 Jun 18;70(9):1079-98.
Ng AH, Uddayasankar U, Wheeler AR. Immunoassays in microfluidic systems.
Anal Bioanal Chem. 2010 Jun;397(3):99

Week 10 - Guest Professor Kirsten Edmiston
Breast Cancer Case Histories for Personalized Medicine
Breast cancer diagnosis and therapy principles. Recent advances in the field of individualized therapy applied to breast cancer. Future vision
Your reading should focus on:
Smith DR, Quinlan AR, Peckham HE, Makowsky K, Tao W, et al (2008) Rapid whole-genome mutational profiling using next-generation sequencing technologies. Genome Res 18: 1638-1642.

Week 11 - Guest Professor Claudius Mueller

Tyrosine Kinases, Phosphatases, and Nitric Oxide: Role in health and disease. Basic enzymatic principles, role in cell biology and diseases, therapeutic strategies, and relevance to individualized therapy
Your reading should focus on: To be distributed
Project Class Presentations begin

Week 12 - Project Class Presentations

Week 13 - Project Class Presentations

Week 14- Project Class Presentations

Week 15 - Project Class Presentations

Week 16 - TAKE HOME Exam Period Wed May 9- Wed May 16 (your class- Monday May 13, 2012)

Additional references and project topic ideas will be provided during the course discussions.

Grades will be based on:
Mid Term Exam: 33%
Final Exam: 33%
Project Presentation: 34%

Fundamental questions and learning objectives about molecular diagnostics, therapeutics, and individualized therapy that one should address during this course:
1. What is the current and future role of molecular diagnostics in medicine?
2. What is the definition of individualized therapy and what are the implications for medical care and the biotechnology community?
3. How is cancer diagnosed and treated today? How is this envisioned to change in the future?
4. How do nucleic acids and proteins differ in their functional role in disease pathogenesis?
5. What are the current tools for measuring disease biomarkers? What are the challenges and limitations of conventional measurement technologies?
6. What is a clinical research trial? Explain the requirements for biomarker clinical validation.
7. Explain how a diagnostic marker result can be used to select from a panel of candidate therapies for an individual patient.
8. Provide real world case studies for the application of individualized therapy to human disease.

University Policies

Plagiarism:
Plagiarism is the presentation of someone else's ideas or work as one's own. Students must give credit for any information that is not either the result of original research or common knowledge. If a student borrows ideas or information from another author, he/she must acknowledge the author in the body of the text and on the reference page. Students found plagiarizing are subject to the penalties outlined in the Policies and Procedures section of the University Catalog, which include a hearing by the Honor Code Committee and may include a failing grade for the work in question or for the entire course. The following website provides helpful information concerning plagiarism for both students and faculty:
http://oai.gmu.edu/honor-code/

Honor Code:
- George Mason University has an Honor Code, which requires all members of this community to maintain the highest standards of academic honesty and integrity. Cheating, plagiarism, lying, and stealing are all prohibited
- All violations of the Honor Code will be reported to the Honor Committee.
- See http://oai.gmu.edu/honor-code/ for more detailed information.

Enrollment:

- Students are responsible for verifying their enrollment in this class.
- Schedule adjustments should be made by the deadline published on the Registrar's website.
- Note the add/drop dates in the Academic Calendar published on the Registrar's website.
- After the last day to drop a class, withdrawing from this class requires the approval of the dean and is only allowed for nonacademic reasons.
- Undergraduate students may choose to exercise a selective withdrawal.
- See http://registrar.gmu.edu for selective withdrawal procedures.

Ethics:
Ethical behavior in the classroom is required of every student. The course will identify ethical policies and practices relevant to course topics.

Technology:
Students are expected to be competent in using current technology appropriate for this discipline. Such technology may include presentation software. Students are required to become familiar with Mason's Responsible Use of Computing Policy #1301 http://copyright.gmu.edu/?page_id=301

Diversity:
Learning to work with and value diversity is essential in every class. Students are expected to exhibit an appreciation for multinational and gender diversity in the classroom.

Civility:
As a diverse community of learners, students must strive to work together in a setting of civility, tolerance, and respect for each other and for the instructor. Rules of classroom behavior (which apply to online as well as onsite courses) include but are not limited to the following:

- Conflicting opinions among members of a class are to be respected and responded to in a professional manner.
- Side conversations or other distracting behaviors including cell phone use or non-class online access are not to be engaged in during lectures, class discussions or presentations
- There are to be no offensive comments, language or gestures

Students not complying will be asked to cease immediately or leave the class session.

Students with Disabilities:
If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703.993.2474. All academic accommodations must be arranged through that office.