## 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)

**Course Level:**
- [x] Graduate

<table>
<thead>
<tr>
<th>College/School:</th>
<th>College of Science</th>
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<tr>
<td>Submitted by:</td>
<td>Diane St. Germain</td>
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<table>
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<tr>
<th>Department:</th>
<th>School of Systems Biology</th>
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<tbody>
<tr>
<td>Ext:</td>
<td>3-4263</td>
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<tr>
<td>Email:</td>
<td><a href="mailto:dstgerma@gmu.edu">dstgerma@gmu.edu</a></td>
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<tr>
<th>Subject Code:</th>
<th>BIOL</th>
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<td>Number:</td>
<td>562</td>
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**Effective Term:**
- [x] Fall
- [ ] Spring
- [ ] Summer
- Year: 2014

**Title:**
- New: Personalized Medicine

**Credits:**
- [x] Fixed
- [ ] Variable
- [ ] Repeat Status: Not Repeatable (NR)
- [ ] Repeatable within degree (RD)
- [ ] Repeatable within term (RT)
- Maximum credits allowed: 3

**Grade Mode:**
- [x] Regular (A, B, C, etc.)
- [ ] Satisfactory/No Credit
- [ ] Special (A, B C, etc. +IP)

**Schedule Type:**
- [ ] 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

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

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

### Description
(No more than 60 words, use verb phrases and present tense)

Please see attached for course description and syllabus

**Notes**
(List additional information for the course)

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:

<table>
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<tr>
<th>When Offered: (check all that apply)</th>
<th>Hours of Lecture or Seminar per week:</th>
<th>Hours of Lab or Studio:</th>
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<tr>
<td>Fall</td>
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<tr>
<td>Summer</td>
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<td>[x] Spring</td>
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**Approval Signatures**

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<tr>
<th>Department Approval</th>
<th>Date</th>
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<th>College/School Approval</th>
<th>Date</th>
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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.

<table>
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<tr>
<th>Unit Name</th>
<th>Unit Approval Name</th>
<th>Unit Approver’s Signature</th>
<th>Date</th>
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**For Graduate Courses Only**

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<th>Graduate Council Member</th>
<th>Provost Office</th>
<th>Graduate Council Approval Date</th>
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*For Registrar Office’s Use Only: Banner ____________________________ Catalog ____________________________ revised 11/8/11*
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

**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.

**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

**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:

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.

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
Examples of recent findings related to cancer diagnosis.
Your reading should focus on:

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:
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:

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.

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.