

## Introduction to Precision Medicine – Spring 2018

The two-semester *Introduction to Precision Medicine* course is offered every year as an elective that confers 3.0 credits/semester for students wishing to pursue the MD-MSci degree with a Precision Medicine focus and for other medical and health sciences students/scholars who wish to take the course for credit. This syllabus covers first semester of the course.

### COURSE SYLLABUS

<b>Title:</b>	Introduction to Precision Medicine
<b>Number:</b>	M7208 (section 001, 20181RSRH7208M001, call number 21146) – for medical students M7208 (section 002, 20181RSRH7208M002, call number 80279) – for all other students/scholars
<b>School:</b>	College of Physicians and Surgeons
<b>Offered:</b>	Spring semester (14 weeks, 2 hours per session)
<b>Eligible Students:</b>	All CUMC/CU/NYP students, scholars and employees
<b>Class Size:</b>	30 students (15 P&S, 15 from other schools/departments)
<b>Time/Day/Location:</b>	4:00-6:00 pm, Thursday (5-7 pm on Feb 1, Mar 22, Apr 26, and May 10, 2018) Roy and Diana Vagelos Education Center (104 Haven Ave, New York, NY 10032) Room PH-10-405 (Room 405, 10th Fl., Presbyterian Hospital Building, 622 W 168th St.) – student presentation sessions
<b>Cost to student:</b>	No extra cost to medical students
<b>Credits:</b>	3.0

Credit	Hours Teaching and Learning for Week		Hours Teaching and Learning for Semester	
	In Class	Outside of Class	In Class	Outside of Class
3	2	3	28	42

#### **INSTRUCTOR**

Wendy Chung, MD, PhD ([wkc15@cumc.columbia.edu](mailto:wkc15@cumc.columbia.edu)) - Course Director

#### **CO-INSTRUCTORS**

Krzysztof Kiryluk, MD

Ronald Wapner, MD

#### **TEACHING ASSISTANTS**

Alex Fedotov, PhD ([avf2117@cumc.columbia.edu](mailto:avf2117@cumc.columbia.edu))

Sophia Li Ferry ([ssl2133@cumc.columbia.edu](mailto:ssl2133@cumc.columbia.edu))

## **COURSE DESCRIPTION**

Precision Medicine is the right treatment for the right patient at the right time. Precision Medicine offers the opportunity to increase effectiveness of health care at reduced cost with improved outcomes, decreased adverse effects, and with greater patient satisfaction. Advances in genomics and information technology now make it possible to realize these goals by using more information about the individual patient to make more informed decisions. Precision medicine will use information from the individual patient in real time to stratify risk of disease iteratively over time and to identify the best methods to manage that risk. Dynamic reassessments of disease risk at regular intervals will be driven by our improved understanding of genetic and genomic data and real time assessment of progression from wellness to disease using advances in biomarkers to gauge a patient's health status. Performing genomic and biomarker tests on blood and tumors will stratify disease along molecular dimensions to provide more accurate prognostic information and targeted therapies with greater probability of success, lower probability of adverse reactions/toxicity, and increased cost efficiency and patient satisfaction.

This course provides health sciences students with an overview of precision medicine. The content of the course covers all aspects of precision medicine with an emphasis on genomic health. Students will learn the basics of molecular genetic basis of disease and molecular diagnostic methods to diagnose germline and somatic mutations and apply these strategies across a wide range of clinical conditions including diagnostic testing and health forecasting. The course will include detailed instruction on how to interpret genomic variation and how to effectively communicate this information to patients in ways that are effective, efficient, and that scale. The course will cover big data initiatives in systems biology and quantitative data analysis and how machine learning and digital health platforms are being applied to individual patient care. Finally, the course will address questions of clinical implementation, including measuring cost effectiveness, clinical utility and will address the ethical, legal, and social issues presented by precision medicine.

The course will be taught by the course directors and experts in specific clinical areas who will present their most up-to-date findings. Each session will comprise a didactic lecture, followed by an interactive breakout session in the format of a journal club. After each session, students will apply the knowledge gained in the lectures by participating in case studies and exercises that build on the topics presented. Students will complete a case study in precision medicine that will be presented at the conclusion of the course.

## **PREREQUISITES AND COURSE OVERLAP**

No prerequisites.

## **COURSE LEARNING OBJECTIVES**

By the end of the course, students will be able to:

1. Define precision medicine
2. Understand how to interpret a genome and genetic variants
3. Understand when and how to use genomic tests and biomarkers and interpret and apply the results in a wide range of clinical situations
4. Assess the impact of genomic testing and biomarkers on clinical outcome, medical utility, and cost effectiveness
5. Understand the practical barriers to clinical implementation of precision medicine and develop strategies to overcome the barriers to allow scalability in a medically responsible manner

## **REQUIRED TEXT**

No text book required; all required readings will be available on CANVAS (CourseWorks 2, <https://courseworks2.columbia.edu>).

## **ASSESSMENT AND GRADING POLICY**

This course is graded “Pass/Fail” (or letter grade, if requested, for non-medical students). Students who have 80% or more of the 100 possible points will receive a passing grade.

Possible points:

<b>Attendance and participation</b>	50 points
<b>Course Exercises</b>	20 points
<b>Case Study</b>	30 points

**Class Participation:** The course is designed as a learning lab. Students are expected to attend all lectures and class exercises, and engage in active class participation. Class participation points will be determined by: active interaction, readings completed prior to class coupled by thoughtful and critical analysis of class material.

**Course Exercises:** After each lecture, students will participate in an interactive breakout exercise/journal club that builds on the knowledge gained during the lecture. The completion of these exercises is required. Final outcomes will be evaluated.

**Case Study:** Students will be assigned to analyze a case study during the course. The students will submit a written and oral presentation at the end of the course. Detailed guidance concerning the requirements for the response will be provided.

## **COURSE REQUIREMENTS**

Students must complete all readings prior to each lecture, submit all assignments on time, attend every class session, and be active participants in all aspects of the course. Failure to meet any of these requirements will result in a reduction of points. If a student must miss a session, the instructor should be notified in advance of class.

## **SCHOOL POLICIES AND EXPECTATIONS**

Students and faculty have a shared commitment to the School’s mission, values and oath. <http://ps.columbia.edu/education/honor-code-policies/ps-guidelines-professionalism>

**Academic Integrity:** Students are required to adhere to the P&S Student Honor Code, available online at <http://ps.columbia.edu/education/honor-code-policies/ps-student-honor-code>.

**Disability Access:** In order to receive disability-related academic accommodations, students must first be registered with the Office of Disability Services (ODS). Students who have, or think they may have a disability are invited to contact ODS for a confidential discussion at 212.854.2388 (V) 212.854.2378 (TTY), or by email at [disability@columbia.edu](mailto:disability@columbia.edu). If you have already registered with ODS, please speak to your instructor to ensure that s/he has been notified of your recommended accommodations by Lillian Morales ([lm31@columbia.edu](mailto:lm31@columbia.edu)), the School’s liaison to the Office of Disability Services.

## COURSE SCHEDULE – Spring 2018

Date (Time)	Instructor	Title	Topic	Location
<b>January 18</b>	Wendy Chung, MD, PhD	Professor of Pediatrics and Medicine, CUMC	Introduction to Precision Medicine	VEC1403
<b>January 25</b>	Erin Heinzen- Cox, PhD	Assistant Professor of Pathology & Cell Biology, CUMC	Next-Generation Sequencing/Bioinformatics tools for genomics	VEC1403
<b>February 1 (5-7 pm)</b>	David Goldstein, PhD	Professor of Medical and Surgical Research, CUMC	Pharmacogenomics	VEC1403
<b>February 8</b>	Leslie Biesecker, MD/Wendy Chung, MD, PhD	Senior Investigator, NHGRI/Professor of Pediatrics and Medicine, CUMC	Seminar/Discussion session	Florence Irving Auditorium/ Room 117 (ICRC)
<b>February 15</b>	Ruth Ottman, PhD	Professor of Epidemiology, CUMC	Introduction to genetic epidemiology	VEC1403
<b>February 22</b>	Andrea Califano, PhD	Professor of Chemical Systems Biology, CUMC	Systems biology and cancer	VEC903
<b>March 1</b>	Anthony Sireci, MD	Assistant Professor of Pathology and Cell Biology, CUMC	Challenges of precision medicine: regulatory framework and health insurance issues	VEC1403
<b>March 8</b>	<i>No class</i>			
<b>March 15</b>	<i>No class</i>			
<b>March 22 (5-7 pm)</b>	Olena Mamykina, PhD	Assistant Professor of Biomedical Informatics, CUMC	Digital health tools and health self- management	VEC1403
<b>March 29</b>	Nicholas Tatonetti, PhD	Assistant Professor of Biomedical Informatics, CUMC	The electronic medical records and precision medicine	VEC1403
<b>April 5</b>	Elena Elkin, PhD	Associate Professor of Healthcare Policy and Research, Weill Cornell Medical College	Studying the economic impact of precision medicine	VEC1403
<b>April 12</b>	<i>No class</i>			
<b>April 19</b>	Ryan Demmer, PhD	Adjunct Assistant Professor of Epidemiology, CUMC	Human microbiome	VEC903
<b>April 26 (5-7 pm)</b>	Wendy Chung, MD, PhD	Professor of Pediatrics and Medicine, CUMC	Ethical, legal and social issues in precision medicine	VEC1403

<b>May 3</b>	<i>Student presentations</i>	PH-10-405
<b>May 10 (5-7 pm)</b>	<i>Student presentations</i>	PH-10-405

