

# Course Bulletin

<b>100005</b>	<b>Graduate Research</b>
Subject: CMDB	Catalog Nbr: 0298
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>100015</b>	<b>Graduate Research</b>
Subject: CMDB	Catalog Nbr: 0299
2020 SUMR	Primary Brent Cochran
brent.cochran@tufts.edu	
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>100025</b>	<b>Masters Degree Only</b>
Subject: CMDB	Catalog Nbr: 0402

<b>100047</b>	<b>PhD Degree Only</b>
Subject: CMDB	Catalog Nbr: 0403
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.	

<b>100060</b>	<b>PhD Degree Only</b>
Subject: CMDB	Catalog Nbr: 0404
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.	

<b>100078</b>	<b>PhD Degree Only</b>
Subject: CMDB	Catalog Nbr: 0405
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.	

<b>102889</b>	<b>Membranes &amp; Trafficking</b>
---------------	------------------------------------

# Course Bulletin

Subject:	Catalog Nbr:			
ISP	209A			
2019 FALL	Primary	Michael Forgac		michael.forgac@tufts.edu
2019 FALL	Secondary	Garabed Sahagian		gary.sahagian@tufts.edu
2019 FALL	Secondary	John Castellot		john.castellot@tufts.edu
2019 FALL	Secondary	Ralph Isberg		ralph.isberg@tufts.edu
2019 FALL	Secondary	Peter Juo		Peter.Juo@tufts.edu
2019 FALL	Secondary	Gerard Reijmers		Leon.Reijmers@tufts.edu
2019 FALL	Secondary	Jamie Maguire		Jamie.Maguire@tufts.edu
2019 FALL	Secondary	Christopher Dulla		Chris.Dulla@tufts.edu
2019 FALL	Secondary	Alan Kopin		alan.kopin@tufts.edu
2019 FALL	Secondary	Karl Munger		Karl.Munger@tufts.edu
2019 FALL	Secondary	Malavika Raman		Malavika.Raman@tufts.edu
This course provides a thorough survey of major topics in cell biology, including membrane structure and function; transport systems, ion channels, and membrane excitability; protein trafficking and organelle biogenesis.				

<b>102982</b>	<b>Cell &amp; Molecular Genetics</b>			
Subject:	Catalog Nbr:			
ISP	210A			
2020 Fall	Primary	Brent Cochran		brent.cochran@tufts.edu
This course covers molecular genetics and basic concepts in developmental biology.				

<b>103003</b>	<b>Molecular Cell Biology of Development</b>			
Subject:	Catalog Nbr:			
ISP	210B			
2020 SPRG	Primary	Victor Hatini		Victor.Hatini@tufts.edu
2020 SPRG	Secondary	Larry Feig		larry.feig@tufts.edu
2020 SPRG	Secondary	James Schwob		jim.schwob@tufts.edu
2020 SPRG	Secondary	Charlotte Kuperwasser		Charlotte.Kuperwasser@tufts.edu
2020 SPRG	Secondary	Li Zeng		Li.Zeng@tufts.edu
2020 SPRG	Secondary	Gordon Huggins		Gordon.Huggins@tufts.edu
2020 SPRG	Secondary	Mary Wallingford		Mary.Wallingford@tufts.edu
This course introduces students to the basic cellular and molecular mechanisms involved in gametogenesis, fertilization, early embryonic development, pattern formation, and organogenesis. The course emphasizes how human disease often recapitulates development.				

<b>104392</b>	<b>Qualifying Exam</b>			
Subject:	Catalog Nbr:			
CTS	0000			
Students present and defend a proposal for research consisting of a statement of an original research problem				

# Course Bulletin

in which a scientific question is asked and the experimental approach to answering the question is explained in a written proposal. The proposal is presented orally to the faculty.

<b>104467</b>	<b>PhD Degree Only</b>			
Subject:	Catalog Nbr:			
CTS	0404			
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.				

<b>104503</b>	<b>Study Design Seminar</b>			
Subject:	Catalog Nbr:			
CTS	0500			
	2020 Fall	Primary	David Kent	david.kent@tufts.edu
	2020 Fall	Primary	Karen Freund	Karen.Freund@tufts.edu
These seminars use proposed and ongoing research projects to explore issues in study design. The course provides investigators and trainees the opportunity to present a research-related problem they are encountering and engages students in a discussion of the approach to the problem and an appropriate plan of action.				

<b>104524</b>	<b>Translational &amp; Molecular Epidemiology</b>			
Subject:	Catalog Nbr:			
CTS	0501			
This course aims to address some of the main challenges of current translational research in the interface of epidemiology and molecular medicine.				

<b>104542</b>	<b>Bridging the Bench-To-Bedside Gap</b>			
Subject:	Catalog Nbr:			
CTS	0502			
This course seeks to diminish the "bench-to-bedside" gap by exposing clinical graduate students to basic science research. Students focus on major questions that are ready for future scientific investigation, how scientific discoveries have influenced clinical practice, and how clinical practice has affected basic research. Examination of active projects at Tufts Medical Center introduces students to translational science in action.				

<b>104602</b>	<b>Introduction to Biostatistical Methods I</b>			
Subject:	Catalog Nbr:			
CTS	0506			
	2020 SUMR	Primary	Sarah Pagni	Sarah.Pagni@tufts.edu
This course is the first half of a two-part course which presents the practical application of biostatistical				

# Course Bulletin

methods for exploring and analyzing health data. Methods for working with data and exploring basic associations are presented through case examples and clinical research projects. CTS 0506 and 0507 are considered equivalent to 0527.

<b>104617</b>	<b>Introduction To Biostatistics II</b>			
Subject:	Catalog Nbr:			
CTS	0507			
2020 Fall	Primary	Sarah Pagni		Sarah.Pagni@tufts.edu
<p>This course is the second half of a two-part course which presents the practical application of biostatistical methods for exploring and analyzing health data. Methods for working with data and exploring basic associations are presented through case examples and clinical research projects. CTS 0506 and 0507 are considered equivalent to 0527.</p>				

<b>104658</b>	<b>Predictive Models</b>			
Subject:	Catalog Nbr:			
CTS	0510			
2019 FALL	Primary	David Kent		david.kent@tufts.edu
2019 FALL	Secondary	Jason Nelson		Jason.Nelson@tufts.edu
<p>This course explores the use of statistical models to predict clinical outcomes for retrospective review and as prospective decision aids. Emphasis is placed on integrating statistical and clinical thinking to construct models that are both statistically and clinically sound and that give accurate predictions when generalized to other populations.</p>				

<b>104676</b>	<b>Machine Learning in Predictive Medicine</b>			
Subject:	Catalog Nbr:			
CTS	0511			
<p>This course introduces computer science students and clinicians to practical applications of machine learning to solving problems in clinical medicine through creation of collaborative research teams working on unsolved problems with a clinical researcher. The short-term goal is for each team to produce a report presented at the end of the course. The long-term goal is to build collaborative relationships and the advancement of interdisciplinary work between computer scientists and clinical researchers.</p>				

<b>104693</b>	<b>Comparative Effectiveness Research Survey</b>			
Subject:	Catalog Nbr:			
CTS	0512			
<p>The course describes the current state of CER and evidence-based medicine (EBM). The tools of this kind of work are defined including various forms of CER from clinical trials, registry and observational research, technology assessments, and evidence reports. Methodologies used are explained, for example effectiveness trials, decision analysis, cost-effectiveness analysis, systematic review, and meta-analysis.</p>				

# Course Bulletin

<b>104708</b>	<b>Clinical Research Project-Certificate Candidates</b>			
Subject: CTS	Catalog Nbr: 0514			
2020 SPRG	Primary	David Kent		david.kent@tufts.edu
2020 SPRG	Primary	Jessica Paulus		Jessica.Paulus@tufts.edu
<p>Students develop mentored research plans with mentors (or mentoring teams) that permits them to demonstrate these skills through the development of a protocol, a report, or research manuscript. The mentoring teams are required to have at least one member who is on the faculty of the GSBS CTS program. The project design is led by students, so they learn the role of principal investigator. This course is required for the Certificate Program, and is not available to non-certificate students.</p>				

<b>104768</b>	<b>Clinical Research Project/Thesis Research- First Year</b>			
Subject: CTS	Catalog Nbr: 0515			
<p>First year master's students begin to learn how to complete comprehensive independent clinical research project, which includes framing a research question and specific project aims, identifying useful data sources, developing appropriate methods, identifying and defending against sources of bias, implementing/managing a project, and writing up a thesis in the form of a publishable article or monograph.</p>				

<b>104826</b>	<b>Clinical Research Project/Thesis Research- Second Year</b>			
Subject: CTS	Catalog Nbr: 0516			
2020 SUMR	Primary	David Kent		david.kent@tufts.edu
<p>Second year master's students continue and complete their independent clinical research projects. Students gain additional skills in framing a research question and specific project aims, identifying useful data sources, developing appropriate methods, identifying and defending against sources of bias, implementing/managing the project, and writing up the thesis in the form of a publishable article or monograph.</p>				

<b>104881</b>	<b>Clinical Research Project/Thesis Research- PhD Candidates</b>			
Subject: CTS	Catalog Nbr: 0517			
2020 SUMR	Primary	David Kent		david.kent@tufts.edu
<p>PhD students complete comprehensive independent clinical research doctoral-level project, which includes framing a research question and specific project aims, identifying useful data sources, developing appropriate methods, identifying and defending against sources of bias, implementing/managing the project and writing up the thesis in the form of a publishable article and PhD thesis.</p>				

<b>104898</b>	<b>Advanced Thesis Research</b>			
Subject:	Catalog Nbr:			

# Course Bulletin

CTS	0518			
	2020 Fall	Primary	Karen Freund	Karen.Freund@tufts.edu
<p>The course is for students who do not complete their theses in the customary timeframe and wish to pursue further research. The Program Director, in consultation with the student's thesis committee and program mentor, determines the number of credits.</p>				

<b>104915</b>	<b>Concentration Practicum</b>			
	Subject:	Catalog Nbr:		
	CTS	0519		
	2019 FALL	Primary	Jessica Paulus	Jessica.Paulus@tufts.edu
	2019 FALL	Secondary	David Kent	david.kent@tufts.edu
<p>This course is an independent mentored experience for students interested in advanced study and skill development in a particular area. This course requires written approval of the Program Director in order to register.</p>				

<b>104952</b>	<b>Introduction to Clinical Epidemiology</b>			
	Subject:	Catalog Nbr:		
	CTS	0523		
	2020 Fall	Primary	Jessica Paulus	Jessica.Paulus@tufts.edu
	2020 Fall	Primary	Robert Goldberg	robert.goldberg@tufts.edu
	2020 Fall	Secondary	David Kent	david.kent@tufts.edu
<p>This course provides students with an overview of the epidemiologic approach to the study of disease causation, its natural history, and epidemiologic methods. This course reviews the application of various observational and experimental research designs and strategies utilized in clinical and epidemiological research. Didactic instruction, readings, and problem sets are used to create each module: investigation of disease outbreaks, sources of health information, observational studies, randomized clinical trials, measures of morbidity and mortality, sources of and controls for bias evaluation of diagnostic and screening tests, and development of surveillance studies.</p>				

<b>104969</b>	<b>Introduction to Clinical Care Research</b>			
	Subject:	Catalog Nbr:		
	CTS	0525		
	2019 SUMR	Secondary	Pei-Jung Lin	plin@tufts.edu
	2020 SUMR	Primary	David Kent	david.kent@tufts.edu
	2020 SUMR	Primary	Jessica Paulus	Jessica.Paulus@tufts.edu
	2020 SUMR	Primary	Robert Goldberg	robert.goldberg@tufts.edu
	2020 SUMR	Secondary	Angie Rodday	Angie.Rodday@tufts.edu
	2020 SUMR	Secondary	Lori Price	Lori.Price@tufts.edu
	2020 SUMR	Secondary	Jonathan Garlick	Jonathan.Garlick@tufts.edu
	2020 SUMR	Secondary	Karen Freund	Karen.Freund@tufts.edu
	2020 SUMR	Secondary	Robin Ruthazer	robin.ruthazer@tufts.edu
	2020 SUMR	Secondary	Thomas Concannon	Thomas.Concannon@tufts.edu

# Course Bulletin

2020 SUMR	Secondary	Raveedhara Bannuru	u Raveedhara.Bannuru@tufts.edu
2020 SUMR	Secondary	Gordon Huggins	Gordon.Huggins@tufts.edu
2020 SUMR	Secondary	Denise Daudelin	Denise.Daudelin@tufts.edu
2020 SUMR	Secondary	John Wong	john_b.wong@tufts.edu
2020 SUMR	Secondary	Andreas Klein	Andreas.Klein@tufts.edu
2020 SUMR	Secondary	James Chambers	James.Chambers@tufts.edu
2020 SUMR	Secondary	William Harvey	William.Harvey@tufts.edu
2020 SUMR	Secondary	Harmon Jordan	harmon.jordan@tufts.edu

This course, meeting three hours daily over a four-week summer session, teaches students how to formulate a clinical research hypothesis and to develop it into a clinical research project. Students acquire an understanding of basic and advanced principles of study design and issues in conducting biomedical research involving human subjects.

<b>104985</b>	<b>Biostatistics I</b>			
Subject:	Catalog Nbr:			
CTS	0527			
2019 FALL	Primary	Farzad Noubary	Farzad.Noubary@tufts.edu	
2020 Fall	Primary	Angie Rodday	Angie.Rodday@tufts.edu	
<p>This course introduces basic principles and applications of statistics to problems in clinical research. Topics covered include descriptive statistics, probability and random variation, sampling, hypothesis testing, proportions, measures of frequency, t-tests, chi-square tests, one-way analysis of variance, correlation, linear regression and nonparametric statistics.</p>				

<b>105046</b>	<b>Scientific Manuscript Writing</b>			
Subject:	Catalog Nbr:			
CTS	0537			
2020 Fall	Primary	Jessica Paulus	Jessica.Paulus@tufts.edu	
2020 Fall	Primary	Robert Goldberg	robert.goldberg@tufts.edu	
2020 SPRG	Primary	David Kent	david.kent@tufts.edu	
<p>This course focuses on principles of scientific manuscript writing. The student learns how to develop a manuscript by reviewing the specific issues of style, authorship and volume of information that should be incorporated into a research paper.</p>				

<b>105065</b>	<b>Scientific Grant Writing</b>			
Subject:	Catalog Nbr:			
CTS	0538			
2020 Fall	Primary	David Kent	david.kent@tufts.edu	
2020 Fall	Primary	Robert Goldberg	robert.goldberg@tufts.edu	
<p>The purpose of this course is to teach the principles of clinical research grant writing. Participants learn the importance of, and how to select, investigators and co-investigators as well as the identification of potential</p>				

# Course Bulletin

funding sources and other important aspects of grant writing.

<b>105102</b>	<b>Scientific Writing, Peer Review &amp; Presentations</b>			
Subject:	Catalog Nbr:			
CTS	0539			
2020 Fall	Primary	David Kent		david.kent@tufts.edu
2020 Fall	Secondary	Robert Goldberg		robert.goldberg@tufts.edu
Students focus on principals of scientific review and grant peer review. This involves critiquing manuscripts and reviewing research grants for mock study section meetings. Students are encouraged and given an opportunity to present their scientific writings and oral presentations for critique on an ongoing basis.				

<b>105120</b>	<b>Ethics of Clinical Investigation</b>			
Subject:	Catalog Nbr:			
CTS	0540			
2020 SPRG	Primary	Robert Sege		rsege01@tufts.edu
2020 SPRG	Secondary	Angie Rodday		Angie.Rodday@tufts.edu
2020 SPRG	Secondary	David Kent		david.kent@tufts.edu
The goal of this course is to increase awareness of research ethics and their practical applications by medical practitioners and researchers – specifically with regard to clinical investigations. The curriculum addresses the interrelationships between ethics, law and professional practice standards and explores the role and workings of Institutional Review Boards.				

<b>105158</b>	<b>Principles of Drug Development</b>			
Subject:	Catalog Nbr:			
CTS	0555			
2020 Fall	Primary	Kenneth Kaitin		Kenneth.Kaitin@tufts.edu
This course examines the important economic, political, legal and scientific issues that face academic clinical investigators who work in partnership with industry sponsors and government regulators to design and conduct clinical studies.				

<b>105251</b>	<b>Introduction To Clinical Trials</b>			
Subject:	Catalog Nbr:			
CTS	0561			
2019 FALL	Secondary	Paul Fuss		paul.fuss@tufts.edu
2020 Fall	Primary	Anastassios Pittas		anastassios.pittas@tufts.edu
2020 Fall	Secondary	Ellen Vickery		No Email on file.
This course considers the various problems and options available in the design and conduct of clinical trials, including classical efficacy trials and "effectiveness trials." Issues to be covered include ethics, experimental design, coordination and operations, database development, interim analysis, safety monitoring and analysis, and reporting.				



# Course Bulletin

<b>105271</b>	<b>Topics in Clinical Trials</b>			
Subject:	Catalog Nbr:			
CTS	0562			
This is a seminar course that explores special topics in clinical trials. Topics include internet-based clinical trials, N of 1 trials, trials in special populations and overseas, industry sponsored trials and multicenter trials.				

<b>105306</b>	<b>Introduction to Health Services Research</b>			
Subject:	Catalog Nbr:			
CTS	0566			
2020 SPRG	Primary	Karen Freund	Karen.Freund@tufts.edu	
2020 SPRG	Primary	Amy Almerico-LeClair	Amy.LeClair@tufts.edu	
2020 SPRG	Secondary	Pei-Jung Lin	plin@tufts.edu	
2020 SPRG	Secondary	Elena Byhoff	Elena.Byhoff@tufts.edu	
This course introduces students to the concepts and methods that distinguish health services and health policy research from other fields. Faculty cover major topics in health services/health policy research including outcomes research design and methods, health economics, pharmacoeconomics, access and payment for health services, healthcare quality and quality improvement.				

<b>105457</b>	<b>Introduction to Evidence Based-Medicine</b>			
Subject:	Catalog Nbr:			
CTS	0581			
2020 SPRG	Primary	Raveedhara Bannuru	Raveendhara.Bannuru@tufts.edu	
2020 SPRG	Primary	James Chambers	James.Chambers@tufts.edu	
This course covers the principles of systematic review processes, evaluation of studies and bodies of evidence as used in the conduct of systematic reviews, meta-analyses and the development of evidence-based clinical practice guidelines. The course focuses on studies of treatment efficacy.				

<b>105474</b>	<b>Genetic Epidemiology</b>			
Subject:	Catalog Nbr:			
CTS	0582			
This course is an introduction to the concepts and methodology of genetic epidemiology, including novel methods of molecular biology, quantitative genetics, study design for genetic traits, segregation analysis and linkage analysis.				

<b>105491</b>	<b>Introduction to Decision Analysis</b>			
Subject:	Catalog Nbr:			
CTS	0584			
This course is a working overview of the principles of decision analysis as applied to medicine, making optimal				

# Course Bulletin

choices in the face of uncertainty. Formal decision analysis has become a well-recognized and accepted research discipline for examining clinical options facing patients, physicians and policymakers.

<b>105533</b>	<b>Special Topics in Clinical and Translational Science</b>		
Subject:	Catalog Nbr:		
CTS	0593		
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.			

<b>105554</b>	<b>Special Topics in Clinical and Translational Science</b>		
Subject:	Catalog Nbr:		
CTS	0594		
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic. {COIRRECT CREDITS}			

<b>108388</b>	<b>Graduate Biochemistry</b>			
Subject:	Catalog Nbr:			
BCHM	0223			
2019 FALL	Primary	Alex Bohm	Andrew.Bohm@tufts.edu	
2019 FALL	Secondary	James Baleja	jim.baleja@tufts.edu	
2019 FALL	Secondary	Peter Bullock	peter.bullock@tufts.edu	
2019 FALL	Secondary	Brian Schaffhausen	brian.schaffhausen@tufts.edu	
2019 FALL	Secondary	William Bachovchin	william.bachovchin@tufts.edu	
2019 FALL	Secondary	Michael Forgac	michael.forgac@tufts.edu	
2019 FALL	Secondary	Albert Tai	albert.tai@tufts.edu	
2019 FALL	Secondary	Alexei Degterev	Alexei.Degterev@tufts.edu	
2019 FALL	Secondary	Marta Gaglia	Marta.Gaglia@tufts.edu	
This course provides a graduate-level discussion of the structure and function of biologically important molecules. Problems of protein and nucleic acid biochemistry are emphasized.				

<b>108410</b>	<b>Advanced Graduate Biochemistry</b>		
Subject:	Catalog Nbr:		
BCHM	0224		
Advanced Graduate Biochemistry is intended to allow students with strong biochemistry backgrounds to explore areas of biochemistry relevant to their interests in a more detailed way. It is offered in parallel with BCHM223 Graduate Biochemistry. It is intended for MD/PhD students who have taken Medical Foundations I and for PhD students coming to the Sackler School with a substantial background in biochemistry. PhD students are allowed to transfer to this course after the first BCHM223 examination if they meet the performance requirements set by the Course Director.			

# Course Bulletin

<b>108532</b>	<b>Biochemistry of Gene Expression &amp; Signal Transduction</b>				
Subject:	Catalog Nbr:				
BCHM	0230				
2020 SPRG	Primary	Amy Yee	amy.yee@tufts.edu		
2020 SPRG	Secondary	Kurtz Paulson	eric.paulson@tufts.edu		
2020 SPRG	Secondary	Larry Feig	larry.feig@tufts.edu		
2020 SPRG	Secondary	Brian Schaffhausen	brian.schaffhausen@tufts.edu		
2020 SPRG	Secondary	Brent Cochran	brent.cochran@tufts.edu		
2020 SPRG	Secondary	Marta Gaglia	Marta.Gaglia@tufts.edu		
2020 SPRG	Secondary	Karl Munger	Karl.Munger@tufts.edu		
2020 SPRG	Secondary	Christine Lary	Chrstitine.Duate@tufts.edu		
<p>This course covers the molecular mechanisms of gene expression and signal transduction. The fundamental mechanisms underlying transcription, RNA processing, translation, and DNA replication are highlighted, and the integration of these fundamental mechanisms into molecular and cellular regulation of proliferation and signal transduction is discussed. Current literature is emphasized.</p>					

<b>108657</b>	<b>Graduate Seminar</b>				
Subject:	Catalog Nbr:				
BCHM	0291				
2019 FALL	Primary	Brent Cochran	brent.cochran@tufts.edu		
<p>Visiting speakers from the Boston community and beyond present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.</p>					

<b>108697</b>	<b>Graduate Seminar</b>				
Subject:	Catalog Nbr:				
BCHM	0292				
2020 SPRG	Primary	Brent Cochran	brent.cochran@tufts.edu		
<p>Visiting speakers from the Boston community and beyond present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.</p>					

<b>108770</b>	<b>Journal Club</b>				
Subject:	Catalog Nbr:				
BCHM	0295				
<p>Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.</p>					

<b>108787</b>	<b>Journal Club</b>				
Subject:	Catalog Nbr:				
BCHM	0296				

# Course Bulletin

Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.

<b>108810</b>	<b>Graduate Research</b>
Subject: BCHM	Catalog Nbr: 0297
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>108837</b>	<b>Graduate Research</b>
Subject: BCHM	Catalog Nbr: 0298
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>108863</b>	<b>Graduate Research</b>
Subject: BCHM	Catalog Nbr: 0299
2019 SUMR	Primary Larry Feig
	<a href="mailto:larry.feig@tufts.edu">larry.feig@tufts.edu</a>
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>108885</b>	<b>Masters Degree Only</b>
Subject: BCHM	Catalog Nbr: 0402

<b>108909</b>	<b>PhD Degree Only</b>
Subject: BCHM	Catalog Nbr: 0403
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis	

<b>108938</b>	<b>PhD Degree Only</b>
Subject: BCHM	Catalog Nbr: 0404
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis	

# Course Bulletin

<b>108962</b>	<b>PhD Degree Only</b>			
Subject:	Catalog Nbr:			
BCHM	0405			
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis				

<b>109050</b>	<b>Biochemistry of Gene Expression</b>			
Subject:	Catalog Nbr:			
BCHM	230A			
2020 SPRG	Primary	Amy Yee	amy.yee@tufts.edu	
2020 SPRG	Secondary	Marta Gaglia	Marta.Gaglia@tufts.edu	
2020 SPRG	Secondary	Karl Munger	Karl.Munger@tufts.edu	
2020 SPRG	Secondary	Christine Lary	Chrstitine.Duate@tufts.edu	
The fundamental mechanisms underlying transcription, RNA processing, translation, and DNA replication are highlighted in this course. Current literature is emphasized. This course represents the first part of Biochemistry 230 and may be taken as a separate course.				

<b>109079</b>	<b>Biochemistry of Signal Transduction</b>			
Subject:	Catalog Nbr:			
BCHM	230B			
2020 SPRG	Primary	Amy Yee	amy.yee@tufts.edu	
2020 SPRG	Secondary	Kurtz Paulson	eric.paulson@tufts.edu	
2020 SPRG	Secondary	Larry Feig	larry.feig@tufts.edu	
2020 SPRG	Secondary	Brian Schaffhausen	brian.schaffhausen@tufts.edu	
2020 SPRG	Secondary	Brent Cochran	brent.cochran@tufts.edu	
2020 SPRG	Secondary	Karl Munger	Karl.Munger@tufts.edu	
The integration of fundamental mechanisms into molecular and cellular regulation of proliferation and signal transduction is discussed. Current literature is emphasized. This course represents the second part of Biochemistry 230 and may be taken as a separate course.				

<b>109102</b>	<b>Molecular Recognition in Biology</b>			
Subject:	Catalog Nbr:			
BCHM	231A			
2020 SPRG	Primary	Alex Bohm	Andrew.Bohm@tufts.edu	
This course builds on graduate biochemistry, providing detailed instruction on how to design and interpret binding experiments, how to visualize and analyze macromolecular structures, and how to apply these techniques in laboratory research.				

# Course Bulletin

<b>109123</b>	<b>Drug Design</b>
Subject: BCHM 2020 SPRG	Catalog Nbr: 231B Primary William Bachovchin william.bachovchin@tufts.edu
Survey and critical analysis of selected case histories of drug design, discovery, and development, including issues related to commercialization such as market size, patents, and licenses.	

<b>109312</b>	<b>Pathobiology</b>
Subject: CMP	Catalog Nbr: 0230 Primary Brent Cochran brent.cochran@tufts.edu
This is a discussion-based course that introduces graduate students to human disease, familiarizes them with pathological specimens and patients, provides examples of how scientific discovery and clinical practice have influenced each other, and uses clinical problems as a starting point for hypothesis-driven research.	

<b>109384</b>	<b>Graduate Seminar</b>
Subject: CMP 2019 FALL	Catalog Nbr: 0291 Primary Brent Cochran brent.cochran@tufts.edu
Visiting speakers from the Boston community and beyond present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.	

<b>109405</b>	<b>Graduate Seminar</b>
Subject: CMP 2020 SPRG	Catalog Nbr: 0292 Primary Brent Cochran brent.cochran@tufts.edu
Visiting speakers from the Boston community and beyond present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.	

<b>109497</b>	<b>Journal Club</b>
Subject: CMP	Catalog Nbr: 0295 Primary Brent Cochran brent.cochran@tufts.edu
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.	

<b>109519</b>	<b>Journal Club</b>
Subject: CMP	Catalog Nbr: 0296 Primary Brent Cochran brent.cochran@tufts.edu
Students select articles from the current literature, analyze their significance, and present them for discussion	

# Course Bulletin

in a seminar group.

<b>109541</b>	<b>Graduate Research</b>
Subject: CMP	Catalog Nbr: 0297
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>109568</b>	<b>Graduate Research</b>
Subject: CMP	Catalog Nbr: 0298
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>109587</b>	<b>Graduate Research</b>
Subject: CMP	Catalog Nbr: 0299
2019 SUMR	Primary Brent Cochran
brent.cochran@tufts.edu	
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>109603</b>	<b>Masters Degree Only</b>
Subject: CMP	Catalog Nbr: 0402

<b>109623</b>	<b>PhD Degree Only</b>
Subject: CMP	Catalog Nbr: 0403
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis	

<b>109641</b>	<b>PhD Degree Only</b>
Subject: CMP	Catalog Nbr: 0404
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.	

# Course Bulletin

<b>109661</b>	<b>PhD Degree Only</b>			
Subject:	Catalog Nbr:			
CMP	0405			
Students are enrolled in this course when they receive permission to write from their thesis committee, and represents the effort in the final preparation and writing of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis				

<b>110372</b>	<b>Qualifying Exam</b>			
Subject:	Catalog Nbr:			
CMDB	0000			
Students present and defend a proposal for research consisting of a statement of an original research problem in which a scientific question is asked and the experimental approach to answering the question is explained in a written proposal. The proposal is presented orally to the faculty.				

<b>110452</b>	<b>Medical Histology</b>			
Subject:	Catalog Nbr:			
CMDB	0203			
This elective Medical School course introduces the student to the organization of a variety of cells, tissues, and organ systems. The lectures present information on the relationships between structure and function (i.e., physiology, biochemistry, and development), while the laboratories involve tissue and organ identification, providing both a practical background in cell and tissue biology.				

<b>110619</b>	<b>Developmental Biology</b>			
Subject:	Catalog Nbr:			
CMDB	0235			
2020 Fall	Primary	Victor Hatini	Victor.Hatini@tufts.edu	
2020 Fall	Secondary	Charlotte Kuperwasser	Charlotte.Kuperwasser@tufts.edu	
2020 Fall	Secondary	Peter Juo	Peter.Juo@tufts.edu	
2020 Fall	Secondary	Pamela Yelick	Pamela.Yelick@tufts.edu	
This course introduces students to modern developmental biology with an emphasis on the cellular and molecular mechanisms involved. General topic areas include fertilization and early development, mechanisms of cell determination and differentiation, and cell-cell and cell-matrix interactions.				

<b>110876</b>	<b>Graduate Seminar</b>			
Subject:	Catalog Nbr:			
CMDB	0291			
2019 FALL	Primary	Brent Cochran	brent.cochran@tufts.edu	
2020 Fall	Primary	Malavika Raman	Malavika.Raman@tufts.edu	
Visiting speakers from the Boston community and beyond present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.				



# Course Bulletin

<b>110897</b>	<b>Graduate Seminar</b>			
Subject:	Catalog Nbr:			
CMDB	0292			
2020 SPRG	Primary	Brent Cochran		brent.cochran@tufts.edu
Visiting speakers from the Boston community and beyond present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.				

<b>110931</b>	<b>Journal Club</b>			
Subject:	Catalog Nbr:			
CMDB	0295			
2020 Fall	Primary	Alex Bohm		Andrew.Bohm@tufts.edu
2020 Fall	Primary	Heber Nielsen		heber.nielsen@tufts.edu
2020 Fall	Primary	Gordon Huggins		Gordon.Huggins@tufts.edu
Subject:	Catalog Nbr:			
CMDB	0295			
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group				

<b>110961</b>	<b>Journal Club</b>			
Subject:	Catalog Nbr:			
CMDB	0296			
2020 SPRG	Primary	Heber Nielsen		heber.nielsen@tufts.edu
2020 SPRG	Primary	Gordon Huggins		Gordon.Huggins@tufts.edu
Subject:	Catalog Nbr:			
CMDB	0296			
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group				

<b>110981</b>	<b>Graduate Research</b>			
Subject:	Catalog Nbr:			
CMDB	0297			
2020 Fall	Primary	Brent Cochran		brent.cochran@tufts.edu
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>120717</b>	<b>Probability and Statistics for Basic Sciences</b>			
Subject:	Catalog Nbr:			
ISP	0220			
This course provides an introduction to the principles of probability and statistics and emphasizes the				

# Course Bulletin

application of these disciplines to the analysis of basic science biomedical research data. Topics include: summarizing data, testing for differences between means, analysis of variance, laws of probability, common probability distributions, the analysis of categorical data, correlation, linear regression, nonlinear curve fitting, and exponential processes.

<b>120748</b>	<b>Laboratory Rotations</b>			
Subject: ISP	Catalog Nbr: 0234			
2020 Fall	Primary	Brent Cochran	brent.cochran@tufts.edu	
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories				

<b>120763</b>	<b>Laboratory Rotations</b>			
Subject: ISP	Catalog Nbr: 0235			
2020 SPRG	Primary	Brent Cochran	brent.cochran@tufts.edu	
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.				

<b>120784</b>	<b>Laboratory Rotations</b>			
Subject: ISP	Catalog Nbr: 0236			
2019 SUMR	Primary	Brent Cochran	brent.cochran@tufts.edu	
8-10 week laboratory rotation for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories				

<b>120859</b>	<b>Journal Club</b>			
Subject: ISP	Catalog Nbr: 0295			
2020 Fall	Primary	Brent Cochran	brent.cochran@tufts.edu	
2020 Fall	Primary	Amy Yee	amy.yee@tufts.edu	
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.				

<b>120875</b>	<b>Journal Club</b>			
Subject: ISP	Catalog Nbr: 0296			
2020 SPRG	Primary	Brent Cochran	brent.cochran@tufts.edu	
2020 SPRG	Primary	Amy Yee	amy.yee@tufts.edu	

# Course Bulletin

Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.

<b>121168</b>	<b>Cell Behavior</b>				
Subject: ISP	Catalog Nbr: 209B				
2020 SPRG	Primary	Victor Hatini		Victor.Hatini@tufts.edu	
2020 SPRG	Secondary	Noorjahan Panjwani		noorjahan.panjwani@tufts.edu	
2020 SPRG	Secondary	John Castellot		john.castellot@tufts.edu	
2020 SPRG	Secondary	Athar Chishti		Athar.Chishti@tufts.edu	
This course covers major topics in cell biology, including cell motility and mitosis; cell-cell and cell-matrix interactions; and receptor-mediated endocytosis.					

<b>123526</b>	<b>Qualifying Exam</b>				
Subject: GENE	Catalog Nbr: 0000				
Students present and defend a proposal for research consisting of a statement of an original research problem in which a scientific question is asked and the experimental approach to answering the question is explained in a written proposal. The proposal is presented orally to the faculty.					

<b>123606</b>	<b>Introduction to Genetics</b>				
Subject: GENE	Catalog Nbr: 0201				
Basic principles and current issues in genetics are the subject of the course. The focus will be on basic genetic principles. Topics will include Mendelian analysis, linkage, recombination/gene conversion, chromosomal abnormalities, crossover and segregation, developmental genetics and differentiation, chromosome structure, chromatin, position effects, meiosis and mitosis. Student presentations of research papers are used to familiarize the class with the manner in which genetic approaches can be applied experimentally.					

<b>123650</b>	<b>Cancer Genetics</b>				
Subject: GENE	Catalog Nbr: 0203				
The course reviews widely-held ideas and current research on the genetic aspects of carcinogenesis. An introduction to cancer concepts is followed by a focus on specific mechanisms and models illustrating the ways in which normal cellular processes are disrupted in particular types of cancers. The course emphasizes problem solving and readings from the current literature.					

<b>123720</b>	<b>Mammalian Genetics</b>				
Subject:	Catalog Nbr:				

# Course Bulletin

GENE	0205				
2020 SPRG	Primary	Bethany Dumont	Bethany.Dumont@tufts.edu		
2020 SPRG	Secondary	Carol Bult	Carol.Bult@tufts.edu		
2020 SPRG	Secondary	Gregory Carter	Gregory.Carter@tufts.edu		
2020 SPRG	Secondary	Robert Burgess	Robert.Burgess@tufts.edu		
2020 SPRG	Secondary	Gregory Cox	Gregory.Cox@tufts.edu		
2020 SPRG	Secondary	Gareth Howell	Gareth.Howell@tufts.edu		
2020 SPRG	Secondary	Steven Munger	Steven.Munger@tufts.edu		
2020 SPRG	Secondary	Christopher Baker	Christopher.Baker614610@tufts.edu		
<p>The course reviews the genetic principles that apply to mammals, including genetic mechanisms of sex determination, genetic imprinting, and mitochondrial inheritance. Attention is focused on the ways in which mutation is manifested in disease phenotypes in humans, and the methodologies that are currently used to perform genetic analysis of mammals.</p>					

<b>123785</b>	<b>Medical &amp; Experimental Mammalian Genetics</b>				
Subject:	Catalog Nbr:				
GENE	0208				
2019 SUMR	Primary	Jennifer Trowbridge	Jennifer.Trowbridge@tufts.edu		
2019 SUMR	Primary	Gareth Howell	Gareth.Howell@tufts.edu		
<p>The course is an intensive, two-week immersion into mammalian genetics with presenters providing background and current research in important areas of mammalian genetics and its impact on health and disease. This course is offered at The Jackson Laboratory, Bar Harbor, ME. Students in the Mammalian Genetics Track have priority for this course; a limited number of slots are available for other GSBS students with permission from the Genetics program and the Dean's Office.</p>					

<b>123914</b>	<b>Laboratory Rotations</b>				
Subject:	Catalog Nbr:				
GENE	0234				
2020 Fall	Primary	Pamela Yelick	Pamela.Yelick@tufts.edu		
<p>8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.</p>					

<b>123936</b>	<b>Laboratory Rotations</b>				
Subject:	Catalog Nbr:				
GENE	0235				
2020 SPRG	Primary	Pamela Yelick	Pamela.Yelick@tufts.edu		
2020 SPRG	Primary	Gareth Howell	Gareth.Howell@tufts.edu		
<p>8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.</p>					

# Course Bulletin

<b>123953</b>	<b>Laboratory Rotations</b>			
Subject: GENE	Catalog Nbr: 0236			
2020 SUMR	Primary	Pamela Yelick	Pamela.Yelick@tufts.edu	
Subject: GENE	Catalog Nbr: 0236			
2019 SUMR	Primary	Gareth Howell	Gareth.Howell@tufts.edu	
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.				

<b>123972</b>	<b>Research Presentations</b>			
Subject: GENE	Catalog Nbr: 0289			
2020 Fall	Primary	Pamela Yelick	Pamela.Yelick@tufts.edu	
Students present progress reports on their research for questions and constructive criticism as well as gain experience in presenting data and leading discussion.				

<b>123991</b>	<b>Research Presentations</b>			
Subject: GENE	Catalog Nbr: 0290			
2020 SPRG	Primary	Pamela Yelick	Pamela.Yelick@tufts.edu	
Students present progress reports on their research for questions and constructive criticism as well as gain experience in presenting data and leading discussion.				

<b>124062</b>	<b>Graduate Seminar</b>			
Subject: GENE	Catalog Nbr: 0291			
2020 Fall	Primary	Pamela Yelick	Pamela.Yelick@tufts.edu	
Visiting speakers from the Boston community and beyond present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.				

<b>124097</b>	<b>Graduate Seminar</b>			
Subject: GENE	Catalog Nbr: 0292			
2020 SPRG	Primary	Pamela Yelick	Pamela.Yelick@tufts.edu	
Visiting speakers present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows. Fall and Spring.				

# Course Bulletin

<b>124116</b>	<b>Special Topics in Genetics</b>
Subject: GENE	Catalog Nbr: 0293
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.	

<b>124144</b>	<b>Special Topics in Genetics</b>
Subject: GENE	Catalog Nbr: 0294
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.	

<b>124194</b>	<b>Journal Club</b>
Subject: GENE	Catalog Nbr: 0295
2020 Fall	Primary Karl Munger Karl.Munger@tufts.edu
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.	

<b>124231</b>	<b>Journal Club</b>
Subject: GENE	Catalog Nbr: 0296
2020 SPRG	Primary Karl Munger Karl.Munger@tufts.edu
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.	

<b>124255</b>	<b>Graduate Research</b>
Subject: GENE	Catalog Nbr: 0297
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>124275</b>	<b>Graduate Research</b>
Subject: GENE	Catalog Nbr: 0298
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>124293</b>	<b>Graduate Research</b>
Subject:	Catalog Nbr:

# Course Bulletin

GENE 0299

2020 SUMR

Primary

Pamela Yelick

Pamela.Yelick@tufts.edu

These courses provide guided research on a topic suitable for a doctoral thesis.

<b>124323</b>	<b>Masters Degree Only</b>
Subject: GENE	Catalog Nbr: 0402

<b>124347</b>	<b>PhD Degree Only</b>
Subject: GENE	Catalog Nbr: 0403
<p>Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.</p>	

<b>124365</b>	<b>PhD Degree Only</b>
Subject: GENE	Catalog Nbr: 0404
<p>Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.</p>	

<b>124386</b>	<b>PhD Degree Only</b>
Subject: GENE	Catalog Nbr: 0405
<p>Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.</p>	

<b>124411</b>	<b>Systems Genetics</b>
Subject: GENE	Catalog Nbr: 0410
<p>This one-week course covers computational and experimental approaches to genetic studies that utilize whole genome approaches. Individuals interested in statistical and computational methods as well as biological problems are welcome. Topics include genetic mapping, gene expression microarray analysis and computational modeling of complex systems. This course is offered at The Jackson Laboratory, Bar Harbor, ME. Students in the Mammalian Genetics Track have priority for this course; a limited number of slots are available for other Sackler students with permission from the program and the Dean's Office.</p>	

# Course Bulletin

<b>124436</b>	<b>Experimental Models of Human Cancer</b>		
Subject:	Catalog Nbr:		
GENE	0450		
2019 SUMR	Primary	Mingyang Lu	Mingyang.Lu@tufts.edu
<p>This ten-day graduate-level genetics course is designed for individuals entering the field of mouse genetics. The course focuses on the mouse as an experimental tool in cancer research. This course is offered at The Jackson Laboratory, Bar Harbor, ME. Students in the Mammalian Genetics Track have priority for this course; a limited number of slots are available for other GSBS students with permission from the Genetics program and the Dean's Office.</p>			

<b>124459</b>	<b>Mammalian Genetics I</b>		
Subject:	Catalog Nbr:		
GENE	205A		
<p>The course reviews the genetic principles that apply to mammals, including genetic mechanisms of sex determination, genetic imprinting, and mitochondrial inheritance. Attention is focused on the ways in which mutation is manifested in disease phenotypes in humans.</p>			

<b>124475</b>	<b>Mammalian Genetics II</b>		
Subject:	Catalog Nbr:		
GENE	205B		
<p>The course explores the methodologies that are currently used to perform genetic analysis of mammals.</p>			

<b>125165</b>	<b>Qualifying Exam</b>		
Subject:	Catalog Nbr:		
MMB	0000		
<p>Students present and defend a proposal for research consisting of a statement of an original research problem in which a scientific question is asked and the experimental approach to answering the question is explained in a written proposal. The proposal is presented orally to the faculty.</p>			

<b>125406</b>	<b>Host Pathogen Interface</b>		
Subject:	Catalog Nbr:		
MMB	0210		
<p>The goal of this course is to critically read and evaluate the scientific literature on bacterial pathogens and host defenses, with particular but not exclusive emphasis on innate immune defenses. Students are required to read at least two papers per topic and discuss them in the group.</p>			

<b>125430</b>	<b>Bacterial-Host Cell Interaction</b>		
---------------	--	--	--



# Course Bulletin

Subject:      Catalog Nbr:  
MMB            0211

The goal of this course is to critically read and evaluate the scientific literature on the cellular biology of bacterial pathogens, with particular emphasis on cultured cell models of microbial diseases. Students are required to read at least two papers per topic and discuss them in the group.

<b>125473</b>	<b>Animal Virology</b>			
	Subject:	Catalog Nbr:		
	MMB	0214		
	2020 SPRG	Primary	John Coffin	john.coffin@tufts.edu
	2020 SPRG	Primary	Marta Gaglia	Marta.Gaglia@tufts.edu
	2020 SPRG	Secondary	Ekaterina Heldwein	Katya.Heldwein@tufts.edu
	2020 SPRG	Secondary	Karl Munger	Karl.Munger@tufts.edu
<p>Molecular aspects of viral replication and host-cell interactions are emphasized. Topics include virion structure; mechanisms of nucleic acid replication, transcription, and translation; virion assembly and release; genetics; mechanisms of transformation by oncogenic viruses; responses of the host to viral infection, tumor viruses and tumor cells; and mechanisms of persistent and slow virus infections. Prerequisites: a course in molecular biology or working knowledge of molecular techniques.</p>				

<b>125598</b>	<b>Introduction to Infectious Diseases</b>			
	Subject:	Catalog Nbr:		
	MMB	0223		
	2019 SUMR	Primary	Ralph Isberg	ralph.isberg@tufts.edu
	2019 SUMR	Primary	Linden Hu	linden.hu@tufts.edu
	2019 SUMR	Primary	Geneve Allison	Geneve.Allison@tufts.edu
<p>This course is comprised of three integrated components; a Medical Microbiology Tutorial designed to introduce students to pathogens and pathophysiology of infectious diseases, Infectious Diseases Problem-Based Learning designed to introduce students to clinical cases, and a Teaching Clinic designed to expose students to real clinical cases and treatment options.</p>				

<b>125630</b>	<b>Laboratory Rotations</b>			
	Subject:	Catalog Nbr:		
	MMB	0234		
	2020 Fall	Primary	Ekaterina Heldwein	Katya.Heldwein@tufts.edu
<p>8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.</p>				

<b>125651</b>	<b>Laboratory Rotations</b>			
	Subject:	Catalog Nbr:		
	MMB	0235		

# Course Bulletin

2020 SPRG	Primary	Ekaterina Heldwein	Katya.Heldwein@tufts.edu
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.			

<b>125665</b>	<b>Laboratory Rotations</b>		
Subject: MMB	Catalog Nbr: 0236		
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.			

<b>125685</b>	<b>Microbial Genetics &amp; Microbiology</b>		
Subject: MMB	Catalog Nbr: 0241		
2020 Fall	Primary	Andrew Camilli	andrew.camilli@tufts.edu
2020 Fall	Secondary	Michael Malamy	michael.malamy@tufts.edu
2020 Fall	Secondary	Claudette Gardel	Claudette.Gardel@tufts.edu
The goal of this course is to learn about the structure, growth, and genetics of bacteria and lambda bacteriophage. This course consists of text book reading, lectures and presentation and discussion of journal articles. Students are required to read one or two papers per topic and be prepared to discuss them in the group.			

<b>125712</b>	<b>Applied Ethics for Scientists</b>		
Subject: MMB	Catalog Nbr: 0275		
This course is a discussion/seminar course that treats selected topics related to ethical behavior in scientific work. Topics covered include fraud, plagiarism, data selection and analysis, record keeping, animal welfare, personnel issues, genetic screening and gene therapy, and conflict of interest. Enrollment is restricted to third and fourth year graduate students.			

<b>125727</b>	<b>Graduate Seminar</b>		
Subject: MMB	Catalog Nbr: 0291		
2020 Fall	Primary	Ekaterina Heldwein	Katya.Heldwein@tufts.edu
Visiting speakers present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.			

<b>125748</b>	<b>Graduate Seminar</b>		
Subject: MMB	Catalog Nbr: 0292		

# Course Bulletin

2020 SPRG	Primary	Ekaterina Heldwein	Katya.Heldwein@tufts.edu
Visiting speakers present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.			

<b>125769</b>	<b>Special Topics in Molecular Microbiology</b>		
Subject: MMB	Catalog Nbr: 0293		
2019 FALL	Primary	Ralph Isberg	ralph.isberg@tufts.edu
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.			

<b>125789</b>	<b>Special Topics in Molecular Microbiology</b>		
Subject: MMB	Catalog Nbr: 0294		
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.			

<b>125805</b>	<b>Journal Club</b>		
Subject: MMB	Catalog Nbr: 0295		
2020 Fall	Primary	Ekaterina Heldwein	Katya.Heldwein@tufts.edu
These courses provide in-depth study and discussion of specific topics involving the critical review of current literature in a small group format. Given by faculty and graduate students (years two through four) and attended by all program members.			

<b>125836</b>	<b>Journal Club</b>		
Subject: MMB	Catalog Nbr: 0296		
2020 SPRG	Primary	Ekaterina Heldwein	Katya.Heldwein@tufts.edu
These courses provide in-depth study and discussion of specific topics involving the critical review of current literature in a small group format. Given by faculty and graduate students (years two through four) and attended by all program members.			

<b>125856</b>	<b>Graduate Research</b>		
Subject: MMB	Catalog Nbr: 0297		
These courses provide guided research on a topic suitable for a doctoral thesis.			

# Course Bulletin

<b>125868</b>	<b>Graduate Research</b>
Subject: MMB	Catalog Nbr: 0298
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>125887</b>	<b>Graduate Research</b>
Subject: MMB	Catalog Nbr: 0299
2020 SUMR	Primary Ekaterina Heldwein
Katya.Heldwein@tufts.edu	
These courses provide guided research on a topic suitable for a doctoral thesis.	

<b>125908</b>	<b>Masters Degree Only</b>
Subject: MMB	Catalog Nbr: 0402

<b>125927</b>	<b>PhD Degree Only</b>
Subject: MMB	Catalog Nbr: 0403
Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.	

<b>125955</b>	<b>PhD Degree Only</b>
Subject: MMB	Catalog Nbr: 0404
Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.	

<b>125976</b>	<b>PhD Degree Only</b>
Subject: MMB	Catalog Nbr: 0405
Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.	

<b>126450</b>	<b>Qualifying Exam</b>
---------------	------------------------

# Course Bulletin

Subject:      Catalog Nbr:  
IMM            0000

Students present and defend a proposal for research consisting of a statement of an original research problem in which a scientific question is asked and the experimental approach to answering the question is explained in a written proposal. The proposal is presented orally to the faculty.

<b>126717</b>	<b>Introduction to Immunology</b>			
Subject:	Catalog Nbr:			
IMM	0212			
2019 FALL	Primary	Henry Wortis	henry.wortis@tufts.edu	
2019 FALL	Secondary	Peter Brodeur	peter.brodeur@tufts.edu	
2019 FALL	Secondary	Stephen Bunnell	Stephen.Bunnell@tufts.edu	
2019 FALL	Secondary	Pedram Hamrah	Pedram.Hamrah@tufts.edu	
2019 FALL	Secondary	Xudong Li	Xudong.Li@tufts.edu	
2019 FALL	Secondary	Shruti Sharma	Shruti.Sharma@tufts.edu	
2019 FALL	Secondary	Marta Rodriguez Garcia	Marta.Rodriguez_Garcia@tufts.edu	
This is a survey based on lectures, texts, problem-solving and small group tutorials. Topics include the cellular basis of innate and adaptive immune responses, the mechanism of antigen receptor gene rearrangement, principles of tissue transplantation and the genetic and mechanistic problems underlying autoimmune and hypersensitivity diseases.				

<b>126797</b>	<b>Imm Mechs of Disease I</b>			
Subject:	Catalog Nbr:			
IMM	0215			
The course covers the pathogenesis of major infectious diseases including current knowledge of immune responses and approaches to prevention, diagnosis and treatment. Current studies of autoimmunity, hypersensitivity, leukemia and lymphoma are also covered.				

<b>126840</b>	<b>Immunological Mechanisms In Disease</b>			
Subject:	Catalog Nbr:			
IMM	0216			
The course covers the pathogenesis of major infectious diseases including current knowledge of immune responses and approaches to prevention, diagnosis and treatment. Current studies of autoimmunity, hypersensitivity, leukemia and lymphoma are also covered.				

<b>126857</b>	<b>1st Year Journal Club</b>			
Subject:	Catalog Nbr:			
IMM	0217			
2019 FALL	Primary	Henry Wortis	henry.wortis@tufts.edu	
2019 FALL	Secondary	Peter Brodeur	peter.brodeur@tufts.edu	

# Course Bulletin

2019 FALL	Secondary	Stephen Bunnell	Stephen.Bunnell@tufts.edu
2019 FALL	Secondary	Xudong Li	Xudong.Li@tufts.edu
First-year students meet with the course director to discuss articles essential for an understanding of contemporary immunology. The development of analytic skills is emphasized.			

<b>127114</b>	<b>Scientific &amp; Grant Wtng</b>		
Subject:	Catalog Nbr:		
IMM	0233		
This course provides graduate students with the opportunity to develop the basic skills essential to the effective oral and written communication of scientific findings and research proposals. The course is a combination of lectures, writing assignments, and oral communication practice sessions with feedback provided by the faculty.			

<b>127136</b>	<b>Laboratory Rotations</b>		
Subject:	Catalog Nbr:		
IMM	0234		
2019 FALL	Primary	Honorine Ward	honorine.ward@tufts.edu
2020 Fall	Primary	Alexander Poltorak	Alexander.Poltorak@tufts.edu
2020 Fall	Primary	Maria Alcaide Alonso	Pilar.Alcaide@tufts.edu
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.			

<b>127165</b>	<b>Laboratory Rotations</b>		
Subject:	Catalog Nbr:		
IMM	0235		
2020 SPRG	Primary	Alexander Poltorak	Alexander.Poltorak@tufts.edu
2020 SPRG	Primary	Maria Alcaide Alonso	Pilar.Alcaide@tufts.edu
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.			

<b>127179</b>	<b>Laboratory Rotations</b>		
Subject:	Catalog Nbr:		
IMM	0236		
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.			

<b>127217</b>	<b>Research Presentations</b>		
Subject:	Catalog Nbr:		
IMM	0289		

# Course Bulletin

2019 FALL	Primary	Honorine Ward	honorine.ward@tufts.edu
2020 Fall	Primary	Maria Alcaide Alonso	Pilar.Alcaide@tufts.edu
Students present progress reports on their research for questions and constructive criticism as well as gain experience in presenting data and leading discussion.			

<b>127238</b>	<b>Research Presentations</b>		
Subject:	Catalog Nbr:		
IMM	0290		
2020 SPRG	Primary	Maria Alcaide Alonso	Pilar.Alcaide@tufts.edu
Students present progress reports on their research for questions and constructive criticism as well as gain experience in presenting data and leading discussion.			

<b>127260</b>	<b>Graduate Seminar</b>		
Subject:	Catalog Nbr:		
IMM	0291		
2020 Fall	Primary	Maria Alcaide Alonso	Pilar.Alcaide@tufts.edu
Visiting speakers present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.			

<b>127291</b>	<b>Graduate Seminar</b>		
Subject:	Catalog Nbr:		
IMM	0292		
2020 SPRG	Primary	Maria Alcaide Alonso	Pilar.Alcaide@tufts.edu
Visiting speakers present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.			

<b>127310</b>	<b>Special Topics in Immunology</b>		
Subject:	Catalog Nbr:		
IMM	0293		
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.			

<b>127329</b>	<b>Special Topics in Immunology</b>		
Subject:	Catalog Nbr:		
IMM	0294		
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.			

# Course Bulletin

<b>127347</b>	<b>Journal Club</b>			
Subject:	Catalog Nbr:			
IMM	0295			
2020 Fall	Primary	Stephen Bunnell		Stephen.Bunnell@tufts.edu
Students in the research portion of their training meet to present and discuss recent papers of importance.				

<b>127367</b>	<b>Journal Club</b>			
Subject:	Catalog Nbr:			
IMM	0296			
2020 SPRG	Primary	Stephen Bunnell		Stephen.Bunnell@tufts.edu
Students in the research portion of their training meet to present and discuss recent papers of importance.				

<b>127391</b>	<b>Graduate Research</b>			
Subject:	Catalog Nbr:			
IMM	0297			
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>127403</b>	<b>Graduate Research</b>			
Subject:	Catalog Nbr:			
IMM	0298			
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>127430</b>	<b>Graduate Research</b>			
Subject:	Catalog Nbr:			
IMM	0299			
2019 SUMR	Primary	Honorine Ward		honorine.ward@tufts.edu
2020 SUMR	Primary	Alexander Poltorak		Alexander.Poltorak@tufts.edu
2020 SUMR	Primary	Maria Alcaide Alonso		Pilar.Alcaide@tufts.edu
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>127436</b>	<b>Qualifying Exam</b>			
Subject:	Catalog Nbr:			
NRSC	0000			
Students present and defend a proposal for research consisting of a statement of an original research problem in which a scientific question is asked and the experimental approach to answering the question is explained in a written proposal. The proposal is presented orally to the faculty.				

<b>127448</b>	<b>Masters Degree Only</b>			
---------------	----------------------------	--	--	--



# Course Bulletin

Subject:	Catalog Nbr:
IMM	0402

<b>127451</b>	<b>Cellular and Molecular Tutorials in Neuroscience</b>			
	Subject:	Catalog Nbr:		
	NRSC	0200		
	2019 FALL	Primary	Christopher Dulla	Chris.Dulla@tufts.edu
	2019 FALL	Secondary	Michele Jacob	michele.jacob@tufts.edu
	2019 FALL	Secondary	Peter Juo	Peter.Juo@tufts.edu
	2019 FALL	Secondary	Gerard Reijmers	Leon.Reijmers@tufts.edu
	2019 FALL	Secondary	Jamie Maguire	Jamie.Maguire@tufts.edu
	2019 FALL	Secondary	Dong Kong	Dong.Kong@tufts.edu
<p>These small group tutorial sessions will introduce students to key principles in cellular and molecular neuroscience, provide students with the historical context in which key advances have been made, and engage students and faculty in informal, one-on-one discussions to deepen understanding of the material.</p>				

<b>127475</b>	<b>PhD Degree Only</b>			
	Subject:	Catalog Nbr:		
	IMM	0403		
<p>Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.</p>				

<b>127491</b>	<b>PhD Degree Only</b>			
	Subject:	Catalog Nbr:		
	IMM	0404		
<p>Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.</p>				

<b>127512</b>	<b>Developmental Neurobiology</b>			
	Subject:	Catalog Nbr:		
	NRSC	0205		
<p>This is a small group, interactive course exploring the mechanisms underlying the formation of the differentiated nervous system. Morphological, biochemical, immunological, and molecular approaches are examined, with an emphasis on the utility of experimental model systems.</p>				

<b>127521</b>	<b>PhD Degree Only</b>			
---------------	------------------------	--	--	--

# Course Bulletin

Subject:      Catalog Nbr:  
IMM            0405

Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is automatically awarded upon completion of the thesis.

## **127621**                      **Systems Neuroscience**

Subject:      Catalog Nbr:  
NRSC           0310

This course, a cross-listing with Tufts University School of Medicine, focuses on the structural and functional organization of the integrated nervous system with significant exposure to neurological disease processes.

## **127641**                      **Synapse Neurobiology**

Subject:      Catalog Nbr:  
NRSC           0213

2020 Fall	Primary	Michele Jacob	michele.jacob@tufts.edu
2020 Fall	Primary	Gerard Reijmers	Leon.Reijmers@tufts.edu

This small group discussion course provides students with an in-depth understanding of how synapses function, how activity modulates function, and how synaptic ensembles coordinate simple behaviors.

## **127741**                      **Scientific Communication and Writing Principles**

Subject:      Catalog Nbr:  
NRSC           0220

2020 Fall	Primary	Paul Davies	Paul.Davies@tufts.edu
-----------	---------	-------------	-----------------------

A discussion and workshop-style course underscoring the fundamental principles underlying expository writing. This course centers on the improvement of each student's existing skills through interactive writing exercises. Enrollment is limited to 10 students.

## **127752**                      **Neuroscience Laboratory Techniques**

Subject:      Catalog Nbr:  
NRSC           0233

2019 FALL	Primary	Jamie Maguire	Jamie.Maguire@tufts.edu
2019 FALL	Secondary	Selene Lomoio	Selene.Lomoio@tufts.edu

The series of workshops exposes student to fundamental laboratory techniques, including tissue culture, genotyping, microscopy, immunohistochemistry, rodent handling, protein quantification, and experimental design. Restricted to first-year Neuroscience students.

## **127776**                      **Laboratory Rotation**

Subject:      Catalog Nbr:

# Course Bulletin

NRSC	0234			
2020 Fall	Primary	Christopher Dulla	Chris.Dulla@tufts.edu	
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.				

<b>127803</b>	<b>Laboratory Rotations</b>			
Subject:	Catalog Nbr:			
NRSC	0235			
2020 SPRG	Primary	Christopher Dulla	Chris.Dulla@tufts.edu	
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.				

<b>127822</b>	<b>Laboratory Rotation</b>			
Subject:	Catalog Nbr:			
NRSC	0236			
2020 SUMR	Primary	Christopher Dulla	Chris.Dulla@tufts.edu	
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.				

<b>127830</b>	<b>Biochemical Foundations in Neuroscience</b>			
Subject:	Catalog Nbr:			
NRSC	0251			
2019 FALL	Primary	Gerard Reijmers	Leon.Reijmers@tufts.edu	
2019 FALL	Primary	Thomas Biederer	Thomas.Biederer@tufts.edu	
2019 FALL	Secondary	James Baleja	jim.baleja@tufts.edu	
2019 FALL	Secondary	Peter Bullock	peter.bullock@tufts.edu	
2019 FALL	Secondary	Larry Feig	larry.feig@tufts.edu	
2019 FALL	Secondary	Brian Schaffhausen	brian.schaffhausen@tufts.edu	
2019 FALL	Secondary	William Bachovchin	william.bachovchin@tufts.edu	
2019 FALL	Secondary	Michael Forgac	michael.forgac@tufts.edu	
2019 FALL	Secondary	Albert Tai	albert.tai@tufts.edu	
2019 FALL	Secondary	Alex Bohm	Andrew.Bohm@tufts.edu	
2019 FALL	Secondary	Peter Juo	Peter.Juo@tufts.edu	
2019 FALL	Secondary	Alexei Degterev	Alexei.Degterev@tufts.edu	
2019 FALL	Secondary	Stephen Moss	Stephen.Moss@tufts.edu	
2019 FALL	Secondary	Yongjie Yang	Yongjie.Yang@tufts.edu	
2019 FALL	Secondary	Marta Gaglia	Marta.Gaglia@tufts.edu	
This course covers fundamental biochemical principles, with special emphasis on mechanisms of particular importance to nervous system function, including neural signaling and non-equilibrium processes. Students will also be exposed to quantitative molecular approaches to studying the nervous system.				

# Course Bulletin

<b>127868</b>	<b>Neurogenetics</b>			
Subject: NRSC	Catalog Nbr: 0263			
The course reviews principles of forward and reverse genetics, presents several animal model systems that are employed in neurogenetics research, and provides examples of genetic approaches that are used to study the molecules and neural circuits that regulate distinct neurobiological processes or are known to be altered in neurological disease states.				

<b>127898</b>	<b>Research Presentations</b>			
Subject: NRSC	Catalog Nbr: 0289			
2020 Fall	Primary	Michele Jacob		michele.jacob@tufts.edu
Students present progress reports on their research for questions and constructive criticism as well as gain experience in presenting data and leading discussion.				

<b>127942</b>	<b>Research Presentations</b>			
Subject: NRSC	Catalog Nbr: 0290			
2020 SPRG	Primary	Michele Jacob		michele.jacob@tufts.edu
Students present progress reports on their research for questions and constructive criticism as well as gain experience in presenting data and leading discussion.				

<b>127981</b>	<b>Graduate Seminar</b>			
Subject: NRSC	Catalog Nbr: 0291			
2019 FALL	Primary	Michele Jacob		michele.jacob@tufts.edu
2019 FALL	Primary	Thomas Biederer		Thomas.Biederer@tufts.edu
2020 Fall	Primary	Yongjie Yang		Yongjie.Yang@tufts.edu
Visiting speakers present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.				

<b>128024</b>	<b>Graduate Seminar</b>			
Subject: NRSC	Catalog Nbr: 0292			
2020 SPRG	Primary	Michele Jacob		michele.jacob@tufts.edu
2020 SPRG	Primary	Christopher Dulla		Chris.Dulla@tufts.edu
Visiting speakers present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.				

# Course Bulletin

<b>128062</b>	<b>Special Topics in Neuroscience</b>			
Subject: NRSC	Catalog Nbr: 0293			
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.				

<b>128101</b>	<b>Special Topics in Neuroscience</b>			
Subject: NRSC	Catalog Nbr: 0294			
2020 SPRG	Primary	Maribel Rios	Maribel.Rios@tufts.edu	
2020 SPRG	Primary	Giuseppina Tesco	Giuseppina.Tesco@tufts.edu	
2020 SPRG	Secondary	Larry Feig	larry.feig@tufts.edu	
2020 SPRG	Secondary	Michele Jacob	michele.jacob@tufts.edu	
2020 SPRG	Secondary	Klaus Miczek	klaus.miczek@tufts.edu	
2020 SPRG	Secondary	Gerard Reijmers	Leon.Reijmers@tufts.edu	
2020 SPRG	Secondary	Jamie Maguire	Jamie.Maguire@tufts.edu	
2020 SPRG	Secondary	Christopher Dulla	Chris.Dulla@tufts.edu	
2020 SPRG	Secondary	Yongjie Yang	Yongjie.Yang@tufts.edu	
2020 SPRG	Secondary	Dong Kong	Dong.Kong@tufts.edu	
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.				

<b>128157</b>	<b>Journal Club</b>			
Subject: NRSC	Catalog Nbr: 0295			
2019 FALL	Primary	Thomas Biederer	Thomas.Biederer@tufts.edu	
2020 Fall	Primary	Christopher Dulla	Chris.Dulla@tufts.edu	
2020 Fall	Secondary	Michele Jacob	michele.jacob@tufts.edu	
2020 Fall	Secondary	F Jackson	rob.jackson@tufts.edu	
2020 Fall	Secondary	Gerard Reijmers	Leon.Reijmers@tufts.edu	
2020 Fall	Secondary	Dong Kong	Dong.Kong@tufts.edu	
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.				

<b>128193</b>	<b>Journal Club</b>			
Subject: NRSC	Catalog Nbr: 0296			
2020 SPRG	Primary	Christopher Dulla	Chris.Dulla@tufts.edu	
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.				

# Course Bulletin

<b>128216</b>	<b>Graduate Research</b>			
	Subject:	Catalog Nbr:		
	NRSC	0297		
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>128237</b>	<b>Graduate Research</b>			
	Subject:	Catalog Nbr:		
	NRSC	0298		
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>128248</b>	<b>Graduate Research</b>			
	Subject:	Catalog Nbr:		
	NRSC	0299		
	2019 SUMR	Primary	Thomas Biederer	Thomas.Biederer@tufts.edu
	2020 SUMR	Primary	Christopher Dulla	Chris.Dulla@tufts.edu
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>128272</b>	<b>Masters Degree Only</b>			
	Subject:	Catalog Nbr:		
	NRSC	0402		

<b>128290</b>	<b>PhD Degree Only</b>			
	Subject:	Catalog Nbr:		
	NRSC	0403		
Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is awarded upon completion of the thesis.				

<b>128311</b>	<b>PhD Degree Only</b>			
	Subject:	Catalog Nbr:		
	NRSC	0404		
Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is awarded upon completion of the thesis.				

# Course Bulletin

<b>128330</b>	<b>PhD Degree Only</b>		
Subject:	Catalog Nbr:		
NRSC	0405		
Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is awarded upon completion of the thesis.			

<b>128378</b>	<b>Biochemical Foundations in Neuroscience Receptor/Channel Mechanisms</b>			
Subject:	Catalog Nbr:			
NRSC	251B			
2019 FALL	Primary	Gerard Reijmers	Leon.Reijmers@tufts.edu	
2019 FALL	Primary	Thomas Biederer	Thomas.Biederer@tufts.edu	
2019 FALL	Secondary	Larry Feig	larry.feig@tufts.edu	
2019 FALL	Secondary	Daniel Cox	dan.cox@tufts.edu	
2019 FALL	Secondary	Peter Juo	Peter.Juo@tufts.edu	
2019 FALL	Secondary	Stephen Moss	Stephen.Moss@tufts.edu	
2019 FALL	Secondary	Yongjie Yang	Yongjie.Yang@tufts.edu	
This course is the middle section of the Biochemical Foundations in Neuroscience course, focusing predominantly on mechanisms of enzyme, receptor, and channel function in the nervous system.				

<b>130459</b>	<b>Clinical Implications of Basic Research</b>			
Subject:	Catalog Nbr:			
GBMD	0210			
2020 SPRG	Primary	James Schwob	jim.schwob@tufts.edu	
This journal club course for MD/PhD students is organized around the "Clinical Implications of Basic Research" column published in the New England Journal of Medicine. Students read a primary paper(s) highlighted in the column or one that is similar to those highlighted and discuss the work. The primary goal of this required course, which meets for one hour every other week, is to encourage and teach students to continually ask how basic research can impact clinical medicine. The format also encourages students to sharpen their communication skills in a relaxed atmosphere.				

<b>136161</b>	<b>Structural Biology</b>		
Subject:	Catalog Nbr:		
CMDB	0202		
This course covers the basic theory and practice of Macromolecular Crystallography and NMR			

<b>136175</b>	<b>Tissue Engineering</b>		
Subject:	Catalog Nbr:		
GSBS	0203		
This course covers Stem Cell Biology and Tissue Scaffolds, the Principles of Bioreactor Design and Integrative			

# Course Bulletin

Approaches to Tissue Engineering.

<b>136203</b>	<b>Imaging Techniques</b>
Subject: GSBS	Catalog Nbr: 0204
This course covers Light Microscopy/Immunofluorescence, Confocal Microscopy and Electron Microscopy. Computer-based image analysis is incorporated into these modules. The samples generated during the Tissue Engineering module are used.	

<b>136219</b>	<b>Mentored Undergrad Teaching</b>
Subject: GSBS	Catalog Nbr: 0205
This course offers an opportunity for GSBS students to obtain mentored teaching experience. Each GSBS student collaborates with a TUSM and a Friedman student to develop a syllabus and three lectures on one of five disease topics (osteoporosis, breast cancer, asthma, metabolic syndrome, heart disease). Lectures are delivered to undergraduate Biology majors at Pine Manor College, Chestnut Hill, MA. Prerequisites: Year 3 or above.	

<b>136275</b>	<b>Applied Ethics for Scientists</b>		
Subject: GSBS	Catalog Nbr: 0275		
2019 FALL	Primary	Jamie Maguire	Jamie.Maguire@tufts.edu
2019 FALL	Secondary	Daniel Jay	daniel.jay@tufts.edu
2019 FALL	Secondary	Henry Wortis	henry.wortis@tufts.edu
2019 FALL	Secondary	Alex Bohm	Andrew.Bohm@tufts.edu
2019 FALL	Secondary	Lara Sloboda	Lara.Sloboda@tufts.edu
2019 FALL	Secondary	Najla Fiaturi	Najla.Fiaturi@tufts.edu
2019 FALL	Secondary	Marta Gaglia	Marta.Gaglia@tufts.edu
2019 FALL	Secondary	Malavika Raman	Malavika.Raman@tufts.edu
2019 FALL	Secondary	Shumin Tan	Shumin.Tan@tufts.edu
The course is built around case study reading material and requires highly interactive discussion in which students analyze specific scenarios of ethical issues encountered in a research environment. Topics include: academic integrity issues/ fraud and misconduct/plagiarism/ data handling/notebooks, mentoring and conflict resolution and ethical use of animals and human subjects.			

<b>136292</b>	<b>Biomedical Techniques &amp; Research</b>		
Subject: GSBS	Catalog Nbr: 0299		
2020 Fall	Primary	Brian Schaffhausen	brian.schaffhausen@tufts.edu
2020 Fall	Primary	Maria Alcaide Alonso	Pilar.Alcaide@tufts.edu



# Course Bulletin

This course includes research with selected advisor. Visiting Students Only.

<b>136304</b>	<b>Clinical Implications of Basic Research</b>			
Subject:	Catalog Nbr:			
GBMD	0209			
2019 FALL	Primary	James Schwob		jim.schwob@tufts.edu
2020 Fall	Primary	Michael Chin		Michael.Chin614279@tufts.edu
<p>This journal club course for MD/PhD students is organized around the "Clinical Implications of Basic Research" column published in the New England Journal of Medicine. Students read a primary paper(s) and discuss the work. The primary goal of this required course, is to encourage and teach students to continually ask how basic research can impact clinical medicine. The format also encourages students to sharpen their communication skills in a relaxed atmosphere.</p>				

<b>136336</b>	<b>Laboratory Rotations</b>			
Subject:	Catalog Nbr:			
GBMD	0299			
2020 SUMR	Primary	Daniel Jay		daniel.jay@tufts.edu
<p>6-8 week laboratory rotations are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.</p>				

<b>137576</b>	<b>Qualifying Exam</b>			
Subject:	Catalog Nbr:			
PPET	0000			
<p>Students present and defend a proposal for research consisting of a statement of an original research problem in which a scientific question is asked and the experimental approach to answering the question is explained in a written proposal. The proposal is presented orally to the faculty.</p>				

<b>137616</b>	<b>Translational Pharmacology I</b>			
Subject:	Catalog Nbr:			
PPET	0211			
2019 FALL	Primary	Najla Fiaturi		Najla.Fiaturi@tufts.edu
2019 FALL	Secondary	David Greenblatt		dj.greenblatt@tufts.edu
2019 FALL	Secondary	Margery Beinfeld		margery.beinfeld@tufts.edu
2019 FALL	Secondary	Richard Shader		richard.shader@tufts.edu
2019 FALL	Secondary	Michael Forgac		michael.forgac@tufts.edu
2019 FALL	Secondary	Jerold Harmatz		jerold.harmatz@tufts.edu
2019 FALL	Secondary	Karina Meiri		karina.meiri@tufts.edu
2019 FALL	Secondary	Emmanuel Pothos		emmanuel.pothos@tufts.edu
2019 FALL	Secondary	Alexei Degterev		Alexei.Degterev@tufts.edu
2019 FALL	Secondary	Paul Abourjaily		Paul.Abourjaily@tufts.edu

# Course Bulletin

This course is a survey of some of the major classes of drugs, with particular emphasis on mechanisms of action and relevant organ systems and cellular physiology. Students are introduced to the central concepts, models and techniques in pharmacology.

<b>137629</b>	<b>Clinical Pharmacology</b>			
Subject:	Catalog Nbr:			
PPET	0212			
<p>This course is devoted to the discussion and presentation of therapeutic topics and the basic principles of therapeutic pharmacology. Subjects that are highlighted include: therapeutic drug monitoring, evaluation of side effects and toxicity, critical evaluation of clinical trial data, pharmacokinetic design of dose regimens, drugs in special populations and medical and legal issues in clinical pharmacology. A mixture of lecture, readings and clinical case-oriented problem-solving is used. Extensive independent study and reading is required.</p>				

<b>137645</b>	<b>Addiction Medicine</b>			
Subject:	Catalog Nbr:			
PPET	0213			
2020 SUMR	Primary	Emmanuel Pothos		emmanuel.pothos@tufts.edu
2020 SUMR	Secondary	Bryan Ho		Bryan.Ho@tufts.edu
2020 SUMR	Secondary	Beverly Rubin		beverly.rubin@tufts.edu
2020 SUMR	Secondary	Neha Sharma		Neha.Sharma@tufts.edu
2020 SUMR	Secondary	Sarah Dodwell		Sarah.Dodwell@tufts.edu
2020 SUMR	Secondary	Dena Whitesell		Dena.Whitesell@tufts.edu
<p>This course is offered in conjunction with the Medical School. It provides an overview of the mechanisms of action of drugs of abuse and their treatment, as well as the fundamentals of treatment of addiction in clinical practice.</p>				

<b>137683</b>	<b>Principles of Immunopharmacology</b>			
Subject:	Catalog Nbr:			
PPET	0218			
2020 Fall	Primary	Theoharis Theoharides		theoharis.theoharides@tufts.edu
<p>This course investigates the appraisal of molecular mechanisms by which drugs can affect cellular processes underlying clinical syndromes such as hypersensitivity, rejection, autoimmunity and neuroimmune disorders. Emphasis is placed on select cases of how certain compounds were chosen for drug development and why many such promising drugs failed.</p>				

<b>137698</b>	<b>Behavioral Pharmacology</b>			
Subject:	Catalog Nbr:			
PPET	0219			
<p>This course is an in-depth examination of the mechanisms by which selected psychoactive agents alter mood</p>				

# Course Bulletin

and behavior with emphasis on the role of neurotransmitters and their receptors.

<b>137710</b>	<b>Advances in Neurochem</b>			
Subject:	Catalog Nbr:			
PPET	0220			
This course focuses on the problem-based approach to the actions of neurotransmitters and neuromodulators and related drugs at the molecular and cellular level.				

<b>137724</b>	<b>Pharmacokinetics in Biological Systems</b>			
Subject:	Catalog Nbr:			
PPET	0221			
2020 Fall	Primary	David Greenblatt	dj.greenblatt@tufts.edu	
2020 Fall	Secondary	Jerold Harmatz	jerold.harmatz@tufts.edu	
This course focuses on the uptake and clearance of drugs, using problem-solving exercises and computer modeling to analyze data from original experiments				

<b>137735</b>	<b>Toxicology</b>			
Subject:	Catalog Nbr:			
PPET	0222			
This course is an in-depth examination of the basic principles of toxicology based on discussion and presentation of selected examples. Subjects considered include apoptosis/necrosis, molecular mechanisms of neurotoxicities, species difference in toxicities, and chemical mutagenesis.				

<b>137756</b>	<b>Neuropeptides</b>			
Subject:	Catalog Nbr:			
PPET	0224			
This course entails detailed reading and critical review of the classical and modern literature on the discovery, chemistry, anatomical distribution, biosynthesis, physiology, pharmacology and current and possible future clinical uses of neuropeptides.				

<b>137777</b>	<b>Introduction to Drug Metabolism</b>			
Subject:	Catalog Nbr:			
PPET	0225			
This is a readings and presentation course designed to illustrate the processes involved with drug metabolism, to describe the non-drug (non-substrate) factors influencing drug metabolism, and to review and critique methods used for the study of drug metabolism.				

<b>137850</b>	<b>Translational Pharmacology II</b>			
---------------	--------------------------------------	--	--	--

# Course Bulletin

Subject:	Catalog Nbr:			
PPET	0232			
2020 SPRG	Primary	Najla Fiaturi		Najla.Fiaturi@tufts.edu
2020 SPRG	Secondary	Theoharis Theoharides		theoharis.theoharides@tufts.edu
2020 SPRG	Secondary	John Castellot		john.castellot@tufts.edu
2020 SPRG	Secondary	Margery Beinfeld		margery.beinfeld@tufts.edu
2020 SPRG	Secondary	Hao Chen		Howard.Chen@tufts.edu
2020 SPRG	Secondary	Gerard Reijmers		Leon.Reijmers@tufts.edu
2020 SPRG	Secondary	Athar Chishti		Athar.Chishti@tufts.edu
2020 SPRG	Secondary	Jonathan Davis		Jonathan.Davis@tufts.edu
2020 SPRG	Secondary	Robert Blanton Jr.		Robert.Blanton@tufts.edu
2020 SPRG	Secondary	Tine Vindenes		Tine.Vindenes@tufts.edu

This course continues with the topics covered in Translational Pharmacology I. It covers major classes of drugs and the concepts, models and techniques in pharmacology.

<b>137860</b>	<b>Scientific Writing and Presentation Skills</b>			
Subject:	Catalog Nbr:			
PPET	0233			
2019 FALL	Primary	Emmanuel Pothos		emmanuel.pothos@tufts.edu
2019 FALL	Secondary	David Greenblatt		dj.greenblatt@tufts.edu
This course provides graduate students with the opportunity to develop the basic skills essential to the effective oral and written communication of scientific findings and research proposals. The course is a combination of lectures, writing assignments, and oral communication practice sessions.				

<b>137871</b>	<b>Laboratory Rotations</b>			
Subject:	Catalog Nbr:			
PPET	0234			
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.				

<b>137881</b>	<b>Laboratory Rotations</b>			
Subject:	Catalog Nbr:			
PPET	0235			
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.				

<b>137889</b>	<b>Laboratory Rotations</b>			
Subject:	Catalog Nbr:			
PPET	0236			
8-10 week laboratory rotations for first-year students are designed to provide experience with experimental				

# Course Bulletin

design and theoretical aspects of the diverse research problems under investigation in various laboratories.

<b>137918</b>	<b>Graduate Seminar</b>			
Subject:	Catalog Nbr:			
PPET	0291			
2020 Fall	Primary	Emmanuel Pothos	emmanuel.pothos@tufts.edu	
Visiting speakers present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.				

<b>137928</b>	<b>Graduate Seminar</b>			
Subject:	Catalog Nbr:			
PPET	0292			
2020 SPRG	Primary	Brent Cochran	brent.cochran@tufts.edu	
2020 SPRG	Primary	Amy Yee	amy.yee@tufts.edu	
2020 SPRG	Primary	Alexei Degterev	Alexei.Degterev@tufts.edu	
2020 SPRG	Secondary	Emmanuel Pothos	emmanuel.pothos@tufts.edu	
Visiting speakers present their scientific research to all members of the program, including faculty, students, and post-doctoral fellows.				

<b>137939</b>	<b>Special Topics in Pharmacology</b>			
Subject:	Catalog Nbr:			
PPET	0293			
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.				

<b>137959</b>	<b>Special Topics in Pharmacology</b>			
Subject:	Catalog Nbr:			
PPET	0294			
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.				

<b>137978</b>	<b>Journal Club</b>			
Subject:	Catalog Nbr:			
PPET	0295			
2020 Fall	Primary	Najla Fiaturi	Najla.Fiaturi@tufts.edu	
2020 Fall	Secondary	Jerold Harmatz	jerold.harmatz@tufts.edu	
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.				

# Course Bulletin

<b>137989</b>	<b>Journal Club</b>			
Subject: PPET	Catalog Nbr: 0296			
2020 SPRG	Primary	Najla Fiaturi	Najla.Fiaturi@tufts.edu	
2020 SPRG	Secondary	Jerold Harmatz	jerold.harmatz@tufts.edu	
2020 SPRG	Secondary	Emmanuel Pothos	emmanuel.pothos@tufts.edu	
Students select articles from the current literature, analyze their significance, and present them for discussion in a seminar group.				

<b>138000</b>	<b>Graduate Research</b>			
Subject: PPET	Catalog Nbr: 0297			
2020 Fall	Primary	Emmanuel Pothos	emmanuel.pothos@tufts.edu	
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>138007</b>	<b>Graduate Research</b>			
Subject: PPET	Catalog Nbr: 0298			
2020 SPRG	Primary	Emmanuel Pothos	emmanuel.pothos@tufts.edu	
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>138017</b>	<b>Graduate Research</b>			
Subject: PPET	Catalog Nbr: 0299			
2020 SUMR	Primary	Emmanuel Pothos	emmanuel.pothos@tufts.edu	
These courses provide guided research on a topic suitable for a doctoral thesis.				

<b>138026</b>	<b>Masters Degree Only</b>			
Subject: PPET	Catalog Nbr: 0402			

<b>138033</b>	<b>PhD Degree Only</b>			
Subject: PPET	Catalog Nbr: 0403			
Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is awarded upon completion of the thesis.				

# Course Bulletin

<b>138043</b>	<b>PhD Degree Only</b>		
Subject:	Catalog Nbr:		
PPET	0404		
Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is awarded upon completion of the thesis.			

<b>138052</b>	<b>PhD Degree Only</b>		
Subject:	Catalog Nbr:		
PPET	0405		
Students enroll in this course when they receive permission to write and defend their theses from their thesis committees. This course represents the effort in the final preparation of the doctoral thesis. A grade of "S" is awarded upon completion of the thesis.			

<b>138644</b>	<b>Transfer Credit</b>		
Subject:	Catalog Nbr:		
TRAN	9999		

<b>138797</b>	<b>Tutorial in Neural Systems and Disease Mechanisms</b>			
Subject:	Catalog Nbr:			
NRSC	0312			
2020 SPRG	Primary	Maribel Rios	Maribel.Rios@tufts.edu	
2020 SPRG	Primary	Giuseppina Tesco	Giuseppina.Tesco@tufts.edu	
2020 SPRG	Secondary	Larry Feig	larry.feig@tufts.edu	
2020 SPRG	Secondary	Michele Jacob	michele.jacob@tufts.edu	
2020 SPRG	Secondary	Klaus Miczek	klaus.miczek@tufts.edu	
2020 SPRG	Secondary	Gerard Reijmers	Leon.Reijmers@tufts.edu	
2020 SPRG	Secondary	Jamie Maguire	Jamie.Maguire@tufts.edu	
2020 SPRG	Secondary	Christopher Dulla	Chris.Dulla@tufts.edu	
2020 SPRG	Secondary	Yongjie Yang	Yongjie.Yang@tufts.edu	
2020 SPRG	Secondary	Dong Kong	Dong.Kong@tufts.edu	
This tutorial is designed as a companion course to NRSC 0310, in order to expand students' understanding of research approaches to common neurological diseases. In preparation for each discussion, students will read historical and recent publications relevant to the class topic, followed by critical discussions of past research advances made and future approaches that might prove most effective in translational research efforts.				

<b>139088</b>	<b>Advanced Cellular Immunology</b>		
---------------	-------------------------------------	--	--

# Course Bulletin

Subject:	Catalog Nbr:			
IMM	0245			
2019 FALL	Secondary	Alexander Poltorak		Alexander.Poltorak@tufts.edu
2019 FALL	Secondary	Cheryl London		Cheryl.London@tufts.edu
2019 FALL	Secondary	Maria Alcaide Alonso		Pilar.Alcaide@tufts.edu
2020 SPRG	Primary	John Iacomini		John.Iacomini@tufts.edu
2020 SPRG	Secondary	Henry Wortis		henry.wortis@tufts.edu
2020 SPRG	Secondary	Stephen Bunnell		Stephen.Bunnell@tufts.edu
2020 SPRG	Secondary	Xudong Li		Xudong.Li@tufts.edu
2020 SPRG	Secondary	Shruti Sharma		Shruti.Sharma@tufts.edu
2020 SPRG	Secondary	Marta Rodriguez Garcia		Marta.Rodriguez Garcia@tufts.edu

This course is designed to give students a solid background in contemporary Cellular Immunology. The course will be based on a lecture series supplemented by extensive readings from the current literature. Thirty minutes of each course is dedicated to discuss the assigned reading material, which is two papers per lecture. Prerequisite: IMM 0212 or equivalent.

<b>139091</b>	<b>System Approaches to Immunology</b>			
Subject:	Catalog Nbr:			
IMM	0252			
2020 SPRG	Primary	Alexander Poltorak		Alexander.Poltorak@tufts.edu
<p>The course introduces mouse as the main model for studies of human biology. It starts with the mouse genetics, continues with classical genetic analysis in the mouse, and moves to genetic basis of immunological phenomena such as receptor editing, B-cell tolerance and autoimmunity. At the end, two lectures and hands-on workshops familiarize students with the basics of microarray analysis and next generation sequencing.</p>				

<b>139092</b>	<b>Immunochemistry- Signaling and Dynamics</b>			
Subject:	Catalog Nbr:			
IMM	0250			
<p>The course covers the genetic basis for lymphocyte differentiation, receptor gene rearrangement, T and B cell antigen-receptor diversity and selection, tolerance, autoimmunity and gene expression.</p>				

<b>139171</b>	<b>Laboratory Research Experience</b>			
Subject:	Catalog Nbr:			
PPET	0134			
2020 Fall	Primary	Emmanuel Pothos		emmanuel.pothos@tufts.edu
<p>16-20 week laboratory rotations for Master's students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.</p>				

<b>139172</b>	<b>Laboratory Research Experience</b>			
---------------	---------------------------------------	--	--	--



# Course Bulletin

Subject: PPET	Catalog Nbr: 0135	2020 SPRG	Primary	Emmanuel Pothos	emmanuel.pothos@tufts.edu
16-20 week laboratory rotations for Master's students are designed to provide experience with experimental design and theoretical aspects of the diverse research problems under investigation in various laboratories.					

<b>139204</b>	<b>Teaching Infectious Diseases</b>				
Subject: GSBS	Catalog Nbr: 0115				
The course provides the background to teach about infectious disease in high school classrooms. The course is based on a 10th – 12th grade (Biology II) curriculum that has been developed by a partnership between a group of Boston teachers and infectious disease specialists from Tufts Medical School. The goal of the course is to teach the key scientific concepts underlying the curriculum - how bacteria, viruses, and parasites cause infectious diseases and how the immune system defends the body against the attack, as well as the pedagogical strategies to deliver the content in the classroom using a variety of inquiry-based constructivist approaches.					

<b>139290</b>	<b>Rotation</b>				
Subject: GSBS	Catalog Nbr: 0236				

<b>139373</b>	<b>Applying Quality Improvement Methods in Healthcare and Public Health</b>				
Subject: CTS	Catalog Nbr: 0231	2020 SPRG	Primary	Denise Daudelin	Denise.Daudelin@tufts.edu
This course aims to provide a broad overview of current trends, core concepts, and methods in quality improvement (QI) and demonstrate their application to healthcare, clinical research and public health. The course focuses on application, and includes didactic instruction, group discussions, and a small group QI project. The semester long QI project involves collaboration with hospital staff or public health practitioners.					

<b>139453</b>	<b>Special Topics in Cell, Molecular, and Developmental Biology</b>				
Subject: CMDB	Catalog Nbr: 0293				
In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic. Fall and Spring.					

<b>139454</b>	<b>Special Topics in Cell, Molecular, and Developmental Biology</b>				
Subject:	Catalog Nbr:				

# Course Bulletin

CMDB	0294			
2019 SUMR	Primary	Alex Bohm	Andrew.Bohm@tufts.edu	

<b>139463</b>	<b>Macromolecular Structural Determination</b>			
Subject:	Catalog Nbr:			
BCHM	0202			
This is an intensive workshop covering the basic theory and practice of modern protein crystallography and NMR. The course alternates between lectures, hands-on demos, and computer exercises.				

<b>139466</b>	<b>Post-placement Rotation</b>			
Subject:	Catalog Nbr:			
GSBS	0234			

<b>139467</b>	<b>Post-placement Rotation</b>			
Subject:	Catalog Nbr:			
GSBS	0235			
Subject:	Catalog Nbr:			
SK	0235			

<b>139826</b>	<b>Advanced Scientific Ethics</b>			
Subject:	Catalog Nbr:			
GSBS	0375			
2019 FALL	Primary	Jamie Maguire	Jamie.Maguire@tufts.edu	
2019 FALL	Secondary	Henry Wortis	henry.wortis@tufts.edu	
2019 FALL	Secondary	Alex Bohm	Andrew.Bohm@tufts.edu	
2019 FALL	Secondary	Najla Fiaturi	Najla.Fiaturi@tufts.edu	
2019 FALL	Secondary	Marta Gaglia	Marta.Gaglia@tufts.edu	
2019 FALL	Secondary	Malavika Raman	Malavika.Raman@tufts.edu	
2019 FALL	Secondary	Shumin Tan	Shumin.Tan@tufts.edu	
This is an NIH-mandated refresher course for responsible conduct of research (RCR) for 5th year students. It builds on SK 0275, Scientific Ethics; students will work in teams to develop a new case study addressing an RCR issue, provide a written in depth analysis and teach the case study to a small group of students enrolled in SK 0275 under the supervision of the course director. The class provides opportunities for team building, writing, ethical analysis and teaching; grading will be based on the quality of case study and analysis, teaching, effort and participation.				

# Course Bulletin

<b>140064</b>	<b>Advanced Topics in Biostatistics</b>			
Subject: CTS	Catalog Nbr: 0533			
	2020 Fall	Primary	Angie Rodday	Angie.Rodday@tufts.edu
	2020 Fall	Primary	Norma Terrin	norma.terrin@tufts.edu
	2020 Fall	Primary	Farzad Noubary	Farzad.Noubary@tufts.edu
<p>This course provides background in advanced applied statistical methods in clinical research. Topics in the course include Poisson, multinomial, and ordinal regression, competing risk survival models, longitudinal data analysis, and hierarchical mixed models. The course provides students with the statistical foundations of these methods and their applications in clinical research.</p>				

<b>140127</b>	<b>Advanced Epidemiology &amp; Regression Methods: An Integrated Approach</b>			
Subject: CTS	Catalog Nbr: 0575			
	2020 SPRG	Primary	Angie Rodday	Angie.Rodday@tufts.edu
	2020 SPRG	Primary	Jessica Paulus	Jessica.Paulus@tufts.edu
	2020 SPRG	Primary	Farzad Noubary	Farzad.Noubary@tufts.edu
<p>This course serves as an introduction to more advanced topics in epidemiologic study design and biostatistical modeling with a focus on multivariate regression methods. It begins with the randomized clinical trial as a paradigm, and proceed to examine observational designs in depth, including prospective and retrospective cohorts, and those sampling from an underlying cohort (i.e. case-control). Design, sampling and analysis strategies and the biases that are specific to each study design will be discussed.</p>				

<b>140320</b>	<b>Design and Analysis of Bioequivalence Studies</b>			
Subject: PPET	Catalog Nbr: 0281			
	2020 SPRG	Primary	Emmanuel Pothos	emmanuel.pothos@tufts.edu
<p>A generic drug is bioequivalent to a brand name drug when their bioavailabilities (assessed by the respective plasma concentration time curves) after administration in the same molar dose are essentially the same. The comparison of the bioavailabilities is examined by conducting a bioequivalence study. The course will train the students in the design and data analysis of bioequivalence studies.</p>				

<b>140762</b>	<b>Basic Skills for Scientists I</b>			
Subject: GSBS	Catalog Nbr: 0101			
	2019 FALL	Primary	Henry Wortis	henry.wortis@tufts.edu
	2019 FALL	Secondary	Maribel Rios	Maribel.Rios@tufts.edu
<p>This three-module course is designed to give trainees basic skills in oral and written presentation, in approaches to the reading of the scientific literature, and designing experiments and interpreting quantitative data.</p>				

# Course Bulletin

<b>140763</b>	<b>Basic Skills for Scientists II</b>			
Subject:	Catalog Nbr:			
GSBS	0102			
2020 SPRG	Primary	Henry Wortis	henry.wortis@tufts.edu	
2020 SPRG	Primary	Maria Alcaide Alonso	Pilar.Alcaide@tufts.edu	
2020 SPRG	Secondary	Misha Eliasziw	Misha.Eliasziw@tufts.edu	
2020 SPRG	Secondary	Karl Munger	Karl.Munger@tufts.edu	
2020 SPRG	Secondary	Aimee Shen	Aimee.Shen@tufts.edu	
This three module course is designed to give trainees basic skills in in presenting data and in writing grant applications.				

<b>141543</b>	<b>Translational Medicine - Drug Discovery to Clinical Development</b>			
Subject:	Catalog Nbr:			
PPET	0205			
This comprehensive course covers key processes from drug discovery to development, including the progression and translation of scientific information through different development stages and the transition to clinical studies, to increase the probability of creating a successful therapeutic product The goal is to impart sufficient background to provide an overall understanding of Translational Medicine that is integral to scientific rationale in Drug Research and Development.				

<b>141547</b>	<b>Mouse Transgenic Model</b>			
Subject:	Catalog Nbr:			
CMDB	0350			
This course provides an overview of using the mouse to develop transgenic models of gene expression and gene targeting. In the first half of this course, students will discuss basic transgenic and gene targeting construct design, methods to generate transgenic mice by microinjection methods, and conditional and inducible systems. In the second half of the course, the focus will be on genome editing techniques such as CRISPR/Cas9, zinc finger nucleases, and TALENs, as well as their applications.				

<b>141552</b>	<b>Introduction to Infectious and Inflammatory Diseases</b>			
Subject:	Catalog Nbr:			
IMM	0223			
2019 SUMR	Primary	Miguel Stadecker	miguel.stadecker@tufts.edu	
2019 SUMR	Primary	Andrew Plaut	andrew.plaut@tufts.edu	
2019 SUMR	Secondary	Ralph Isberg	ralph.isberg@tufts.edu	
This course is comprised of three integrated components; 1) a Medical Microbiology and Inflammation/Immunology Tutorial designed to introduce students to pathogens and pathophysiology of infectious and inflammatory diseases, 2) Infectious and Inflammatory Diseases Problem-Based Learning designed to introduce students to clinical cases, and 3) Teaching Clinics designed to expose students to real clinical cases and treatment options.				

# Course Bulletin

<b>141613</b>	<b>Survey of Clinical Care Research</b>		
	Subject: CTS	Catalog Nbr: 0125	
<p>This course offers an introduction to contemporary topics and instruments in clinical care research, with a focus on the role of outcomes research, health economics, systematic reviews and clinical decision making in clinical and translational science. Foundational concepts in clinical trial design (pragmatic and explanatory), meta-analysis and systematic review, health services research, bench-to-bedside translational research, decision analysis, pharmaco-economics and prediction models are surveyed by program faculty. This course also reinforces and applies core concepts in biostatistics and epidemiology by illustrating how study designs and statistical approaches may be applied in the context of these designs and analytic approaches, as well as highlighting pitfalls to certain applications.</p>			

<b>141614</b>	<b>Principles of Biostatistics for Clinical Research</b>		
	Subject: CTS	Catalog Nbr: 0127	
<p>This course introduces the basic principles and applications of statistics, as they are applied to problems in clinical research. The emphasis is on developing an understanding of the assumptions, limitations, practical considerations and critical thinking in the use of statistical methods in data arising from continuous, binary, and time-to-event data. This course will also introduce biostatistical modeling with a focus on multivariate regression methods. Through webinars, the course will include data exercises and class discussion of articles from the scientific literature that apply methods covered in lectures.</p>			

<b>141615</b>	<b>Elements of Epidemiology for Clinical Research</b>		
	Subject: CTS	Catalog Nbr: 0123	
<p>This course serves as an introduction to topics in epidemiologic study design and analysis, with a focus on those relevant to clinical epidemiology and comparative effectiveness research. After examining the randomized clinical trial as a paradigm, the course proceeds to review the major observational designs, including ecologic, cross-sectional, cohort, and case-control studies. For each study design, relevant sampling and analytical strategies, measures of association and the attendant biases will be covered. Principles and methods will be illustrated through several interactive webinars that include discussion of articles from the literature, data analytic exercises, and causal diagrams.</p>			

<b>141715</b>	<b>Health Economics</b>		
	Subject: CTS	Catalog Nbr: 0557	
	2020 SPRG	Primary	James Chambers
	2020 SPRG	Secondary	Tara Lavelle
	2020 SPRG	Secondary	David Kim
			James.Chambers@tufts.edu
			Tara.Lavelle@tufts.edu
			dd.kim@tufts.edu

# Course Bulletin

This course aims to introduce health care professionals and clinical researchers to key economic concepts and their relation to health care. The course is designed for students with no or rudimentary understanding of economics. In addition to providing students with a foundation in economics, the course will provide students with an understanding of the structure and performance of the US health care system, and an introduction to methods for the economic evaluation of medical technology. The course will also include lectures on the regulation of medical technology, health care innovation, and emerging health policy trends. Coursework will include a workshop in which students will gain hands-on experience manipulating economic evaluations for medical technology.

<b>142318</b>	<b>Inflammation and Chronic Inflammatory Diseases</b>			
Subject:	Catalog Nbr:			
IMM	0230			
2019 FALL	Primary	Maria Alcaide Alonso	Pilar.Alcaide@tufts.edu	
2019 FALL	Secondary	Miguel Stadecker	miguel.stadecker@tufts.edu	
2019 FALL	Secondary	Li Zeng	Li.Zeng@tufts.edu	
2019 FALL	Secondary	Giuseppina Tesco	Giuseppina.Tesco@tufts.edu	
2019 FALL	Secondary	Cheryl London	Cheryl.London@tufts.edu	
2019 FALL	Secondary	Athan Kuliopulos	athan.kuliopulos@tufts.edu	
2019 FALL	Secondary	Robert Blanton Jr.	Robert.Blanton@tufts.edu	
2019 FALL	Secondary	Xudong Li	Xudong.Li@tufts.edu	
2019 FALL	Secondary	Shruti Sharma	Shruti.Sharma@tufts.edu	
2019 FALL	Secondary	Maher Ghamloush	Maher.Ghamloush@tufts.edu	
<p>The course focuses on reading primary literature about the role of inflammation in several chronic diseases. The emphasis is on understanding the role of the immune response during the initiation and progression of chronic inflammatory diseases. The course will explore human diseases and delve into available animal models for such conditions, discuss the beneficial vs pathological aspects of inflammation in various diseases, and ongoing therapies and clinical trials for such conditions.</p>				

<b>142319</b>	<b>Clinical Trial Practicum</b>			
Subject:	Catalog Nbr:			
CTS	0520			
<p>This course is designed to explore how to design and run real-world clinical trials. Course activities will include hands-on activities in the CTRC with clinical trial principal investigators and staff, invitations to attend IRB and Scientific Review Committees, and meetings with the CTRC Scientific Director and administrative leadership. Through these activities, students will be exposed to some of the cornerstones of launching and implementing a clinical trial. Topics to be covered include cohort identification, patient recruitment, protection of human subjects, disease registries (especially for rare diseases), data collection (biological samples and patient questionnaires) and organizing and managing patient visits at the Clinical and Translational Research Center at Tufts Medical Center.</p>				

<b>142383</b>	<b>Foundations in Biostatistics and Computational Biology</b>			
Subject:	Catalog Nbr:			

# Course Bulletin

CMDB      0320
Introduction to biostatistics with application to the biomedical sciences and genetics, and introduction to computational biology.

<b>142483</b>	<b>Building Diversity in Biomedical Sciences Summer Research Experience</b>		
Subject:	Catalog Nbr:		
GSBS	0099		
Summer residential research program designed to develop interest and talent in underrepresented minority students in STEM.			

<b>142496</b>	<b>CNS Drug Discovery</b>		
Subject:	Catalog Nbr:		
NRSC	0277		
<p>This course covers the process of bringing a new pharmaceutical treatment against disorders of the central nervous system (CNS) to the market, starting at the conception of a novel idea. Compared to other disease areas, CNS drug discovery faces – literally – several additional barriers. Most importantly, therapeutics need to cross the blood-brain-barrier in order to reach their site of action. This provides unique challenges throughout the discovery and development stages, especially for large molecules like antibodies. Moreover, CNS drug discovery has a high need for innovation in areas such as biomarker development and drug delivery. Students will gain an understanding of pre-clinical research, including molecular, biological, neuroanatomical, electrophysiological, and behavioral techniques; biomarker development and strategy, as well as proof of mechanism and concept testing in volunteers and patients.</p>			

<b>142692</b>	<b>Advanced Topics in Microbiology O</b>		
Subject:	Catalog Nbr:		
MMB	0260		
This collection of lectures of four trending topics in Microbiology is offered in odd years.			

<b>142693</b>	<b>Advanced Topics in Microbiology E</b>		
Subject:	Catalog Nbr:		
MMB	026E		
2020 SPRG	Primary	Wai-Leung Ng	Wai-Leung.Ng@tufts.edu
2020 SPRG	Secondary	Andrew Camilli	andrew.camilli@tufts.edu
2020 SPRG	Secondary	Ralph Isberg	ralph.isberg@tufts.edu
2020 SPRG	Secondary	Bree Aldridge	Bree.Aldridge@tufts.edu
2020 SPRG	Secondary	Shumin Tan	Shumin.Tan@tufts.edu
This collection of lectures of four trending topics in Microbiology is offered in even years.			

<b>143029</b>	<b>Special Topics in Genetics A</b>		
---------------	-------------------------------------	--	--

# Course Bulletin

Subject: Catalog Nbr:  
GENE 293A

In-depth information is provided on selected topics. Students may also pursue guided individual study of an approved topic.

**143078****Design and Execution of Clinical Trials**

Subject: Catalog Nbr:  
PPET 0261

This course will provide graduate students with an understanding of the basic principles and methodology by which a putative therapeutic agent that has been proven safe and effective in preclinical animal models can be developed into one that is suitable for marketing for clinical use in human patients.

**143189****Externship**

Subject: Catalog Nbr:  
GSBS 0899

Summer internship experience in biotech, pharmaceuticals, and other biomedical industry. Requires application, program consent, mentor consent, and dean's office approval; must have completed 2 complete academic years and the Qualifying Exam.

**143441****Master's Continuation**

Subject: Catalog Nbr:  
PPET 0103

Student who have not completed their Master's Research by the end of the 2-year program enroll in this course during their third fall term. There is no tuition charge for this course, but all enrolled students must pay the laboratory fee.

**143846****External Cross-Registration**

Subject: Catalog Nbr:  
GBCR 0550

External Cross Registration (BC, BR, or BU)

**144162****Introduction to Genetics**

Subject: Catalog Nbr:  
GENE 0301

2019 FALL	Primary	Brent Cochran	brent.cochran@tufts.edu
2019 FALL	Primary	Alexander Poltorak	Alexander.Poltorak@tufts.edu
2019 FALL	Secondary	Victor Hatini	Victor.Hatini@tufts.edu
2019 FALL	Secondary	Peter Juo	Peter.Juo@tufts.edu
2019 FALL	Secondary	Pamela Yelick	Pamela.Yelick@tufts.edu



# Course Bulletin

2019 FALL	Secondary	Claudette Gardel	Claudette.Gardel@tufts.edu
2019 FALL	Secondary	Gordon Huggins	Gordon.Huggins@tufts.edu
2019 FALL	Secondary	Lucy Liaw	Lucy.Liaw@tufts.edu

This course serves as an introduction to genetics, building on student prior knowledge of Mendelian Genetics Principles, to provide a solid knowledge and understanding of the basic principles of Genetics for research in eukaryotes, and how they have developed as the field has matured.

The goal of this course is to teach students modern methods of genetic analysis of model organisms, ranging from simple eukaryotic yeast to humans. Students will learn how to use molecular genetics to answer biological questions and read current literature in genetics.

The second part of the course will introduce mouse as the main model for studies of human biology, development and disease. It will start with mouse genetics, will continue with classical genetic analyses in the mouse, and will move to genetic basis of immunological phenomena such as receptor editing, B-cell tolerance and autoimmunity. Experience with reading current primary literature in the field will also be included. At the completion of the course, two lectures and hands-on workshops will have familiarized students with the basics of microarray analysis and next generation sequencing (NGS).

<b>144163</b>		<b>Health Care Activism, Community Health, and Patient-Centered Research</b>			
Subject:	Catalog Nbr:				
CTS	0549				
2020 SPRG	Primary	Peter Levine	Peter.Levine@tufts.edu		
2020 SPRG	Primary	Carolyn Rubin	Carolyn.Rubin@tufts.edu		
2020 SPRG	Primary	Thomas Concannon	Thomas.Concannon@tufts.edu		
<p>This introductory course focuses on principles and methods that can be used to support the involvement of stakeholders in research. The course will examine three approaches to stakeholder and community engagement that have addressed theory, principles, challenges, and potential benefits.</p> <p>The three approaches include patient-centered research in which researchers collaborate with the public to make research more useful, community-based health research in which researchers and communities work together to co-create research, and health care activism in which individuals come together to influence stewards of publicly-funded research.</p>					

<b>144228</b>		<b>Glia-Neuron Interactions in Development and Disease</b>			
Subject:	Catalog Nbr:				
NRSC	0248				
2020 SPRG	Primary	Yongjie Yang	Yongjie.Yang@tufts.edu		
2020 SPRG	Secondary	F Jackson	rob.jackson@tufts.edu		
2020 SPRG	Secondary	Maribel Rios	Maribel.Rios@tufts.edu		
2020 SPRG	Secondary	Philip Haydon	Philip.Haydon@tufts.edu		
2020 SPRG	Secondary	Giuseppina Tesco	Giuseppina.Tesco@tufts.edu		
2020 SPRG	Secondary	Christopher Dulla	Chris.Dulla@tufts.edu		
2020 SPRG	Secondary	Shruti Sharma	Shruti.Sharma@tufts.edu		
<p>This course will introduce and discuss development of different glial cell types in several model systems and how they distinctly interact with neurons and the physiological and pathological significance of their</p>					

# Course Bulletin

interactions will be discussed. In addition, unique experimental approaches to study glia will also be included.

<b>144398</b>	<b>Brandeis Cross Registration</b>			
Subject:	Catalog Nbr:			
SKBR	0550			
Brandeis Cross Registration				

<b>144636</b>	<b>Special Topics GSBS-wide</b>			
Subject:	Catalog Nbr:			
GSBS	0294			
2020 SPRG	Primary	Daniel Jay		daniel.jay@tufts.edu
2020 SPRG	Primary	Stefan Gross		Stefan.Gross@tufts.edu
2020 SPRG	Secondary	Paul Beninger		Paul.Beninger@tufts.edu

<b>144915</b>	<b>Communities of Practice and Management in Academia and Industry</b>			
Subject:	Catalog Nbr:			
GSBS	0180			
2020 Fall	Primary	Daniel Jay		daniel.jay@tufts.edu
2020 Fall	Primary	Stefan Gross		Stefan.Gross@tufts.edu
<p>This course will introduce concepts of management skills and provide talks by alumni in differing careers who will discuss what the community of practice is for their workplace. As academic and industry workplaces have different unwritten rules of conduct we will have talks on academic (research intensive and primarily undergraduate), industrial (start-up, biotech and big pharma) and non-bench science careers (venture, IP, policy). Students will present based on their analysis of one specific workplace with regard to its community of practice.</p>				

<b>145056</b>	<b>Introduction to Genetics</b>			
Subject:	Catalog Nbr:			
GENE	0212			
2020 Fall	Primary	Pamela Yelick		Pamela.Yelick@tufts.edu
2020 Fall	Primary	Gregory Cox		Gregory.Cox@tufts.edu
2020 Fall	Primary	Philip Hinds		Phil.Hinds@tufts.edu
2020 Fall	Secondary	Brent Cochran		brent.cochran@tufts.edu
2020 Fall	Secondary	Victor Hatini		Victor.Hatini@tufts.edu
2020 Fall	Secondary	Peter Juo		Peter.Juo@tufts.edu
2020 Fall	Secondary	Claudette Gardel		Claudette.Gardel@tufts.edu
2020 Fall	Secondary	Gordon Huggins		Gordon.Huggins@tufts.edu
2020 Fall	Secondary	Steven Munger		Steven.Munger@tufts.edu
<p>The goal of the first part of the course is to provide a common foundation for all students in the major</p>				

# Course Bulletin

principles of molecular genetics upon which they can base more advanced studies. By the end of this course students are expected to understand the major principles of molecular genetics and the underlying processes by which cells and organisms replicate, repair, read, and translate their genetic codes. Students should achieve an advanced understanding of these topics that will allow them to read the primary research literature, understand the biological processes examined, and interpret the results in the larger context of molecular genetics. The goal of the second part is to build upon the first to provide a solid knowledge and understanding of the basic principles of Genetic model organisms, ranging from research in eukaryotes, and how they have developed as the field has matured. The goal of this course is to teach students modern methods of genetic analysis of model organisms, ranging from simple eukaryotic yeast to humans. Students will learn how to use molecular genetics to answer biological questions and read current literature in genetics. Experience with reading current primary literature in the field, and with the basics of microarray analysis and next generation sequencing (NGS).