Clinical and Translational Science

Department Website: https://chess.uchicago.edu/training-and-education/academic-courses (https://chess.uchicago.edu/training-and-education/academic-courses/)

The Committee on Clinical and 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 the Center for Health and the Social Sciences (http://chess.bsd.uchicago.edu) (CHeSS) and the Institute for Translational Medicine (http://itm.uchicago.edu), the CCTS mobilizes faculty from across the University to enhance course offerings in clinical and translational science. While most courses offered in CCTS are designed for graduate-level trainees, postdoctoral fellows, and junior faculty, there are also specific courses designed for undergraduate students interested in health and social sciences. For more information, contact Absera Melaku at amelaku@bsd.uchicago.edu.

Current areas of concentration include:

- Comparative Effectiveness Research
- Translational Informatics
- Health Services Research
- Quality and Safety
- Clinical Research
- Community-Based Research
- Global Health
- Pharmacogenomics

Below is a list of undergraduate courses that have been offered in the past. Refer to the CCTS section of the CHeSS website at chess.uchicago.edu/training-and-education/academic-courses (https://chess.uchicago.edu/training-and-education/academic-courses/) for current course offerings and prerequisites for each course.

**EXAMPLES OF PREVIOUSLY OFFERED CO-UNDERGRADUATE/GRADUATE COURSES**

**CCTS 20400. Health Disparities in Breast Cancer. 100 Units.**
Across the globe, breast cancer is the most common women’s cancer. In the last two decades, there have been significant advances in breast cancer detection and treatment that have resulted in improved survival rates. Yet, not all populations have benefited equally from these improvements, and there continues to be a disproportionate burden of breast cancer felt by different populations. In the U.S., for example, white women have the highest incidence of breast cancer but African-American women have the highest breast cancer mortality overall. The socioeconomic, environmental, biological, and cultural factors that collectively contribute to these disparities are being identified with a growing emphasis on health disparities research efforts. In this 10-week discussion-based course students will meet twice weekly and cover major aspects of breast cancer disparities.

Instructor(s): E. Dolan, S. Conzen Terms Offered: Winter
Prerequisite(s): BIOS 25108
Note(s): GP.
Equivalent Course(s): CCTS 40400, BIOS 25327, GNSE 30408, HLTH 20400, GNSE 20408

**CCTS 20500. Machine Learning & Advanced Analytics for Biomedicine. 100 Units.**
The age of ubiquitous data is rapidly transforming scientific research, and advanced analytics powered by sophisticated learning algorithms is uncovering new insights in complex open problems in biology and biomedicine. The goal of this course is to provide an introductory overview of the key concepts in machine learning, outlining the potential applications in biomedicine. Beginning from basic statistical concepts, we will discuss concepts and implementations of standard and state of the art classification and prediction algorithms, and go on to discuss more advanced topics in unsupervised learning, deep learning architectures, and stochastic time series analysis. We will also cover emerging ideas in data-driven causal inference, and demonstrate applications in uncovering etiological insights from large scale clinical databases of electronic health records, and publicly available sequence and omics datasets. The acquisition of hands-on skills will be emphasized over machine learning theory. On successfully completing the course, students will have acquired enough knowledge of the underlying machinery to intuit and implement solutions to non-trivial data science problems arising in biology and medicine.

Instructor(s): Ishanu Chattopadhyay Terms Offered: Winter. Not offered every year
Prerequisite(s): Rudimentary knowledge of probability theory, and basic exposure to scripting languages such as python/R is required. This course does not qualify in the Biological Sciences major.
Equivalent Course(s): BIOS 29208, CCTS 40500
CCTS 21005. Scholars in Ethics and Medicine Cohort (SEM) 100.00 Units.
This multidisciplinary course draws insights from medicine, sociology, moral psychology, philosophy, ethics, and theology to explore answers to the unique challenges that medicine faces in the context of late modernity: How does one become a "good physician" in an era of growing moral pluralism and health care complexity? Students will engage relevant literature from across these disciplines to address issues regarding the legitimate goals of medicine, medical professionalism, the doctor-patient relationship, vocation and calling, the role of religion in medicine, and character development in medical education. The course will first introduce the challenges that moral pluralism in contemporary society presents to the profession of medicine along with the subsequent calls for a renewed pursuit of clinical excellence in today's complex health care system. It will then survey the resurgence of a philosophical discipline (virtue ethics) that has begun to shape contemporary debate regarding what types of "excellences" are needed for a good medical practice dominated by medical science and technology. Instructor(s): Kathryn Rowland Terms Offered: Autumn Spring Winter
Note(s): This course is limited to those who have been accepted into the Emerging Scholars Cohort in Bioethics (Hyde Park Institute, https://hydeparkinstitute.org/esc). Depending on space availability, other students interested in enrolling will need prior approval from course instructor(s). This is a yearlong course with several two-hour lecture discussions throughout the year, two all-day Saturday sessions (Fall/Spring), and an off-site practicum. Registration in Autumn, Winter, and Spring courses is required. The Spring Quarter course will be worth 50 units.
Equivalent Course(s): CCTS 41005, MEDC 31005

CCTS 21011. Clinical Research Design and Interpretation of Health Data. 100 Units.
This course will introduce the interdisciplinary field of clinically oriented health services research with a focus on the interpretation of health-related metrics and policy-related applications. We will examine how translational medical science informs healthcare providers, payers, and professional societies. COVID-19 and postmenopausal hormone replacement therapy will illustrate the challenges of data interpretation, translation of research findings into clinical medicine, and the adoption of evidence-based guidelines. Using a highly interactive approach, students will gain experience in selection of research study designs, measurement of health status, risk adjustment, causal inference, and understanding the placebo effect. We will discuss how clinicians, administrators, and public reporting entities judge and use information derived from investigations. The COVID-19 pandemic will demonstrate the challenges that varied clinical presentations, diagnostic accuracy, and case definition (identification of diseased patients) create in the formulation of health statistics (e.g., case-fatality rates and disease attribution of mortality). We will also discuss methods of defining study populations for both clinical research and public health reporting.
Instructor(s): Gregory Ruhnke Terms Offered: Spring
Equivalent Course(s): PBPL 21011, BIOS 29331, HLTH 21011, CCTS 41011

CCTS 21014. Religion and AIDS. 100 Units.
The AIDS crisis was not an epoch that we survived. It is a battle that we are still fighting...when Americans talk about AIDS they are rarely just talking about a scientific problem or a pharmaceutical solution. They are instead offering a sociology of suffering and a plan for spiritual warfare." - Kathryn Lofton Is it possible to understand current debates over public health or the role of religion in the public sphere without first examining religious responses to the AIDS crisis? This course focuses on the emergence of the AIDS epidemic during the peak of the American culture wars. As such, students will analyze the fraught intersection of political power structures, medical epistemologies, and religious views on bodies, sex, and public morality. Through a varied catalog of disciplinary frameworks, e.g., history, theology, medical ethics, sociology of religion, and history of medicine, students will weigh the accuracy of Lofton's claim that for Americans, AIDS is more than just a disease. Thus, we will scrutinize moral rhetoric surrounding contraception and its public availability. We will discuss the extent to which religious philanthropy, especially on the international stage, reshaped approaches to global health. Finally, we will revisit the role of religious communities in providing both care for the sick and theological responses to suffering. Prior knowledge of religious studies and/or medical history is not required for the course.
Instructor(s): Mark M. Lambert Terms Offered: Autumn
Equivalent Course(s): SOCI 20563, CHST 26301, RLST 26301, HIST 28007, HIPS 26301, PBPL 25301, GNSE 23142, HLTH 26301

CCTS 21015. Religion and Abortion in the United States. 100 Units.
In American public discourse, it is common to hear abortion referred to as a "religious issue." But is abortion a religious issue? If so, in what ways, to whom, and since when? In this course we will answer these questions by tracing the relationship between religion and abortion in American history. We will examine the kinds of claims religious groups have made about abortion; how religion has shaped the development of medical, legal, economic, and cultural perspectives on the topic; how debates over abortion have led to the rise of a certain kind of religious politics in the United States; and how issues of race, class, gender, sexuality, and the body are implicated in this conversation. Although the course will cover a range of time periods, religious traditions, and types of data (abortion records from Puritan New England, enslaved people's use of root medicine to induce miscarriage, and Jewish considerations of the personhood of the fetus, among others), we will give particular attention to the significance of Christianity in legal and political debates about abortion in the twentieth and twenty-first centuries. There are no prerequisites for this course and no background in Religious Studies is required. However, this course may be particularly well-suited to students interested in thinking about how
their areas of study (medicine and medical sciences, gender and sexuality, race and ethnicity, political science) converge with religion and Religious Studies.

Instructor(s): Emily D. Crews  Terms Offered: Autumn
Equivalent Course(s): HIST 28008, PBPL 25304, RLST 26304, HLTH 26304, SOCI 20564, GNSE 12115, HIPS 26304

CCTS 21016. Indigenous Religions, Health, and Healing. 100 Units.
This course introduces students to the dynamic, often-contested understandings of health, healing, and religion among the Indigenous peoples of the Americas. Our task will be threefold: first, to examine the drastic effects of settler colonialism upon the social determinants of health for Indigenous peoples throughout the Americas, including the Caribbean, Mexico, United States, and Hawaii. Second, we shall attempt to understand healing practices as they are steeped in and curated by Indigenous traditions and religious beliefs. Our goal is to counteract centuries-old stereotypical images of Native peoples and challenge our preconceived notions of wellness, selfhood, and the boundaries of medicine. Third, we will reflect upon contemporary Indigenous approaches to health and healing with particular attention to the postcolonial hybridity of these practices. Throughout the course we will attend to a generative diversity of epistemologies, anthropologies, and religious worldviews with the ultimate goal that a renewed understanding of Indigenous healing traditions will augment our own approaches to global/public health and the study of religion.
Instructor(s): Mark M. Lambert  Terms Offered: Winter
Equivalent Course(s): HLTH 27501, CRES 21501, HIPS 27520, CHST 27501, RLST 27501

CCTS 33000. Scientists Advancing the Forefront. 000 Units.
In this survey course, leading basic and translational biomedical scientists will review cutting-edge themes that constitute the forefront of medical research. Learners will emerge with a broad understanding of:
Instructor(s): Erika Claud, Ronald Cohen  Terms Offered: Spring Winter. Students who register in fall and spring will earn 50 credit units in spring.
Prerequisite(s): Course open to MS1 students
Note(s): Students should email Kelsey Bogue at kbogue@bsd.uchicago.edu to request permission to enroll.
Equivalent Course(s): MOLM 33000, MEDC 33000

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): R. S. Huang, B. Stranger  Terms Offered: Spring
Prerequisite(s): Undergraduates (third- and fourth-years only) must have taken BIOS 20187 and are required to email instructors for approval (bstranger@medicine.bsd.uchicago.edu and rhuang@medicine.bsd.uchicago.edu) prior to registering.
Equivalent Course(s): CABI 47510