BIOS-691
Instructors: Professor Lance Liotta MD PhD
Professor Emanuel Petricoin PhD

Mondays: 4:30-7:10 PM, Prince William Campus, Bun Run Hall, Rm. 253

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- Monday 1/23/12 - 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- Monday 1/30/12 - 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- Monday 2/6/12 - 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- Monday 2/13/12 - 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- Monday 2/27/12 - 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.  

Week 6- Monday 3/5/12 - 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 –March 12- March 18

Week 8- Monday 3/19/12 - Guest Professor Paul Russo


Your reading should focus on:


Week 9- Monday 3/26/12- 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:


**Week 10- Monday 4/2/12 - 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- Monday 4/9/26- 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- 16 April**

Project Class Presentations

**Week 13- 23 April**

Project Class Presentations

**Week 14- 30 April**

Project Class Presentations
Week 15- 7 May
Project Class Presentations

Week 16- 14 May

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.