COMMITTEE ON CLINICAL AND TRANSLATIONAL SCIENCE

The Committee on Clinical & Translational Science (CCTS) is a freestanding academic unit housed within the Biological Sciences Division. Our mission is to enhance multidisciplinary training in clinical and translational science at the University of Chicago. We seek to offer high-quality curriculum and mentorship to a new generation of researchers who will synthesize social and biological science to significantly advance medical science and practice.

With joint input from CHeSS and the Institute for Translational Medicine, the CCTS mobilizes faculty from across the University of Chicago to enhance course offerings at the university in clinical and translational science. We organize these courses into coherent areas of concentration designed to provide graduate-level trainees, postdoctoral fellows, and junior faculty with state-of-the-art skills in the field. For more information contact Kelsey Bogue, committee administrator at kbogue@bsd.uchicago.edu. You can also visit our website at chess.uchicago.edu/CCTS.

Current Areas of Concentration include:
- Comparative Effectiveness Research
- Translational Informatics
- Health Services Research
- Quality & Safety
- Clinical Research
- Community-Based Research
- Global Health
- Pharmacogenomics

In the "courses" tab there is a list of graduate courses that have been offered over the past two years. Refer to the CCTS section of the CHeSS website for current course offerings and prerequisites for each course:

http://chess.uchicago.edu/CCTS

CLINICAL AND TRANSLATIONAL SCIENCE COURSES

CCTS 31300. Infectious Disease Epidemiology; Networks and Modeling. 100 Units.
No description available.
Instructor(s): M. David, J. Schneider Terms Offered: Spring 2015
Prerequisite(s): PBHS 30700 or PBHS 30900 or introductory epidemiology or consent of instructor.
Equivalent Course(s): PBHS 31300, BIOS 25419, MEDC 31300
CCTS 32411. Mediation, Moderation, and Spillover Effects. 100 Units.
This course is designed for graduate students and advanced undergraduate students from social sciences, statistics, public health science, public policy, and social services administration who will be or are currently involved in quantitative research. Questions about why a treatment works, for whom, under what conditions, and whether one individual’s treatment could affect other individuals’ outcomes are often key to the advancement of scientific knowledge. We will clarify the theoretical concepts of mediated effects, moderated effects, and spillover effects under the potential outcomes framework. The course introduces cutting-edge methodological approaches and contrasts them with conventional strategies including multiple regression, path analysis, and structural equation modeling. The course content is organized around application examples. The textbook “Causality in a Social World: Moderation, Mediation, and Spill-Over” (Hong, 2015) will be supplemented with other readings reflecting latest developments and controversies. Weekly labs will provide tutorials and hands-on experiences. All students are expected to contribute to the knowledge building in class through participation in presentations and discussions. Students are encouraged to form study groups, while the written assignments are to be finished and graded on an individual basis. Intermediate Statistics, Introduction to Causal Inference, and their equivalent are prerequisites.
Instructor(s): G. Hong Terms Offered: Spring
Prerequisite(s): Intermediate Statistics, Introduction to Causal Inference, and their equivalent
Note(s): CHDV Distribution, M*; M*
Equivalent Course(s): PSYC 32411, PBPL 29411, STAT 33211, SOCI 30318, CHDV 32411

CCTS 32901. Introduction to Clinical Trials. 100 Units.
This course will review major components of clinical trial conduct, including the formulation of clinical hypotheses and study endpoints, trial design, development of the research protocol, trial progress monitoring, analysis, and the summary and reporting of results. Other aspects of clinical trials to be discussed include ethical and regulatory issues in human subjects research, data quality control, meta-analytic overviews and consensus in treatment strategy resulting from clinical trials, and the broader impact of clinical trials on public health.
Instructor(s): TBD Terms Offered: TBD. Course not offered every year.
Prerequisite(s): PBHS 32100 or STAT 22000; Introductory Statistics or Consent of Instructor
Equivalent Course(s): STAT 35201, PBHS 32901
CCTS 40003. Genomics of Personalized Medicine. 050 Units.
Aspects of genomics have slowly become integrated into many levels of medical research. This has led to the incorporation of genomics into clinical trial design, cost-effectiveness research, pharmacogenetic studies, as well as influencing the direction of basic science investigation. The field of medical genomics is fast moving and requires specialized knowledge in genetics, statistics, molecular and cell biology, animal models, and epidemiology, thus making it a highly collaborative and translational field. This is a new course designed specifically for upper level graduate students, fellows and junior faculty members, and is meant to provide a strong overview of several areas of knowledge needed to integrate genomics into medical research. Each class will address a different aspect of genetics and genomics as they relate to disease, with emphasis on state-of-the-art research methods, current study designs and analysis, and relevant clinical examples drawn from a wide range of medical fields. At the end of this course, clinicians and translational researchers will have a good understanding of how genetics/genomics provides a basis for personalized medicine.
Instructor(s): Minoli Perera Terms Offered: Summer
Equivalent Course(s): CABI 40400, MPMM 40400

CCTS 40004. Advanced Clinical Pharmacology I. 050 Units.
This course provides an interactive introduction to fundamental principles of the practice of clinical pharmacology relevant to drug development and personalized therapeutics. Topics include: pharmacokinetics, drug metabolism, protein binding, absorption and renal and hepatic elimination, pharmacodynamics, introduction to modeling methods, evaluation of adverse events, and pre-clinical and clinical elements of drug development.
Instructor(s): N. Pinto, M. Sharma Terms Offered: Autumn
Prerequisite(s): MEDC 30777, equivalent Intro to Pharmacology course, or instructor approval.

CCTS 40006. Pharmacogenomics: Discovery and Implementation. 100 Units.
Pharmacogenomics is aimed at advancing our knowledge of the genetic basis for variable drug response. Advances in genetic knowledge gained through sequencing have been applied to drug response, and identifying heritable genetic variants that predict response and toxicity is an area of great interest to researchers. The ultimate goal is to identify clinically significant variations to predict the right choice and dose of medications for individuals—"personalizing medicine." The study of pharmacogenomics is complicated by the fact that response and toxicity are multigenic traits and are often confounded by nongenetic factors (e.g., age, co-morbidities, drug-drug interactions, environment, diet). Using knowledge of an individual’s DNA sequence as an integral determinant of drug therapy has not yet become standard clinical practice; however, several genetics-guided recommendations for physicians have been developed and are highlighted. The ethics and economics of pharmacogenomics are also discussed.
Instructor(s): M. E. Dolan, R. S. Huang Terms Offered: Spring
Prerequisite(s): BIOS 20186 and 20187 and consent of Instructor.
Equivalent Course(s): CABI 47510, BIOS 25310
CCTS 40200. Cancer Biology 2: Molecular Mechanisms in Cancer Biology. 100 Units.
This course provides students with an in-depth understanding of how key cellular processes are deregulated in cancer and the molecular mechanisms underpinning these defects. The course covers cell cycle checkpoint control, cell death, tumor suppressor and oncogene function, DNA repair mechanisms, epigenetics of cancer, nuclear hormone receptor activity in cancer, tumor metabolism, hypoxia responses, angiogenesis and metastasis. In addition to material covered in formal lectures, discussion sessions cover tumor stem cells, "oncogene addiction," inflammatory responses, cancer therapeutics, mouse models of human cancer and other topical subjects relevant to understanding tumor initiation and progression, as well as how current research may facilitate cancer treatment.
Instructor(s): Donald Vander Griend Terms Offered: Winter
Equivalent Course(s): MPMM 30900, CABI 30900

CCTS 40300. Signal Transduction and Disease. 100 Units.
Topics include receptor ligands, membrane receptor tyrosine kinases and phosphatases, G proteins, proto-oncogenes, signaling pathways, cytoplasmic protein kinases and phosphatases, transcription factors, receptor-nucleus signaling, development and cancer, genetic dissection of signaling pathways, cell growth and cell proliferation, interplay of cell cycle regulators, cell cycle progression and apoptosis, and sensing of hypoxia and mechanical stimuli. The role of signaling in disease is a theme throughout the course.
Instructor(s): N. Dulin Terms Offered: Winter
Equivalent Course(s): MPMM 30600

CCTS 42000. Introduction to Clinical Research Informatics. 050 Units.
Informatics is the science of information, studying how "data" is acquired, structured, stored, processed, retrieved, analyzed, and ultimately communicated in order to become actionable "information." Given the extraordinary growth in the quantity, source, variety and availability of health data, clinical informatics (a.k.a. healthcare informatics, biomedical informatics, medical informatics, etc.) has become a fundamental skill that should be familiar to every profession within healthcare. This course provides an introduction to clinical and research informatics, describing the fundamental concepts, vocabularies, techniques and trends needed for one to participate in healthcare discussions and research. This course addresses areas foundational to clinical and research data development, clinical decision support, mobile applications of healthcare information, and the human computer interactions that have become necessary in today’s healthcare environment. We will focus on the patient, health care provider, and the health care delivery institutions, framing each theme with the overarching clinical and research use cases applied to that topic. In addition to the foundational concepts of informatics, this course will also address sources and forms of clinical and provider data, system integration, analytics and educational applications and new and emerging uses of technology.
Instructor(s): J. Segal, S. Volchenbaum, D. McClintock, C. Kao Terms Offered: Winter
CCTS 43100. Topics in Global Health. 100 Units.
This course is a continuation of Introduction to Global Health (CCTS 43000). It is designed to address specific medical issues of global significance including maternal and child health, communicable and non-communicable diseases, and emerging diseases; the course will also address the impact of population growth, migration, environmental decay, and humanitarian disasters on health. Finally, the course will discuss research and career opportunities within the field of global health.
Instructor(s): C. S. Olopade Terms Offered: Winter
Prerequisite(s): This course does not meet the requirements for the Biological Sciences major.
Equivalent Course(s): BIOS 29279

CCTS 45000. Introduction to Biostatistics. 100 Units.
This course will provide an introduction to the basic concepts of statistics as applied to the bio-medical and public health sciences. Emphasis is on the use and interpretation of statistical tools for data analysis. Topics include (i) descriptive statistics; (ii) probability and sampling; (iii) the methods of statistical inference; and (iv) an introduction to linear and logistics regression.
Instructor(s): S. Watson Terms Offered: Summer
Prerequisite(s): 2 quarters of pre-calculus
Note(s): *In addition to the course, there is a statistical computing workshop on Wednesdays from 10-11:30am.
Equivalent Course(s): PBHS 32100

CCTS 45100. Clinical Epidemiology. 100 Units.
Clinical epidemiology is the "application of epidemiologic principles and methods to problems encountered in clinical medicine." This course introduces the basic principles of epidemiologic study design, analysis and interpretation, with a particular focus on clinical applications. The course includes lectures and discussions based on critical appraisal of significant research articles. The course is primarily intended for, but not restricted to, students with prior clinical training. Public Health Sciences 30700 and 30900 may not both be taken for credit, either will fulfill the basic epidemiology requirement for the MSCP in Public Health Sciences and either will serve as the epidemiology prerequisite for Public Health Sciences 31001.
Instructor(s): B. Chiu, D. Lauderdale Terms Offered: Summer
Prerequisite(s): Introductory statistics recommended, may be taken concurrently.
Equivalent Course(s): PBHS 30700
CCTS 45200. Fundamentals of Health Services Research: Theory, Methods & Applications. 100 Units.
This course is designed to provide an introduction to the fundamentals of health services research. The basic concepts of health services research will be taught with emphasis on both their social scientific foundations and the methods needed for their practical application to empirically relevant research. Theoretical foundations will draw on principles from economics, sociology, psychology, and the other social sciences. Methodological topics to be covered will include techniques for data collection and analysis, including outcomes measurement, survey methods, large data set research, population-based study design, community based participatory research, research based in clinical settings, qualitative methods, cost-effectiveness analysis, and tools of economic and sociological analysis. The theoretical and empirical techniques taught will emphasize those relevant to the examination of health care costs, quality, and access. Major applications will include: measurement and improvement of health care quality, analysis of health disparities, analysis of health care technology, and analysis of health care systems and markets.
Instructor(s): David Meltzer, Marshall H. Chin Terms Offered: Summer

CCTS 46001. Fundamentals of Quality Improvement and Patient Safety (QI & PS 101) 025 Units.
Quality Improvement Patient Safety was designed for faculty and staff at University of Chicago Medicine with the support of the Center for Clinical and Translational Science (CCTS). The course provides an overview of concepts and methodologies for improving the quality and safety of care. Participants will design quality improvement projects using skills learned in class. In addition, UCMC leaders will speak on key topics throughout the course. Participants will become familiar with tools for improving quality of care and service delivery, such as the Model for Improvement and Lean Performance Improvement. Participants will design an actual quality improvement project and complete a personal improvement project using skills learned in the class. Participants will understand the factors impacting the delivery of safe and high quality care in health care organizations such as teamwork, good communication and organization culture. Participants will understand “Systems Thinking” and other key concepts in patient safety such as Human Factors and Reliability. Participants will understand the key role of QI in today’s health care environment as a mechanism for improving organizational effectiveness and the patient experience. The course is comprised of seven classes total. Faculty, staff, and students/trainees at the University of Chicago Medical Center are welcome to audit the course and should contact Kelsey Bogue at kbogue@bsd.uchicago.edu to register.
Instructor(s): A. Davis, L. Botwinick Terms Offered: Autumn
CCTS 46003. Advanced Healthcare Quality and Improvement. 050 Units.
This course will provide critical content in Quality Improvement and Patient Safety for faculty and staff leaders at University of Chicago Medicine. Participants will be provided with a general overview of concepts and methodologies for improving the quality and safety of care. This course will provide the practical skills and knowledge necessary to assess and improve quality of care, as well as key concepts relating to the Science of Improvement. Important literature in the area of quality improvement and patient safety will be covered. The course will also address the importance of the system within which improvement activities are being implemented, including organization culture and leadership. The health policy and regulatory context for QI will also be covered. Personal improvement projects will be completed as part of this course as a way of teaching improvement concepts.
Instructor(s): W. Padula Terms Offered: Spring
Prerequisite(s): Preferred background in intro to quality and improvement.
Note(s): Please note that this course is limited and you must apply for the course to be eligible. Staff will notify you prior to class if you are able to enroll.

CCTS 47000. Bioinformatics analysis of high-throughput genomics data. 100 Units.
Biomedical researches all around the world are starting to exploit the power of high-throughput genomics technologies to address an increasingly diverse range of biological problems. The primary bottleneck in using big genomics data including Next Generation Sequencing (NGS), is the bioinformatics; high-throughput genomics data analysis is not trivial and requires access to dedicated High Performing Computing (HPC) infrastructures, to address the CPU intensive and memory demanding analysis tasks. The focus of this course is training researchers on the use of computational technologies and the latest bioinformatics analysis tools, required to deal with big genomics data. This training will cover a complete range of technologies and applications from the basics of computational thinking to the large-scale data analysis on Linux and HPC infrastructures. Topics include microarray data analysis using R, the implementation of open source based NGS analysis workflows for RNA-seq data, genomics visualization tools (e.g., IGV, UCSC, circos, etc.) and tools that can perform the most common everyday tasks for bioinformaticians of “omics” data. The course will cover in-depth practical theory and hands-on training.
Instructor(s): S. Volchenboum, J. Andrade, R. Bao, K. Hernandez, L. Huang, W. Kang, S.Kadri Terms Offered: Autumn. Autumn (not offered every year); Meets over four days in December.
Equivalent Course(s): CCTS 27000
CCTS 47001. Advanced Community Based Participatory Research (CBPR) 
Training Program 1. 000 Units.
The goal of health-related research is to improve the lives of people in the 
community studied. In traditional research, the community is not actively involved 
in designing the projects. Community-based participatory research is a partnership 
approach to research that equitably involves community members, organizational 
representatives, and academic researchers in all aspects of the research process. The 
Advanced CBPR Training Program is designed to help meet the growing need and 
demand for educational resources that help build the knowledge and skills needed 
to develop and sustain effective CBPR partnerships. The Program consists of six 
sessions that are offered on various Fridays throughout the year. 
Instructor(s): Doriane Miller, Deborah Burnet Terms Offered: Autumn

CCTS 47002. Advanced Community Based Participatory Research (CBPR) 
Training Program 2. 000 Units.
The Advanced CBPR Training Program is designed to help meet the growing need 
and demand for educational resources that help build the knowledge and skills 
needed to develop and sustain effective CBPR partnerships. The Program consists of 
six sessions that are offered on various Fridays throughout the year. Lunch will be 
provided at each session. 
Instructor(s): Doriane Miller, Deborah Burnet Terms Offered: Winter

CCTS 47003. Advanced Community Based Participatory Research (CBPR) 
Training Program 3. 025 Units.
The Advanced CBPR Training Program is designed to help meet the growing need 
and demand for educational resources that help build the knowledge and skills 
needed to develop and sustain effective CBPR partnerships. The program consists of 
six sessions that are offered on various Fridays throughout the year. Lunch will be 
provided at each session. 
Instructor(s): D. Burnet, D. Miller Terms Offered: Spring
Prerequisite(s): Students must register for three-course sequence in order to 
receive course credit; CCTS 47001 and CCTS 47002 in Winter Quarter as well as for 
CCTS 47003 in Spring Quarter. Students must also register online. Contact CCTS 
administrator Kelsey Bogue at kbogue@bsd.uchicago.edu for more details.
CCTS 47005. Methods in Health and Biomedical Informatics. 075 Units.
Most Health and Biomedical Informatics (HBMI) Graduate Programs around
the country have independently come to the conclusion that the computational
methods that informatics graduate students need to be familiar with is too broad
and numerous to be addressed by a series of independent courses. Therefore, most
programs have created a set of integrated courses that expose the students to a wide
variety of informatics methods in short modules. Typically, these required methods
series are organized as a series of required courses taken during the first year of
graduate study. This course is the result of discussions by Health and Biomedical
Informatics researchers and educators from the Chicago Biomedical Informatics
Training (CBIT) initiative. This course is designed as first course of a year-long
sequence.
Instructor(s): Sam Volchenboum, David McClintock, UIC & NU faculty Terms
Offered: Autumn
Prerequisite(s): Basic understanding of Python programming language; prior or
simultaneous enrollment in Health & Biomedical Informatics (HBMI) intro course.
Course takes place at Northwestern’s downtown campus.

CCTS 47100. Bioinformatics Analysis of Integrative ‘Omics Data. 100 Units.
The workshop will focus on the integration of multiple ‘omic/clinical data sets to
answer complex questions on Biomedical research. Strong focus will be placed
on the use of NGS based ChIP-seq analysis pipeline and its integration with gene
expression and clinical information.
Instructor(s): S. Volchenboum, J. Andrade Terms Offered: Winter. Winter (not
offered every year); Meets over 4 days in December.
Prerequisite(s): Instructor consent is required. Visit chess.uchicago.edu/ccts for more
information on how to apply to the course.
Equivalent Course(s): CCTS 27100