2-B. Curriculum

i. Describe the proposed educational objectives of the program.

EDUCATIONAL OBJECTIVES

The Translational Science (TS) PhD program will achieve important educational and organizational objectives for each UT component and the UT System. The educational objectives, competencies, and curriculum for the TS PhD program outlined below are categorized by "domains", which are classifications or groupings of learning objectives and competencies that enable systematic planning of educational programs.

The overall educational objective of this unique, four-institution TS PhD program is to train future scientists who have the capacity to integrate information from multiple domains and competencies and conduct research that can be applied to the improvement of human health. Key elements in the translational science process are 1) applying scientific discoveries in the lab or at the bedside in ways that are more efficient and effective; and 2) shortening the time between scientific discovery and application. However, the processes (mechanisms) by which application of discoveries and ways to speed their dissemination and implementation are not known, and are the focus of the research in this area. TS training focuses on the study of these mechanisms.
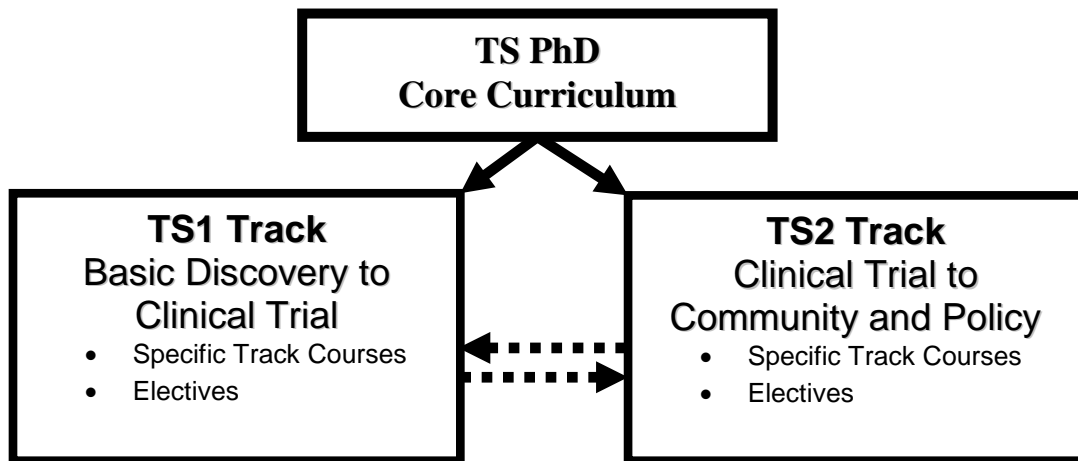
TS includes multiple disciplines with necessary breadth, from basic lab discovery to public health policy development. As the national discussion establishing the discipline of TS evolves, several descriptions have emerged to define the TS spectrum. To avoid confusion, the following table specifies the terms we will use in this TS PhD application:

TS PhD Application	Other TS Definitions
TS1 - Basic Discovery to Clinical Trial ('Bench-to-Bedside')	**T1** – Basic discovery and pre-clinical animal studies. May include metabolic and physiologic human studies.
	T2 – First studies of new drugs, devices, interventions in humans (phase I and II studies) and demonstration of clinical efficacy (phase III studies)
TS2 – Clinical Trial to Community and Policy	**T3** – Studies to implement best practices into community settings (e.g., Health Services Research, Implementation and Improvement Sciences)
	T4 – Policy and Guideline development and studying the impact on health and service delivery.

For the purposes of this application, two TS PhD tracks have been developed: TS1 (Basic Discovery to Clinical Trial) and TS2 (Clinical Trial to Community and Policy). These characterizations are consistent with the way TS was originally envisioned in the Clinical and Translational Science Award funding opportunity announcement from NIH (RFA-RM-09-004): **"Translational research includes two areas of translation. One is the process of applying discoveries generated during research in the laboratory, and in preclinical studies, to the development of trials and studies in humans. The second area of translation concerns research aimed at enhancing the adoption of best practices in the community. Cost-effectiveness of prevention and treatment strategies is also an important part of translational science."** As the spectrum of translational science is further divided and specified, we will include the subcategories (T1, T2, T3, T4, and others as they emerge) within the broader definitions as used here.

The four UT components in San Antonio have developed the collaborative strategy of designing a brand new PhD program tailored to the strengths and resources in South Texas. Representatives from each campus have been meeting in monthly sessions since June 2008 to plan the programmatic and administrative aspects of this program. Additionally, a one-day facilitated retreat in October 2009, attended by 32 faculty and 2 representatives from the UT System, specifically focused on defining the domains, competencies, and structures necessary for the TS PhD curriculum. In contrast, most existing TS PhD programs at other universities around the U.S. share two common features: (a) they were derived from existing PhD programs, and (b) the majority emphasize only the 'bench-to-bedside' or T1 (basic discovery to clinical trial) content.

In San Antonio a different approach has been taken. We recognized that each of the four UT components had necessary expertise for the transformative vision of a TS PhD program; however, none of them had sufficient capacity to mount the PhD on their own. Over the past two years we rigorously discussed the concepts of TS, assessed our unique strengths and resources, and then developed this PhD proposal. Along the way, we have been cognizant of and incorporated key concepts that are evolving in the National CTSA consortium, especially with respect to the key competencies necessary for becoming a successful translational scientist. The result is a core curriculum that then differentiates into a TS1 or TS2 research track, based on the interests of the candidate, supervising professor, and graduate committee. The San Antonio TS PhD program structure is summarized in the following figure:

```
                    ┌─────────────────────┐
                    │      TS PhD         │
                    │  Core Curriculum    │
                    └─────────────────────┘
                         ↙           ↘
┌──────────────────────────┐   ┌──────────────────────────┐
│       TS1 Track          │   │       TS2 Track          │
│   Basic Discovery to     │◄┄►│    Clinical Trial to     │
│     Clinical Trial       │   │  Community and Policy    │
│   • Specific Track Courses │   │   • Specific Track Courses │
│   • Electives            │   │   • Electives            │
└──────────────────────────┘   └──────────────────────────┘
```

This straight forward structure lays the groundwork for including multiple disciplines in the delivery of TS training. For prospective researchers who seek a rigorous, advanced training program designed to enhance their capacity to conduct high quality translational investigations, this program will provide in depth training in targeted research concepts and methods. The goal is to produce graduates that not only demonstrate core competencies, but are able to conduct innovative independent research. This is not a managerial or experiential degree; rather, the emphasis will be on training graduate students to investigate the mechanisms and processes of translational science and, after graduation, to be productive researchers and effective teachers.

It is the core domains and competencies (developed by translational scientists) that drive the structure of the curriculum. In our discussions, the eight domains for every graduate of this PhD program include:

1. **A Clear Understanding of Translational Science:** Students will articulate what constitutes T1 and T2 translational science and the inter-relationships between the two broad tracks.

2. **Responsible Research Conduct:** Students will be knowledgeable about and be able to apply research ethics and work effectively with regulatory groups within their organization(s).

3. **Expertise in Research Design and Analysis in their Scientific Discipline:** Students will formulate research questions and appropriately design experiments and studies to test hypotheses. They will develop specific analytic strategies based on the study design and assure that their studies are adequately powered to test the hypotheses.

4. **Ability to Lead, Motivate, and Manage Collaborative Team Science:** Students will work effectively in and be able to lead interdisciplinary research teams to (a) identify health related problems and (b) design and conduct research to address the problems.

5. **Utilization of Multi-level Cultural Proficiency:** Students will be able to identify the different cultures that exist within and among (a) organizations and (b) communities (locally and globally). In recognizing these differences, students will learn to use cultural competence and work effectively to conduct research investigations in different settings.

6. **Communicate Effectively:** Since communication is a key domain of translational science, students will demonstrate oral and written competency in their ability to communicate research clearly to other translational scientists via journal articles and scientific presentations. They will be able to effectively write abstracts and manuscripts, give oral presentations, and communicate the relevance of their scientific expertise. Beyond the core requirements, students will receive training in grant writing and be expected to develop grant applications for career development (e.g., NIH F-32 or K-grant series) or independent funding.

7. **Display Competence in the Business of Translational Science:** Students will become functionally informed about intellectual property licensing and the processes of developing products, drugs, or devices for human use. They will be able to design and implement research protocols to study improvement in health care processes and outcomes. Students will be able to function within different legal, regulatory, and economic environments.

8. **Evidence Based Implementation and Policy:** Students will be able to independently read and interpret the scientific literature in their content area. They will be able to systematically review a body of scientific literature to apply to policy implementation. They will be able to make data based decisions and inform policy and guideline development.

These eight domains form the foundation for the TS PhD educational objectives. Within each domain are specific competencies (adapted from multiple groups at the national level – see below in this section for specifics) that each candidate will have to fulfill. Applicants may already have the necessary training in some of these areas. For example, graduates of the MSCI program have taken required courses in Responsible Conduct of Research (MEDI 5070) and Scientific Communication (MEDI 5075); however, they will not have didactic training in the conduct of team science or cultural proficiency and would need to complete the required core courses before moving further to candidacy in their TS1 or TS2 tracks.

ORGANIZATIONAL OBJECTIVES

Important organizational objectives will be achieved by the implementation of the joint TS PhD program. Within the spirit of the CTSA, the TS PhD can be transformative in forging new

procedures in graduate education that make the resources and talent within the entire UT System available to individual graduate students and their supervising professors. These objectives seek to:

1. Produce doctoral-level graduates with exceptional training and skill in translational science.

2. Develop a multi-disciplinary program among four UT component institutions, and a joint degree program among three UT component institutions in San Antonio.

   - University of Texas Health Science Center at San Antonio, utilizing faculty from five Schools (Graduate School of Biomedical Sciences, School of Medicine, Dental School, School of Nursing, and School of Health Professions)

   - University of Texas at San Antonio, utilizing faculty from thirteen Graduate Departments in five Colleges

   - University of Texas at Austin College of Pharmacy, utilizing faculty from Austin and San Antonio campuses

   - University of Texas School of Public Health, San Antonio Regional Campus, utilizing faculty from the Houston and San Antonio campuses (not participating in the joint degree due to limitations from the accrediting body)

3. Provide education and research opportunities that will benefit San Antonio and South Texas.

4. Prepare scientists to be leaders in the fields of translational team science.

5. Provide an innovative training program that will enhance the research and education objectives and missions of the component UT institutions.

6. Support and encourage minority participation in advanced education at all four UT component institutions.

ii. **Use tables to identify the required courses and prescribed electives of the program. Note with an asterisk (*) courses that would be added if the program is approved.**

The curriculum for the TS PhD program is organized by each of the eight core domains. Following a parallel structure, each domain includes the following information:

1. **Table of Competencies:** This table was compiled for each domain utilizing documents from the American Association for Medical Colleges (AAMC), the national Clinical and Translational Science Award (CTSA) consortium, the Centers for Disease Control (CDC), Association for Prevention Teaching and Research (ATPR), and the Essential Competencies for Evidence Based Practices in Nursing (ECEBPN). Through a consensus process involving representatives from each of the four UT components, the competencies were grouped, reviewed for priority, and edited to be customized for the TS PhD program. We have adopted and adapted a broad range of input so as to align the San Antonio TS PhD program with national movements in the development of translational science training programs.

2. **Coursework:** The didactic portion of the TS PhD program will include core courses, prescribed track courses, and other/free elective courses. The core courses and prescribed track electives were carefully selected to address competencies in Translational Science that are emerging nationally. These core courses will provide essential knowledge, skills, and training in the competencies necessary to conduct translational research. The elective courses permit development of unique features for each PhD candidate, allowing them to gain expertise and pursue in-depth training to undertake research in novel areas.

   a. **Core Courses:** Students will be required to take 1-2 core courses to meet the competencies within each domain. Where courses are offered with similar content within multiple UT components, students may choose the one course that meets their individualized needs and/or is more convenient for them.

   b. **T1 and T2 Translational Science Courses:** These courses will be presented for each TS Track within each domain. Students will seek guidance from their academic/graduate advisor or supervising professor regarding enrollment that will optimize their research work. Additional guidance may be sought from the student's dissertation committee and/or the TS PhD Committee on Graduate Studies (COGS).

      1) **Prescribed Track Courses:** These courses will be required for students to provide additional depth and breadth specific to each student's track. If more than one course meets the requirements, as with the core courses, students will select the course that most effectively meets their educational needs from a list of recommended courses.

      2) **Other Electives:** These courses may be selected by the student to meet the unique educational needs to successfully conduct their dissertation research and progress in their career development. The goal is to provide students with a robust portfolio of courses among the four San Antonio UT components.

The plans of study and specific courses to be taken by students will vary, depending on the choice of the TS1 or TS2 translational track, individual student interest, student background/discipline, and program goals. Being able to offer courses from four UT component institutions will provide flexibility and variability in content and skill development, as well as reducing the number of new courses that would have to be developed for a stand-alone degree program. The proposed curriculum will consist of 24 hours of core courses for all students, 12 hours of prescribed courses for each track, 6 hours of elective courses, and 30 hours of research and dissertation (total of 72 hours). In some cases, more than one course will meet a

core requirement or elective need; students will select the most appropriate course with the consultation and approval of their supervising professor and committee. The courses proposed for each educational domain listed below have been carefully considered for this program, but they are not a hard structure; rather, we understand that course relevance and availability will change from time to time. The TS COGS will be responsible for regularly reviewing the quality of the courses and, through evaluation, monitoring the rigor of instruction. Course offerings will be updated to ensure they address the changing research needs of the discipline and continue to meet the requirements of the educational domains and competencies. The full-time course load for the TS PhD Program is 9 semester credit hours (SCH) in the spring and fall semesters, and 6 SCH in the summer. The minimum course load for a student will be 3 SCH, for example, during a semester where they are writing, submitting, and defending their dissertation.

CURRICULUM SEQUENCE: Prospective students applying to the TS PhD program must have a Master's or Professional (e.g., MD, DDS, PharmD) degree prior to enrollment in the program. While there is no prescribed sequence of courses for the TS PhD program, some courses are offered only one time per year and some courses require prerequisites, so students and their academic/graduate advisors must develop the individualized education plan accordingly to maintain a three-year schedule to graduation. An example of a three-year curriculum is as follows; although a full time student could complete the TS PhD program in 3 years, we anticipate that many students require more time (4-5 years) given the real world challenges of conducting translational research. Because the program design provides for course choices, only the educational domains are identified in this example.

<table>
<tr><td colspan="6">PRE-REQUISITE
MASTER'S OR PROFESSIONAL DEGREE
(ANTICIPATED MINIMUM OF 2 TO 4 YEARS BEYOND UNDERGRADUATE EDUCATION)</td></tr>
<tr><td colspan="6">THREE-YEAR CURRICULUM
FOR COMPLETION OF TRANSLATIONAL SCIENCE PhD</td></tr>
<tr><td colspan="2">Year 1, Fall</td><td colspan="2">Year 1, Spring</td><td colspan="2">Year1, Summer</td></tr>
<tr><td>Translational Science (Core)</td><td>1</td><td>Research Design-Methods2 (Core)</td><td>2</td><td>Track and/or Free Electives</td><td>6</td></tr>
<tr><td>Responsible Conduct (Core)</td><td>2</td><td>Research Design-Biostatistics2 (Core)</td><td>2</td><td></td><td></td></tr>
<tr><td>Research Design-Methods1 (Core)</td><td>2</td><td>Leadership & Team Science (Core)</td><td>3</td><td></td><td></td></tr>
<tr><td>Research Design-Biostatistics1 (Core)</td><td>2</td><td>Track Elective</td><td>2</td><td></td><td></td></tr>
<tr><td>Scientific Communication (Core)</td><td>2</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>9</td><td></td><td>9</td><td></td><td>6</td></tr>
</table>

Year 2, Fall		Year 2, Spring		Year 2, Summer	
Business of Translational Science (Core)	3	Cultural Proficiency (Core)	3	Track and/or Free Electives	3
Evidence-Based Policy & Implementation (Core)	2	Track and/or Free Electives	3	Research	3
Track and/or Free Electives	4	Research	3		
	9		9		6
Year 3, Fall		Year 3, Spring		Year 3, Summer	
Research/Dissertation	9	Research/Dissertation	9	Research/Dissertation	6

COMPETENCIES AND COURSES BY EDUCATIONAL DOMAIN

DOMAIN 1: Translational Science

Translational Science Competencies

1. Define and explain basic principles, processes, and outcomes of translational research across its entire spectrum.
2. Display knowledge of T2 translation community-engaged research approaches, including strategies for identification, development, and maintenance of community partnerships.
3. Display knowledge of T1 translation research approaches including basic discovery, technology transfer and product development.
4. Define and identify the resources needed to conduct T2 research (epidemiology and evidence synthesis, communications theory, behavioral science, public policy, organization theory, system engineering, informatics, qualitative research, financing and economics, social network analysis, and community partnerships).
5. Define and identify the resources needed to conduct T1 research (laboratories, specialized core equipment, facilities for study implementation, animals, and reagents).
6. Compare and contrast goals, settings, study designs, and investigator roles and qualifications for accomplishing T1 and T2 research.
7. Identify synergies between T1 and T2 research and how they are integrated to improve human health.

Translational Science Courses

University	Prefix/Number	Translational Science Required Courses (Core)	SCH	Track
Requirement: 1 SCH				
UTHSC	New Course	Introduction to Translational Science *	1	TS1/TS2

University	Prefix/Number	Translational Science Prescribed Track Courses	SCH	Track
		None		

University	Prefix/Number	Translational Science Free Elective Courses	SCH	Track
UTHSC	MEDI 6101	Topics in Translational Science	1-3	TS1/TS2

DOMAIN 2: Responsible Research Conduct

Responsible Research Conduct Competencies

1. Summarize the history of research abuses and the rationale for creating codes, regulations, and systems for protecting participants in clinical research that requires community input.
2. Explain the function of the Institutional Review Board (IRB) and the Institutional Animal Use and Care Committee (IACUC).
3. Determine the need for a risk-benefit ratio that is in balance with the outcomes in clinical and translational research.
4. Describe and apply the elements of voluntary informed consent, including:
    a. increasing knowledge about research,
    b. avoiding undue influence or coercion, and
    c. assuring the decision-making capacity of participants.
5. Explain the special issues that arise in research with vulnerable participants and the need for additional safeguards.
6. Explain and assure the need for privacy protection and best practices for protecting privacy throughout all phases of a study.
7. Explain and assure the need for fairness in recruiting participants and in distributing the benefits and burdens of clinical research.
8. Demonstrate and apply appropriate knowledge regarding authorship standards.
9. Explain how the structural arrangement of science and the research industry influences the behavior of scientists and the production of scientific knowledge.
10. Implement procedures for the identification, prevention, and management of financial, intellectual, and employment conflicts of interests.
11. Critique a clinical or translational research proposal for risks to human subjects.
12. Critique a translational research proposal for appropriate care and use of animals.
13. Delineate the forms of scientific misconduct and adhere to institutional procedures to report unprofessional behavior by colleagues who engage in research misconduct.
14. Apply ethical principles to the collection, maintenance, use, and dissemination of data and information.
15. Apply legal and ethical principles to the use of information technology and resources.
16. Analyze the ethical complexities of conducting community-engaged research.

Responsible Research Conduct Courses

University	Prefix/Number	Responsible Research Conduct Required Courses (Core)	SCH	Track
Requirement: Minimum of 2 SCH from:				
UTHSC	MEDI 5070	Responsible Conduct of Patient-Oriented Clinical Research	2	TS1/TS2
UTHSC	NURS 6226	Ethics of Nursing Science	2	TS1/TS2
UTSA	BIO 7413	Research Ethics and Responsible Conduct in Research (College of Sciences: Biology)	3	TS1/TS2
UTCOP	PHR 182W	Ethics in Science and Clinical Practice	1	TS1/TS2

University	Prefix/Number	Responsible Research Conduct Prescribed Track Courses	SCH	Track
UTHSC	MEDI 6102	Practicum in Institutional Review Board (IRB) Procedures	1	TS1/TS2
UTHSC	MEDI 6100	Practicum in Institutional Care and Animal Use Committee (IACUC) Procedures	1	TS1
UTSA	BIO 5001	Ethical Conduct of Research (College of Sciences: Biology)	1	TS1

University	Prefix/Number	Responsible Research Conduct Other Elective Courses	SCH	Track
UTHSC	MEDI 6103	Selected Topics in Advanced Research Ethics	3	TS1/TS2

DOMAIN 3:   Research Design and Analysis

Research Design and Analysis Competencies

1. **FORMULATING TRANSLATIONAL RESEARCH QUESTIONS**
   a. Apply the FINER Criteria to critiquing a research question: Feasible, Interesting, Novel, Ethical, and Relevant.
   b. Identify data that formulate testable translational research hypotheses:
      1) Basic and pre-clinical studies that provide potential testable translational research hypotheses.
      2) Research observations that could provide the basis for clinical trials with humans.
      3) Study results that could lead to community dissemination and/or policy development (i.e., Makes community-specific inferences from quantitative and qualitative data).
      4) Community needs assessment that may provide the rational for basic science investigations.
   c. Critique clinical and translational research questions using data-based literature searches.
   d. Formulate well-defined translational research questions.

2. **STUDY DESIGN**
   a. Propose study designs for addressing a translational research question.
   b. Assess the strengths and weaknesses of possible study designs for a given translational research questions (surveys, case-control studies, cohort studies, and clinical trials, secondary data analysis, qualitative studies, meta-analyses, and other study designs).
   c. Identify target populations and recruitment strategies for translational research projects.
   d. Identify existing appropriate measures (assessments of baseline characteristics and outcomes) of translational research.
   e. Evaluates the methods and instruments for collecting quantitative and qualitative data.
   f. Determine resources needed to implement a clinical or translational research plan.
   g. Critically appraise published examples of common research designs: surveys, case-control, cohort, and randomized controlled studies.
   h. Locate, appraise, and assimilate evidence from scientific studies related to health problems.
   i. Demonstrate knowledge of community-engaged research approaches, including strategies for identification, development, and maintenance of community partnerships.
   j. Utilize knowledge of practice variability to design studies related to guideline development and best practices.
   k. Design primary research to address factors within the health care system, micro-systems, and the individual that are associated with uptake of evidence-based clinical practice guidelines and quality improvement processes.
   l. Incorporate appropriate positive and negative controls.

3. **RESEARCH IMPLEMENTATION**
   a. Compare the feasibility, efficiency, and ability to derive unbiased inferences from different translational research study designs.
   b. Assess threats to internal validity in any planned or completed clinical or translational study, including selection bias, information bias, and confounding.
   c. Incorporate regulatory precepts into the design of any clinical or translational study.
   d. Integrate elements of translational research into given study designs that could provide the bases for future research, such as the collection of biological specimens, nested studies, and the development of community-based interventions.

e. Differentiate between qualitative and quantitative evaluation methods in relation to their strengths, limitations, and appropriate uses, and emphases on reliability and validity.
f. Evaluate and utilize methods to quantify outcomes of care and establish benchmarks.

4. STATISTICAL APPROACHES
a. Describe the role that biostatistics serves in biomedical and public health research.
b. Describe the basic principles and practical importance of random variation, systematic error, sampling error, measurement error, hypothesis testing, type I and type II errors, and confidence limits.
c. Scrutinize the assumptions behind different statistical methods and their corresponding limitations.
d. Generate simple descriptive and inferential statistics that fit the study design chosen and answer research questions.
e. Compute sample size, power, and precision for comparisons of two independent samples with respect to continuous and binary outcomes.
f. Describe the uses of meta-analysis methods.
g. Defend the significance of data and safety monitoring plans.
h. Collaborate with biostatisticians in the design, conduct, and analyses of clinical and translational research.
i. Evaluate computer output containing the results of statistical procedures and graphics.
j. Explain the uses, importance, and limitations of early stopping rules in clinical trials.
k. Utilize informatics approaches in translational research (e.g., bioinformatics and clinical informatics, evidence based practice).
l. Makes community-specific inferences from quantitative and qualitative data.

5. SOURCES OF ERROR
a. Describe the concepts and implications of reliability and validity of study measurements.
b. Evaluate the reliability and validity of measures.
c. Assess threats to study validity (bias) including problems with sampling, recruitment, randomization, and comparability of study groups.
d. Differentiate between the analytic problems that can be addressed with standard methods and those requiring input from biostatisticians and other scientific experts.
e. Implement quality assurance systems with control procedures for data intake, management, and monitoring for different study designs.
f. Assess data sources and data quality to answer specific clinical or translational research questions.
g. Evaluate the integrity and comparability of data and data sources.
h. Implement quality assurance and control procedures for different study designs and analysis.
i. Assess internal versus external validity.

Research Design and Analysis Courses

University	Prefix/Number	Research Design and Analysis Required Courses (Core)	SCH	Track
Requirement: Minimum of 8 SCH from:				
UTHSC	MEDI 5071	Patient-Oriented Clinical Research Methods-1	2	TS1/TS2
UTHSC	MEDI 5072	Patient-Oriented Clinical Research Biostatistics-1	2	TS1/TS2
UTHSC	MEDI 6060	Patient-Oriented Clinical Research Methods-2	2	TS1/TS2
UTHSC	MEDI 6061	Patient-Oriented Clinical Research Biostatistics-2	2	TS1/TS2
UTHSC	CSBL 5095	Experimental Design and Data Analysis	2	TS1/TS2
UTSA	STA 5103	Applied Statistics (College of Business: Statistics)	3	TS1/TS2
UTSA	STA 6833	Design and Analysis of Experiments (College of Business: Statistics)	3	TS1/TS2
UTSA	PSY 5413	Inferential Statistics (College of Liberal & Fine Arts: Psychology)	3	TS1/TS2
UTSA	PSY 6213	Correlation and Regression Analyses (College of Liberal & Fine Arts: Psychology)	3	TS1/TS2
UTSA	SOC 5023	Quantitative Research Methods (College of Liberal & Fine Arts: Sociology)	3	TS1/TS2
UTCOP	PHR 383Q	Statistics in Translational Science	3	TS1/TS2
UTSPH	PHS 1725	Intermediate Biostatistics I	4	TS1/TS2
UTSPH	PHS 1726	Intermediate Biostatistics II	4	TS1/TS2
UTSPH	PHW 1610	Introduction to Biostatistics (Online)	4	TS1/TS2
UTSPH	PHS 2710	Advanced Epidemiologic Methods I	4	TS1/TS2

University	Prefix/Number	Research Design and Analysis Prescribed Track Courses	SCH	Track
UTHSC	MEDI 5074	Data Management, Quality Control, and Regulatory Issues	2	TS1/TS2
UTHSC	INTD 5067	Introduction to Bioinformatics and Computational Biology	2	TS1
UTHSC	NURS 7380	Qualitative Inquiry for Clinical Nursing Research	3	TS2
UTSA	SOC 5033	Qualitative Research Methods (College of Liberal and Fine Arts: Sociology)	3	TS2
UTCOP	PHR 381W	Molecular Biology in Translational Research	3	TS1
UTCOP	PHR 282JA	Advanced Pharmacotherapy Seminar	1	TS1
UTCOP	PHR 282JB	Advanced Pharmacotherapy Seminar	1	TS1
UTCOP	PHR 196S	Seminar in Pharmacy	2	TS1
UTCOP	PHR 197S	Seminar in Pharmacy Advanced Topics	2	TS1

University	Prefix/Number	Research Design and Analysis Free Elective Courses	SCH	Track
UTHSC	MEDI 5073	Integrating Molecular Biology with Patient-Oriented Clinical Research	2	TS1
UTHSC	MEDI 6066	Instrument Development and Validation	2	TS2
UTHSC	MEDI 6067	Genetics and Genetic Epidemiology	1	TS1/TS2
UTHSC	INTD 6021	Animal Models	3	TS1
UTHSC	CSBL 6064	Genes and Development	1-4	TS1
UTHSC	NURS 6373	Nursing: Quantitative Research Methods II	3	TS2
UTHSC	NURS 6374	Quantitative Research Methods I	3	TS2
UTHSC	NURS 6375	Regression Models in Nursing Science	3	TS2
UTHSC	NURS 6376	Mixed Methods for Clinical Nurse Scientists	3	TS2
UTHSC	NURS 7310	Theory Development, Analysis and Evaluation in Nursing	3	TS2
UTHSC	NURS 7382	Structural Equation Models for Nursing Science	3	TS2
UTHSC	NURS 7383	Qualitative Methods II: Applications in Nursing Science	3	TS2
UTSA	BME 6903	Biomaterials (College of Engineering: Biomedical Engineering)	3	TS1
UTSA	BME 6913	Biomaterials II (College of Engineering: Biomedical Engineering)	3	TS1
UTSA	BME 6923	Tissue Engineering (College of Engineering: Biomedical Engineering)	3	TS1
UTSA	GBA 7023	Research Methods II (College of Business: General Business Administration)	3	TS2
UTSA	IS 7023	Behavioral and Organizational Information Systems Research (College of Business: Information Systems)	3	TS2
UTSA	STA 5073	Methods of Statistics I (College of Business: Statistics)	3	TS1/TS2
UTSA	STA 5083	Methods of Statistics II (College of Business: Statistics)	3	TS1/TS2
UTSA	STA 6913	Bioinformatics and Data Mining I: Microarray Data Analysis (College of Business: Statistics)	3	TS1
UTSA	STA 7923	Bioinformatics and Data Mining II: Data Mining (College of Business: Statistics)	3	TS1/TS2
UTSA	CS 5263	Bioinformatics (College of Sciences: Computer Science)	3	TS1
UTSA	CHE 7263	Recent Advances in Bioanalytical Chemistry (College of Sciences: Chemistry)	3	TS1
UTSA	CS 6293	Advanced Topics in Bioinformatics (College of Sciences: Computer Science)	3	TS1
UTSA	DEM 7013	Basic Demographic Methods of Analysis (College of Public Policy: Demography)	3	TS2

University	Prefix/Number	Research Design and Analysis Free Elective Courses	SCH	Track
UTSA	DEM 7023	Advanced Methods of Applied Demographic Analysis (College of Public Policy: Demography)	3	TS2
UTSA	DEM 7203	Software Applications for Demographic Analysis (College of Public Policy: Demography)	3	TS2
UTSA	DEM 7213	Advanced Software Applications for Demographic Analysis (College of Public Policy: Demography)	3	TS2
UTSA	DEM 7223	Advanced Methods for Life Table Analysis (College of Public Policy: Demography)	3	TS2
UTSA	KAH 5093	Statistics and Research in Health and Kinesiology (College of Education and Human Development: Health and Kinesiology)	3	TS2
UTSA	KAH 5123	Research in Health and Kinesiology (College of Education and Human Development: Health and Kinesiology)	3	TS2
UTCOP	PHR 381W	Molecular Biology in Translational Science	3	TS1
UTCOP	PHR 383W	Biopharmaceutical Analysis	3	TS1
UTCOP	PHR 184U	Biopharmaceutical Analysis Laboratory	1	TS1
UTCOP	PHR 381M	Advanced Pharmacy Administration – Pharmacoepidemiology	3	TS1
UTCOP	PHR 391J	Methods in Clinical Psychopharmacology and Mental Health Outcomes Research	3	TS1
UTCOP	PHR 393Q	Health-Related Quality of Life Measurement	3	TS1/TS2
UTCOP	PHR 389P	Advanced Infectious Diseases	3	TS1
UTCOP	PHR 289J	Advanced Pharmacotherapeutics of Cardiovascular Diseases	2	TS1
UTCOP	PHR 384S	Introduction to Epidemiology and Pharmacoepidemiology	3	TS1
UTCOP	PHR 381M	Advanced Pharmacy Administration: Pharmacoepidemiology	3	TS1
UTCOP	PHR 385L	Clinical Pharmacokinetics	3	TS1
UTCOP	PHR 385M	Advanced Pharmacokinetics and Pharmacodynamics	3	TS1
UTSPH	PHS 1998	Special Topics in Biostatistics	1	TS2
UTSPH	PHS 2950	Genetic Epidemiology of Chronic Disease	2	TS1
UTSPH	PHS 2998	Special Topics in Epidemiology: Epidemiologic Data Management and Analysis	3	TS1/TS2
UTSPH	PHS 3926	Health Survey Research Design	4	TS1/TS2

DOMAIN 4. Leadership and Team Science

Leadership and Team Science Competencies

1. Advocate for multiple points of view.
2. Clarify language differences across disciplines.
3. Demonstrate group decision-making techniques.
4. Manage conflict.
5. Participate as a member of an interdisciplinary team of scientists (demonstrate the ability to collaborate, work with, and participate on inter-professional teams).
6. Build an investigative team that matches the objectives of the research problem.
7. Apply communication strategies, including principled negotiation, conflict resolution, and active listening in the interactions with individuals and groups.
8. Work as a leader of a multidisciplinary research team.
9. Manage a multidisciplinary team across its fiscal, personnel, regulatory compliance and problem solving requirements.
10. Maintain skills as a mentor and mentee.
11. Validate others as a mentor.
12. Foster innovation and creativity.
13. Demonstrate leadership skills for building partnerships.
14. Apply the principles of program planning, development, budgeting, management and evaluation in organizational and community initiatives.
15. Apply communication strategies, including principled negotiation, conflict resolution, and active listening in the interactions with individuals and groups.
16. Facilitate collaboration with internal and external groups to ensure participation of key stakeholders.
17. Demonstrate team building, negotiation, and conflict management skills.
18. Differentiate among goals, measurable objectives, related activities, and expected outcomes for the population.

Leadership and Team Science Courses

University	Prefix/Number	Leadership and Team Science Required Courses (Core)	SCH	Track
Requirement: 3 SCH				
UTSPH	PHS 5200	Foundations in Leadership (ITV Houston)	3	TS1/TS2

University	Prefix/Number	Leadership and Team Science Prescribed Track Courses	SCH	Track
UTSPH	PHW 1110	Social and Behavioral Aspects of Community Health (Online)	3	TS2
UTSPH	PHS 3740	Community-Based Health Assessment	4	TS2

University	Prefix/Number	Leadership and Team Science Free Elective Courses	SCH	Track
UTSA	SOC 5143	Demography and Community Trends (College of Liberal and Fine Arts: Sociology)	3	TS2
UTSA	MGT 5043	Management and Behavior in Organizations (College of Business: Management)	3	TS1/TS2
UTSA	DEM 7043	Health Care Organizations, Professions, and the Government (College of Public Policy: Demography)	3	TS2
UTSA	KAH 5133	Health Program Planning, Implementation and Evaluation (College of Education and Human Development: Health and Kinesiology)	3	TS2
UTSPH	PHS 1112	Health Promotion Theory and Methods II	3	TS2
UTSPH	PHS 3998	Special Topics: Health Policy and High Performance Health Care Delivery System	2	TS2
UTSPH	PHW 3715	Introduction to Management and Policy Sciences (Online)	3	TS2
UTSPH	PHS 3750	Organizational Psychology	4	TS1/TS2
UTSPH	PHS 3710	Administration and Public Health (ITV)	3	TS2

DOMAIN 5. Cultural Proficiency

Cultural Proficiency Competencies

1. Differentiate between cultural competency and cultural sensitivity principles.
2. Discuss and describe the cultural and social variation in standards of research integrity.
3. Recognize demographic, geographic, and ethnographic features within communities and populations when designing a clinical study.
4. Describe the relevance of cultural and population diversity in clinical research design.
5. Examine characteristics that bind people together as a community, including social ties, common perspectives or interests, and geography.
6. For cultural and linguistic competence and health literacy:
   a. Describe the basic principles, processes, and outcomes of translational community-engagement research.
   b. Specify their impact on all forms of translational research.
7. Analyze inter-relationships among systems that influence the quality of life of people in their communities.
8. Explain how the contexts of gender, race, poverty, history, migration, and culture are important in the design of interventions.
9. Incorporate strategies for interacting with persons from diverse cultural, socioeconomic, educational, racial, ethnic and professional backgrounds.
10. Consider the role of cultural, social, and behavioral factors in determining the delivery of health services.
11. Develop health programs and strategies responsive to the diverse cultural values and traditions of the communities being served.
12. Synthesize and present information appropriate to the needs of the audience, and discuss achievable and acceptable plans of action that address issues of priority to the individual and community.
13. Recognize and work effectively with professional cultural differences within and among organizations.

Cultural Proficiency Courses

University	Prefix/Number	Cultural Proficiency Required Courses (Core)	SCH	Track
Requirement: 3 SCH				
UTSA	SOC 5133	Sociology of Health and Health Care (College of Liberal & Fine Arts: Sociology)	3	TS1/TS2

University	Prefix/Number	Cultural Proficiency Prescribed Track Courses	SCH	Track
		None		

University	Prefix/Number	Cultural Proficiency Free Elective Courses	SCH	Track
UTHSC	MEDI 6068	Cross-Cultural Adaptation of Research Instruments	1	TS2
UTSA	MGT 5043	Management and Behavior in Organizations (College of Business: Management)	3	TS1/TS2
UTSA	ANT 6133	Seminar in Medical Anthropology (College of Liberal and Fine Arts: Anthropology)	3	TS1/TS2

DOMAIN 6:   Scientific Communication

Scientific Communication Competencies

1. Communicate translational research findings to different groups of individuals, including inter-professional groups of colleagues, students, the lay public, and the media.
2. Demonstrate effective written and oral skills for communicating research:
    a.   Write an informative title.
    b.   Write a clear abstract.
    c.   Prepare a poster.
    d.   Prepare a PowerPoint presentation.
3. Identify, interpret and critique literature to assess knowledge – students will be able to:
    a. Conduct a comprehensive and systematic search of the literature using informatics techniques.
    b. Summarize evidence from the literature on a clinical problem.
    c. Describe the mechanism of a clinical problem reviewed in a manuscript.
    d. Use evidence as the basis of the critique and interpretation of results of published studies.
    e. Assess sources of bias and variations in published studies.
    f.   Interpret published literature in a causal framework.
    g. Identify the unknown knowledge within a research problem.
4. Translate the implications of translational research findings:
    a.   for clinical practice, advocacy, and governmental groups.
    b.   into national health strategies or guidelines for use by the general public.
5. Write manuscripts for publication in the peer-reviewed literature:
    a. Display knowledge of appropriate formatting for journals.
    b. Behave responsibly as an author.
    c. Write clear introductions, methods, results, discussions and conclusions.
    d. Manage bibliographic references effectively with appropriate software.
6. Disseminate evaluative outcomes and implications for clinical practice and future research.
7. Develop skills for writing grants:
    a. Write clear specific aims.
    b. Formulate testable hypotheses.
    c. Be familiar with and able to follow grant mechanisms for major research organizations (e.g., National Institutes of Health, Centers for Disease Control, Veterans Administration).

Scientific Communication Courses

University	Prefix/Number	Scientific Communication Required Courses (Core)	SCH	Track
Requirement: One Course from:				
UTHSC	MEDI 5075	Scientific Communication	2	TS1/TS2
UTCOP	PHR 487Q	Communication Skills for Scientists	4	TS1/TS2

University	Prefix/Number	Scientific Communication Prescribed Track Courses	SCH	Track
UTHSC	MEDI 6064	Grantsmanship and Peer Review	1	TS1/TS2
UTHSC	CSBL 5077	Scientific Writing	2	TS1/TS2
UTCOP	PHR 398T	Supervised Teaching	3	TS1/TS2

University	Prefix/Number	Scientific Communication Free Elective Courses	SCH	Track
UTHSC	BIOC 5077	Presentation of Published Research	1	TS1/TS2
UTSA	COM 5103	Theories and Applications of Communication (College of Liberal and Fine Arts: Communication)	3	TS1/TS2

DOMAIN 7. Business of Translational Science

Business of Translational Science Competencies

1. Explain the utility and mechanisms of commercialization for translational research findings.
2. Display a fundamental knowledge of what constitutes intellectual property and the processes for protecting and developing it.
3. Display a fundamental knowledge of patent rights and procedures.
4. Able to participate in research projects related to technology transfer.
5. Articulate the health, fiscal, administrative, legal, ethical, social, and political implications of policy options.
6. Analyze the potential impacts of legal and regulatory environments on the conduct of translational research.
7. Display fundamental knowledge of health economics and health care delivery.
8. Has a working knowledge of the components of a business plan.
9. Able to work effectively with a team to develop a business plan for a health related product, organization, or service.

Business of Translational Science Courses

University	Prefix/Number	Business of TS Required Courses (Core)	SCH	Track
Requirement: Minimum of 3 SCH from:				
UTSA	MOT 5173	Technology Transfer: The Theory and Practice of Knowledge Utilization (College of Business: Management of Technology)	3	TS1/TS2

University	Prefix/Number	Business of TS Prescribed Track Courses	SCH	Track
UTSA	MOT 5163	Management of Technology (College of Business: Management of Technology)	3	TS1
UTSA	PAD 5323	Public Policy Formulation and Implementation (College of Public Policy: Public Administration)	3	TS2
UTSPH	PHS 3998	Health Policy and High Performance Health Care Delivery System	2	TS2
UTSPH	PHS 3910	Introduction to Health Economics (ITV)	3	TS2

University	Prefix/Number	Business of TS Free Elective Courses	SCH	Track
UTSA	BLW 6553	Legal, Ethical, and Social Issues of Health Care Management (College of Business: Business Law)	3	TS2
UTSA	MOT 5323	Biotechnology Industry (College of Business: Management of Technology)	3	TS1/TS2
UTSA	CHE 7673	Advanced Topics in Medicinal Chemistry (College of Sciences: Chemistry)	3	TS1

University	Prefix/Number	Business of TS Free Elective Courses	SCH	Track
UTSA	BIO 5762	Fundamentals of Immunology for Biotechnology (College of Sciences: Biology)	2	TS1
UTSA	BIO 6513	Drug Development (College of Sciences: Biology)	3	TS1
UTSA	BIO 6543	Vaccine Development (College of Sciences: Biology)	3	TS1
UTSA	PAD 5313	Public Policy Analysis (College of Public Policy: Public Administration)	3	TS2
UTSPH	PHW 3715	Introduction to Management and Policy Sciences (Online)	3	TS2
UTSPH	PHS 3818	Texas Health Policy (ITV)	3	TS2
UTSPH	PHS 3825	Public Health Law	3	TS2
UTCOP	PHR 381D	Product Development	3	TS1
UTCOP	PHR 386M	Pharmaceutical Distribution	3	TS1
UTCOP	PHR 386Q	Preclinical and Clinical Drug Development	3	TS1
UTCOP	PHR 387C	Advanced Institutional Pharmacy Management	3	TS1
UTCOP	PHR 393T	Pharmacoeconomics	3	TS1
UTCOP	PHR 397C	Pharmacy and Health Care Economics	3	TS1

DOMAIN 8. Evidence-Based Policy and Implementation

Evidence-Based Policy and Implementation Competencies

1. Document the organizational entities and structures responsible for health care delivery at local, state, and national levels.
2. Define and identify the necessary interactions among the resources needed to accomplish T2 research (epidemiology and evidence synthesis, communications theory, behavioral science, public policy, organization theory, system engineering, informatics, qualitative research, financing and economics, social network analysis, and community partnerships).
3. Conduct a comprehensive review of the scientific evidence related to a health issue, concern, or intervention.
4. Independently appraise original research reports for practice implications in context on Evidence-Based Practice.
5. Interpret results of evidence summaries to the scientific community, clinicians, policy-makers and the public.
6. Critically appraise evidence summaries for practice implications in context of Evidence Based Practice and as the basis for proposing primary research studies.
7. Use existing and advanced scientific methodologies (e.g., meta-analysis) for research synthesis to critically appraise clinical practice guidelines.
8. Design primary research to address factors within the health care system, micro-systems, and individuals associated with uptake of evidence-based clinical practice guidelines and quality improvement processes.
9. Design and implement improvement plans for health care systems, micro-systems, and individual practices, based on principles and theories from organizational models, change, and adoption of innovation.
10. Design processes to determine the impact of Evidence Based Practice on multiple outcomes.
11. As part of planned organizational change, outline systematic approaches to develop evidence-based clinical practice guidelines.
12. Interpret research evidence to support evidence-based guideline development.
13. Disseminate research results and their implications at organizational levels.
14. Provide convincing rationales for using evidence-based approaches in clinical decision making, research, healthcare policy, and education.
15. Utilize community engagement as a strategy for identifying community health issues, translating health research to communities and reducing health disparities.
16. Uses data to address scientific, political, ethical, and social public health issues.

Evidence-Based Policy and Implementation Courses

University	Prefix/Number	Evidence-Based Policy & Implementation Required Courses (Core)	SCH	Track
Requirement: 2-3 SCH from:				
UTHSC	MEDI 6065	Health Services Research	2	TS1/TS2
UTSPH	PHS 3730	Health Program Planning, Implementation, and Evaluation	3	TS1/TS2

University	Prefix/Number	Evidence-Based Policy & Implementation Prescribed Track Courses	SCH	Track
UTHSC	MEDI 5074	Data Management, Quality Control, and Regulatory Issues	2	TS1/TS2
UTSA	PAD 5313	Public Policy Analysis (College of Public Policy: Public Administration)	3	TS2
UTSA	PAD 5323	Public Policy Formulation and Implementation (College of Public Policy: Public Administration)	3	TS2
UTSPH	PHW 3715	Introduction to Management and Policy Science (Online)	3	TS2
UTSPH	PHS 3740	Community-Based Health Assessment	4	TS2

University	Prefix/Number	Evidence-Based Policy & Implementation Free Elective Courses	SCH	Track
UTHSC	NURE 53XX	Evidence-Based Quality Improvement and Patient Safety	3	T2
UTSA	IS 7023	Behavioral and Organizational Information Systems Research (College of Business: Information Systems)	3	TS2
UTSA	SOC 5043	Evaluation Research (College of Liberal and Fine Arts: Sociology)	3	TS2
UTSA	DEM 7063	Applied Demography in Policy Settings (College of Public Policy: Demography)	3	TS2
UTSA	DEM 7073	Disparities in Heath and Healthcare (College of Public Policy: Demography)	3	TS2
UTSA	DEM 7233	Applied Forecasting Methods in Demography (College of Public Policy: Demography)	3	TS2
UTSA	DEM 7403	Health Care Organizations, Professions, and the Government (College of Public Policy: Demography)	3	TS2
UTSA	PAD 5333	Program Evaluation (College of Public Policy: Public Administration)	3	TS2
UTSA	KAH 5063	Health Behaviors (College of Education and Human Development: Health and Kinesiology)	3	TS2
UTSA	KAH 5073	Essential Concepts in Promotion (College of Education and Human Development: Health and Kinesiology)	3	TS2
UTSA	KAH 5133	Health Program, Planning, Implementation, and Evaluation (College of Education and Human Development: Health and Kinesiology)	3	TS2
UTSA	KAH 6053	Nutrition in Health and Disease (College of Education and Human Development: Health and Kinesiology)	3	TS2

University	Prefix/Number	Evidence-Based Policy & Implementation Free Elective Courses	SCH	Track
UTSA	KAH 6973	Special problems (Obesity and Health) (College of Education and Human Development: Health and Kinesiology)	3	TS2
UTSPH	PHS/PHW 1120	Introduction to Program Evaluation	3	TS2
UTSPH	PHS 1433	Research Seminar in Health Promotion and Behavioral Sciences	1	TS2
UTSPH	PHS 1113	Advanced Methods for Planning and Implementing Health Promotion Programs	4	TS2
UTSPH	PHS 2998	Special Topics in Epidemiology: Epidemiologic Data Management and Analysis	3	TS2
UTSPH	PHS 3998	Health Policy and High Performance Health Care Delivery System	2	TS2

Research and Dissertation

Research and Dissertation Competencies

1. Apply ethical principles to the collection, maintenance, use and dissemination of data and information.
2. For Research Involving Human Subjects: Complete an Institutional Review Board (IRB) application and adhere to IRB procedures.
3. For Research Involving Animals: Complete an Institutional Animal Care and Use Committee (IACUC) application and adhere to IACUC procedures.
4. Apply the main rules, guidelines, codes, and professional standards for the conduct of clinical and translational research.
5. Apply the rules and professional standards that govern the data collection, sharing, and protection throughout all phases of translational research.
6. Write a research Protocol:
   a. Conduct a comprehensive review of the scientific evidence related to a health issue, concern, or intervention.
   b. Prepare the background and significance sections of a research proposal.
   c. Design the research study.
   d. Design a research data analysis plan.
7. Manage a translational research study.
   a. Implement quality assurance systems with control procedures for data intake, management, and monitoring for the research project.
   b. Collect, analyze, interpret and disseminate quantitative and/or qualitative data.
   c. Apply data collection processes, information technology applications, and computer systems to storage and retrieval strategies.
8. Appropriately analyze the data.
9. Prepare the data for presentation at a scientific meeting.
10. Write a manuscript based on the study to submit to a peer-reviewed journal.
11. Participate as a member of an interdisciplinary team of scientists.

Research and Dissertation Courses

University	Prefix/Number	Research and Dissertation	SCH	Track
Requirement: 30 SCH from:				
UTHSC	INTD 6097	Research	30	TS1/TS2
UTHSC	INTD 7099	Dissertation		
UTSA	TBD	Research	30	TS1/TS2
UTSA	TBD	Dissertation		
UTCOP	PHR 185W; PHR 285W; PHR 385W	Advanced Pharmacotherapy Research	30	TS1/TS2
UTCOP	PHR 185J; PHR 285J; PHR 385J	Advanced Pharmacotherapy Laboratory Research		
UTCOP	PHR 290R; PHR 390R	Special Problems in Pharmacotherapy		
UTCOP	PHR 195H	Advanced Pharmacotherapy Research Conference		

University	Prefix/Number	Research and Dissertation	SCH	Track
UTCOP	PHR 399R; PHR 699R; PHR 899R; or PHR 999R	Dissertation		
UTCOP	PHR 399W; PHR 699W; PHR 899W; or PHR 999W	Dissertation		