

<b>Graduate School of Biomedical Sciences - Division of Clinical Science - Master of Science in Clinical Science Requirements - Updated 1/2017</b>				<b>MSCS</b>
				<b>36 hours</b>
				<b>2 or 3 years</b>
<b>Course #</b>	<b>UTSW Courses/Practicum</b>	<b>Credit Hours</b>	<b>Semester</b>	<b>14 hours required coursework; 7 hours electives; 15 hours practicum credit</b>
CTM 5501	Practicum: Research Project	5	N/A	required
CTM 5402	Practicum: Publishable Manuscript	4	N/A	required
CTM 5603	Practicum: Extramural Research Grant Application	6	N/A	required
CTM 5107	Responsible Conduct of Research	1	Summer	required
CTM 5208	Clinical Research Management & Leadership	2	Spring	required
CTM 5106	Grant Writing & Funding Strategies	1	Summer	required
BMI 5361W	UT Health Science Center at Houston - Informatics for Clinical Researchers (Online, 8 weeks)	2	Spring	required
CTM 5301	Clinical Research Design & Analysis	3	Fall	required
CTM 5309/5391	Biostatistics I (Conceptual or Mathematical)	3	Fall	required
CTM 5209	Clinical Research Questions, Methods & Protocol Development	2	Spring	required
CTM 5105	Ethics in Clinical Research	1	Fall (Odd)	electives
CTM 5302	Biostatistics II	3	Spring	
CTM 5115	Clinical Research from Proposal to Implementation	1	Fall	
CTM 5307	Epidemiology for the Clinical Investigator	3	Spring	
CTM 5201	Developing & Validating Measures	2	Fall	
CTM 5203	Clinical Pharmacology & Drug Development	2	Fall	
CTM 5207	Intro to Patient Centered Outcomes Research & Comparative Effectiveness Research	2	Spring (Even)	
CTM 5113	Advanced Clinical Research Design & Analysis	1	Spring	
CR 5301	Mechanisms of Drug Action	3	Spring	
CTM 5114	Preparing a Journal Report (Scientific Writing Workshop)	1	TBD - New	
CTM 5118	Successfully Obtaining an R (SOAR) Grant Writing Seminar	0.5	Fall	
CTM 5119	Mentoring Excellence for Developing Leaders	1	Varies	
CTM 5XXX	CTM Socratic Curriculum	2	Varies	
CTM 5096	Independent Study	1-3	All	
	<i>UT Health Science Center at Houston Courses in Public Health and Bioinformatics</i>	Vary	Vary	



Course Offerings

Last Updated: December 2016

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Course #	Course Name	Credit Hours	Course Description
<b>Summer Courses</b>			
CTM 5106	Grant Writing & Funding Strategies <b>CORE</b> (Toto)	1	2-Day intensive course. This course will review the different types of federal grant mechanisms as well as grants or contracts from research foundations, advocacy organizations and industry. How to write a persuasive, well-reasoned application will be the focus of the course including the budget, resources and environment, preliminary data, and the research plan.
CTM 5107	Responsible Conduct of Research <b>CORE</b> (Holbein)	1	Regulatory requirements of clinical research (IRB, GCP, HIPAA, and investigational filings), ensuring patient safety, interactions with government and industry, contract negotiations, successful strategies and tactics.
CTM 52XX	CTM Socratic Curriculum (Varies)	2	Students will participate in seminars dedicated to their comprehensive understanding of clinical and translational research, careers in academic medicine, and other relevant professional development topics.
<b>Fall Courses</b>			
CTM 5105	Ethics in Clinical Science (Sadler)  <i>Offered in odd numbered years only.</i>	1	Introduction to ethical reasoning and related processes, techniques of settling disagreements among people, treatment versus research, informed consent, clinical research relevant to third parties, dealing with unexpected scientific and clinically important findings, getting what you want from mentors, consent and risk issues with unproven biological markers, conflicts of interest/duty, handling misconduct and fraud, ethics of subject recruitment, compensating for injuries or medical errors in research, talking to media, public policy advising, authorship order and publications, gender and ethnicity in sciences careers.
CTM 5391	Mathematical Biostatistics for the Clinical Investigator <b>CORE</b> (Reisch)	3	Traditional, mathematical approach to statistical analysis of biomedical data. Topics include data description, summary statistics, elements of probability, distributions of random variables including applications of the binomial and normal distributions, estimation and confidence intervals, hypothesis testing, analysis of variance, correlation and regression and contingency tables. Additional topics include statistical power, sample size, and study design.
CTM 5309	Conceptual Biostatistics for the Clinical Investigator <b>CORE</b> (Hynan)	3	Conceptual approach to statistical analysis of biomedical data. Review of fundamental statistical principles focusing on explanation of the appropriate scientific interpretation of statistical tests rather than the mathematical calculation of the tests themselves. The course covers All topics typically used in biomedical publications, including data description, summary statistics, p values, and non-parametric tests, analysis of variance, correlation, regression, and statistical power & sample size estimation.
CTM 5301	Clinical Research Design & Analysis <b>CORE</b> (Jacobe)	3	Basic and intermediate level principles in research design; formulation of the research question; identifying primary and secondary structures; use of control groups and pre-specified hypotheses; surrogate measurements; analysis of incomplete data; meaning of P values and confidence intervals; identification of bias and flaws in study design.
CTM 5115	Clinical Research from Proposal to Implementation (Toto)	1	This course reviews basic elements for a research proposal and implementation. Topics include regulatory approvals; continuing regulatory oversight; monitoring patient safety; recruitment; clinical assessments, data treatment, data collection, entry and auditing; provision of experimental tests/tasks; data analyses; publication planning.

CTM 5118	Successfully Obtaining an R (SOAR) Grant Writing Seminar (Yin)	0.5	SOAR is designed to increase NIH R-type grant acquisition success rates in basic, translational, and clinical research. SOAR includes topics such as demystifying the grant writing process, grantsmanship, surviving the NIH study section review, writing tips and tricks, navigating NIH requirements, peer-review, etc.
<b>Spring Courses</b>			
CTM 5207	Introduction to Patient Centered Outcomes Research & Comparative Effectiveness Research (Halm)	2	This course covers the methods used in outcomes and health services research, which includes research design, theory, measurement, methods of analysis and evaluation of published research. Course objectives are: 1) describe basic concepts, definitions, and types of outcomes and health services research; 2) understand structure, process, outcomes and underuse, misuse, overuse conceptual models; 3) identify common approaches and challenges to measuring cost, quality, access, and equity in health and health care; 4) describe experimental and observational research designs used to assess the impact of health services (drugs, devices, procedures, strategies, delivery and financing systems) on patient-oriented, clinical, and resource use outcomes.
CTM 5302	Biostatistics for Clinical Sciences II (Reisch)	3	Linear and logistic regression models (control of confounding and predictive models); categorical data analysis (binomial and Poisson distributions, analysis of paired categorical data, nonparametric methods for ordinal data); survival analysis (Kaplan-Meier curves. Hazard functions, types of censoring, log-rank tests and generalized Wilcoxon tests, Cox regression model).  <b>Prerequisite: CTM 5309 or CTM 5391 or instructor consent.</b>
CTM 5209	Clinical Research Questions, Methods & Protocol Development <b>CORE</b> (Jacobe)	2	Defining and developing a research question; distinguishing between correlative and mechanistic questions, matching methods to questions, understanding bias and confounding, random and systemic error, quantifying clinical information.  Practical aspects of research protocol conceptualization and development. Enrollees will learn how to translate a research question into a hypothesis; how to identify and describe hypothesis appropriate study subjects and study measurements; select a specific study design appropriate to the research question and resources available; synthesize the elements into a study plan; develop a statistical section and analytical plan. Protocols developed by the enrollees will form the primary basis for group discussions.  <b>Prerequisite: CTM 5301 or instructor consent</b>
CTM 5307	Epidemiology for the Clinical Investigator (Haley)	3	Concepts of multivariate causality; criteria for establishing causality; risk; rates; incidence, prevalence and attack rates; incidence density; crude, specific and adjusted rates; relative risk, odds ratio, case-fatality rate and attributable risk; sampling error, selection bias, information bias, definition bias, and confounding; statistical techniques to control for bias; variables; overview of statistical analysis; multiple comparisons correction; study designs to avoid bias: survey and sample selection, cross-sectional, cohort, case-control; prospective vs. retrospective; attributes of cohort studies; design principles of case-control studies; types of control groups; strategies of matching in case-control studies; experiential introduction to statistical computing for different types of clinical epidemiology studies.
CTM 5208	Clinical Research Management & Leadership <b>CORE</b> (Argenbright)	2	This course is a structured review and discussion of the basics of management and leadership theory and practice. Topics include project management and budgeting, information systems, leadership style, effective interviewing and hiring techniques, conflict resolution, and the basics of organizational culture. Predominant theories and research, as well as shared experiences of the instructor and the group will be discussed in order to enhance each participant's effectiveness as a manager and leader. It will be a combination of assigned readings, didactic lectures, active group discussion, a mid-term project and final examination.

CR 5301	Mechanisms of Drug Action (Albanesi)	3	The course is designed to cover a broad range of topics from fundamental principles in drug action to commercial applications. We start by examining how drugs interact with their receptors to induce their effects. We will discuss allosteric regulation, receptor desensitization and intracellular trafficking, and biophysical methods to analyze drug-receptor interactions. We then review how drugs enter, distribute and become eliminated from the body and the mathematical analysis of their pharmacokinetics, as well as the development of drug tolerance and dependence. Next, we learn the principles underlying the action of a few selected classes of drugs and receptors. The second half of the course deals with specialized topics, including drugs used in psychiatry and drugs of abuse, in the chemotherapy of bacterial and virus infections, and in the treatment of parasitic diseases and the problems of developing drugs for Third World countries. We go on to discuss drugs affecting cholesterol homeostasis, prostaglandins and leukotriene pharmaceuticals, and the basis of drug interactions. We discuss emerging cancer therapeutics (antibodies, RNA, DNA, gene therapy, nanoparticles). The final lecture concerns the process of drug development in the pharmaceutical industry and the scientific and commercial complexities of getting the drug from the laboratory to the bedside.
BMI 5361W	UT Health Science Center at Houston – Informatics for Clinical Researchers (Online);  (Only available to matriculated CTM students.)  <b>CORE</b> (Instructor Varies)	2	Train the next generation of clinical researchers in the basics of clinical information systems (CIS) so they can both use the data that is derived from these systems as well as understand the issues surrounding the design, development, implementation, and evaluation of CIS-based interventions. Tentative Course Schedule: Week 1 - Introduction to course and Biomedical Informatics Week 2 - Clinical Informatics for Care Delivery Week 3 - Clinical Data Warehouse Week 4 - REDCap Week 5 - Standards and Interoperability Week 6 - Clinical Text Mining/Natural Language Processing Week 7 - Precision Medicine/Bioinformatics Week 8 - Decision-making/Applied Research/Wrap-up The course is offered in an 8-week online format requiring the equivalent of 4 classroom hours of work each week for successful completion.
<b>Semester Varies</b>			
CTM 5114	Preparing a Journal Report (TBD)	1	General writing skills and strategies; how to prepare an empirical article including tips on writing the abstract, introduction, aims, methods, results, and discussion/conclusion sections of a peer reviewed journal article. Students will be required to submit a journal article and review others' articles.
CTM 5113	Advanced Clinical Research Design & Analysis (TBD)	1	By the end of the course, students will be able to critically review and critique the methods of scientific journal articles pertinent to academic medicine.
CTM 5203	Clinical Pharmacology & Drug Development (Holbein)	2	Pharmacokinetics; pharmacodynamics; drug absorption, distribution, metabolism/elimination; drug-drug and drug-disease interactions; preclinical drug development (Phase I, II, III and IV); proof-of-concept and dose-finding studies; post-marketing surveillance.
CTM 5117	Mentoring Excellence for Developing Leaders (Argenbriht)	1	This is an interactive, participant-based course on mentoring excellence. Its objective is to engage mentors at all points in their career and give them the tools and skills necessary in order to improve their mentoring. This course is based on a combination of mentoring curricula and techniques that were observed at high performing translational medical centers (UCSF, Harvard, Wisconsin) as well as the National Research Mentoring Network (NRMN) mentor training. The NRMN curriculum facilitates career-stage appropriate training for mentors and mentees, tailored to foster the success of a diverse group of biomedical researchers, with a specific focus on deepening the alignment and impact of mentoring relationships. <b>Prerequisite: CTM 5208 or instructor consent.</b>

CTM 5096	Independent Study/Special Topics (Assigned mentor)	1-3	
<b>Other</b>			
	Online courses offered through the University of Texas Health Science Center at Houston. (Only available to matriculated CTM students.)		<a href="#"><i>Courses offered through the School of Public Health in the division of Health Promotion &amp; Behavioral Sciences</i></a>  <a href="#"><i>Courses offered through the School of Biomedical Informatics</i></a>

\***CORE** = Required for Master of Science in Clinical Science degree plan.