The students in this course will have the opportunity to study the gross and histological anatomy of the central and peripheral nervous systems. The course will include dissection of the brain and spinal cord and study of the circulatory system of the central nervous system. The students also will study basic neurology. P: IC.

This course provides opportunities to experience day to day applications of gross anatomy in the clinical specialities of surgery, radiology, and pathology. Weekly discussions of the various cases will be held during which the pertinent anatomical correlations will be analyzed as will methods of best conveying to health sciences students the clinical information gained. Students will be expected to write a synopsis of each case and conduct the necessary literature research for a current relevant bibliography. This course is repeatable up to eight credits. P: IC.

The opportunity to design and implement educational techniques appropriate for lecture, small group, and laboratory applications. Each student will prepare and deliver two formal lectures which will be videotaped and constructively critiqued by faculty and peers. Approaches to computer-aided educational techniques will be considered as will specific teaching strategies for traditional lectures and tutorials. P: IC.

Provides a discussion group which is focused on current literature in clinical anatomy, surgery, pathology and radiology as it directly pertains to the study and clinical application of anatomy in the health sciences. This course is repeatable up to eight credits P: IC.

The Center for Clinical and Translational Science (CCTS) at Creighton University is committed to the cutting-edge multidisciplinary clinical and translational research in a manner that builds upon current science strengths to help bring about an era of personalized medicine. The Center is an innovative resource to support and advance education, collaboration and research in clinical and translational science by pooling existing strengths and expertise together. The goal is to increase the number, quality and diversity of clinical and translational researchers and promote research and intellectual exchange among diverse professionals that elicit novel approaches to area health care priorities and fostering long-term, bi-directional relationships with academic and community partners. An integral part of this commitment is to identify, educate, and create a mentored environment to develop and enrich the career of next generation of clinical and translational researchers to become independent investigators, and engage the community in clinical research efforts.

Successful scholars in the CTS program will be mentored and supported to write independent research grant applications. Scholars will be enrolled either as full-time or part-time scholars. The CTS graduate program will provide a structured course curriculum. Since the stature comes with recognition of qualifications, successful scholars will earn Graduate Certificate in CTS and MS in CTS. The graduates of the CTS program will:
1. demonstrate the competence and knowledge in applied biostatistics, federal policies in clinical and translational research, and disparity in global health issues as they pertain to the community;
2. demonstrate an ability to combine critical thinking, disciplined research, and effective problem-solving both within their field of study and beyond, for use in the service to others;
3. demonstrate the knowledge of scientific integrity, ethics, and moral values to maintain responsible conduct of research in the field of clinical and translational science following Catholic and Jesuit mission;

4. demonstrate competency in written and oral communication of their acquired knowledge and research findings in relation to public health issues to scientific and non-scientific audience;

5. demonstrate deliberate reflection for lifelong personal and professional career in their field of expertise; and

6. demonstrate an ability to interact and coordinate with a diverse group of colleagues and the ability to respond effectively to the questions and feelings of others.

The MS Graduates will have gained the ability to identify important clinical questions, ability to independently conduct clinical and translational research, develop research protocols, generate pilot data, conduct clinical investigations, ability to critique and interpret findings to non-specialists in their field, analyze and write the results in a publishable form and develop and submit grant proposals.

Each scholar will select a Graduate Advisory Committee. It will be comprised of four members of the CTS faculty and other qualified faculty within the Health Sciences and other schools at Creighton. The committee members will be selected by the scholar in consultation with the major advisor and in consultation with the Program Director of the CTS program. The Participant Advisory Committee of each scholar will set up educational goals, will provide information about opportunities for conferences, networking and communication, and will provide information about clinical research opportunities and assist the scholar in identifying a focus area. The scholar will meet in person with his/her major advisor at least once a week. Progress of the scholar will be evaluated at least once every quarter by the scholar’s graduate advisory committee. The purpose of such meetings will be to evaluate the scholar’s progress and the effectiveness of the CTS graduate program. A written report of each advisory committee meeting will be maintained in the file of the scholar.

**Faculty**


Associate Professors: K. Drescher, B. Furlong, J. Knezetic, P. Turner;

Assistant Professors/Instructors: P. Nowatzke, J. Tolman.

**Admission Requirements**

1. A minimum of bachelor’s degree or equivalent, with satisfactory completion of course work in both the biological and chemical sciences.

2. A minimum GPA of 3.0 on a scale of 4.0 is required.

3. The applicant is required to submit results from the Graduate Record Examination (GRE) prior to admission. GRE scores in the 50th percentile or above for the verbal and quantitative parts of the examination are preferred. A minimum score of 3.5 is required for the analytical writing component.

4. The scores of the MCAT, DAT, USMLE or other Health Professional Entrance Examination may be considered in lieu of GRE.

5. GRE will not be required from applicants who hold a professional degree, such as MD, Pharm D, DDS, or Master of Science in Nursing (MSN) or equivalent.

6. The Graduate School requires all students from countries in which English is not the native language to demonstrate competence in English by a minimum score of 550 in TOEFL (Test of English as a Foreign Language) examination or a minimum of 80 on the Internet-based Test (iBT) at the graduate level.

Each applicant’s "Personal Statement" together with prior academic preparation and Letters of Reference will be carefully reviewed by an internal committee chaired by the Program Director, Devendra K. Agrawal. Highly motivated scholars will be selected and the final recommendation to the Dean of Graduate School will be made for their enrollment in the Graduate Certificate in CTS or Master of Science in CTS. Selection will be based on: (i) the quality of the applicant’s academic and/or clinical record, (ii) quality of applicant’s letters of recommendation, (iii) potential for development into an independent clinical and translational researcher focused on patient-oriented clinical research, (iv) commitment to a career in patient-oriented clinical research whether in academia or in a pharmaceutical industry, and interest in disseminating clinical trial outcomes to health-related fields that serve the general community.
Master of Science (M.S.) with a Major in Clinical and Translational Science

The scholars in the MS program will be required to complete 30 credit hours including the following core courses (15 credit hours). Based on individual scholar’s academic preparedness, there will be flexibility in the core courses. For example, if a scholar already had taken some of the following core courses during their training program, those scholars can take other courses in the CTS graduate program.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CTS 601</td>
<td>Biostatistics and Analysis</td>
<td>3</td>
</tr>
<tr>
<td>IDC 601</td>
<td>Responsible Conduct of Research</td>
<td>1</td>
</tr>
<tr>
<td>CTS 701</td>
<td>Intermediate Biostatistics</td>
<td>3</td>
</tr>
<tr>
<td>CTS 702</td>
<td>Federal Policies in Clinical &amp; Translational Research</td>
<td>1</td>
</tr>
<tr>
<td>CTS 704</td>
<td>Community-Based Participatory Research</td>
<td>1</td>
</tr>
<tr>
<td>CTS 705</td>
<td>Community Engagement in Clinical Trans. Research</td>
<td>2</td>
</tr>
<tr>
<td>CTS 713</td>
<td>Preparation of Competitive Grant Applications</td>
<td>2</td>
</tr>
<tr>
<td>CTS 719</td>
<td>Translation of Research Innovation</td>
<td>2</td>
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<tr>
<td>CTS 791</td>
<td>Seminars in Clinical &amp; Translational Science</td>
<td>1</td>
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<tr>
<td>CTS 797</td>
<td>Directed Independent Research</td>
<td>6-9</td>
</tr>
<tr>
<td>CTS 799</td>
<td>Master's Thesis</td>
<td>1-6</td>
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In addition, each scholar will be required to successfully complete at least 4 credit hours of course work from the list of elective courses offered in the CTS program.

Graduate Certificate in Clinical & Translational Science: 15 credits

The scholars will be required to take the following core courses. Based on individual scholar’s academic preparedness, there will be flexibility in the core courses. For example, if a scholar had already taken some of the following core courses during their previous education, he/she can choose other courses in the CTS graduate program, but this requires approval by the Program Director.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>CTS 601</td>
<td>Biostatistics and Analysis of Clinical data for Evidence-based Practice</td>
<td>3</td>
</tr>
<tr>
<td>IDC 601</td>
<td>Responsible Conduct of Research</td>
<td>1</td>
</tr>
<tr>
<td>CTS 701</td>
<td>Intermediate Biostatistics</td>
<td>3</td>
</tr>
<tr>
<td>CTS 702</td>
<td>Federal Policies in Clinical &amp; Translational Research</td>
<td>2</td>
</tr>
<tr>
<td>CTS 705</td>
<td>Community Engagement in Clinical Trans. Research</td>
<td>2</td>
</tr>
</tbody>
</table>

CTS 601 Biostatistics and Analysis of Clinical Data for Evidence-based Practice (3)
The focus of CTS 601 will be on descriptive, parametric and nonparametric bivariate inferential statistics used in medicine and foundational to the empirical “evidence” supporting evidence-based practice. Didactic lectures, class discussions, individual and group projects using empirical data, and presentations to peers will develop analytical skills for evaluating the published empirical research in medicine and related health care disciplines. Emphasis is on identifying the appropriate research design, statistical tests, and interpretation of results, given a specific practice-based question.

CTS 701 Intermediate Biostatistics: Correlational & Multivariate Regression Analyses of Clinical Data (3) 1
The CTS 701 course builds on the principles mastered in CTS 601 by developing the skills and knowledge for appropriate use of multivariate regression techniques based on the correlational aspects of clinical data. The conceptual and applied applications of correlational and multivariate regression analyses to clinically relevant research datasets will be the focus of the course while keeping mathematics to a minimum of college-level algebra. Specific datasets will be provided along with encouragement for students to incorporate their own research datasets into the course.
CTS 702  **Federal Policies in Clinical & Translational Research** (2) I
This class will provide a comprehensive overview of the History of Federal Regulations that Govern Human Subject Research. These will include: (1) Research Ethics, (2) Federal and State Regulations, (3) OHRP and FDA Documents, (4) Institutional Review Board Functions and Operations, and (5) Informed Consent. The program objective will be to: (i) provide a Historical Perspective of the Development of the IRB System and Federal Regulations, (ii) discuss the Relevant Ethical Principles and their Application, (iii) cover all Federal and State Regulations (DHHS, FDA, HIPAA), (iv) analyze guidance documents (OHRP, FDA), (v) Provide an overview of IRB functions and operations (exempt/expedited/convened review, IRB requirements, risk/benefit analysis, vulnerable populations, subject recruitment, advertising), (vi) explore Informed Consent (required elements, practical considerations, proper documentation, helpful hints, common errors), and (vii) case Studies and Discussion (to braid together the course content with real-life work experiences).

CTS 705  **Community Engagement in Clinical & Translational Research** (2) S
This two-credit hour course focuses on the definitions, concepts, Best Practices, and challenges of Community Engagement in Clinical and Translational Research. Learning strategies will include: didactic and seminar classes, independent reading and assignments, local and national speakers with expertise in Community Engagement and Clinical and Translational Research, case studies, audiovisuals, etc. The student will: (1) Demonstrate a knowledge of the history, rationale, and the emerging emphasis of Community Engagement in Clinical and Translational Research, (2) Identify the resources and organizations furthering community engagement, (3) Demonstrate an understanding of definitions, concepts, Best Practices, and challenges of community engagement, (4) Compare and contrast community engagement in several countries, (5) Apply Best Practices of community engagement to one’s own student research project, and (6) Demonstrate an appreciation for the value of Community Engagement in Clinical and Translational Research.

CTS 706  **Epidemiology** (2) II, S
Epidemiology is the study of the distribution, determinants, and prevention of diseases in the population. Epidemiology studies natural history of diseases, environmental and genetic risk factors that may increase or decrease the risk of diseases, and interventions that can prevent the occurrence, recurrence, and adverse sequelae of diseases. This course will consist of approximately 20 hours of classroom with a combination of didactic instruction, interactive panel discussion, and small group projects in designing epidemiologic studies. Primary emphasis will be on epidemiologic study methods and applications.

CTS 708  **Health Disparity in Global Health** (2) II
The global health issues are extremely critical due to transmission of infectious diseases across the world, emergence of resistance to current antibiotic therapies, threat of bioterrorism, and health disparity between and within nations. Thus, it is critical to understand the social and environmental factors that contribute to diseases and develop preventive measures. Upon completion of this course, the CTS scholar will be able to understand: (1) health inequalities, (2) socio-economic risk factors, (3) maternal and child health, (4) the health of special populations, (5) HIV-AIDS, Malaria and tuberculosis, (6) globalization and emerging infectious diseases, and (7) global health payers and players and their role in understanding cultural issues.

CTS 709  **Clinical Research Design and Methods** (2)
An overview of the research designs available for clinical investigation: Strengths and weaknesses of controlled trials, cohort studies, and case control studies; the problem of response heterogeneity; bias and its sources; the problem of lost sampling units; randomization and its importance; the weaknesses of systematic reviews and of evidence-based medicine.

CTS 712  **Bioinformatics and Information Technology in Clinical Medicine** (2)
This course will introduce the scholars to Bioinformatics, which uses computer databases to store, retrieve and assist in understanding biological information. Genome-scale sequencing projects have led to an explosion of genetic sequences available for automated analysis. These gene sequences are the codes, which direct the production of proteins that in turn regulate all life processes. The CTS graduate program scholars will be shown how these sequences can lead to a much fuller understanding of many biological processes allowing pharmaceutical and biotechnology companies to determine for example new drug targets or to predict if particular drugs are applicable to all patients.
CTS 713 **The Discipline of Scientific Writing and Preparation of Competitive Grant Applications** (2)

The course will entail lectures on how to write a scientific paper and a proposal for funding with adherence to conventions of the literature and expectations of individual journals and funding agencies. Emphasis will be placed on writing clear English, and sequence of information. Course topics will include those in the recommended literature: (1) Writing a scientific paper and speaking at scientific meetings, second edition, Communicating in Science, by Vernon Booth, Cambridge University Press, 1993, (2) The Elements of Style, by W. Strunk and E.B. White, and (3) Writing a Scientific Paper, Chapter 1. The ACS Style Guide, A manual for Authors and Editors, Second Edition, J.S. Dodd, Editor, 1997, American Chemical Society. The lecture topics will be demonstrated in class discussions of papers selected from the literature. Students will be expected to participate in discussions and write individual critiques of the papers.

CTS 715 **Applied Pharmacokinetics and Pharmacodynamics for Clinicians** (3) I

This course will prepare the clinician for individualized optimization of drug dosage based on a thorough understanding of pharmacokinetic and pharmacodynamic principles. The clinical application of pharmacokinetics to specific drugs will be discussed through the presentation and solution of problems commonly encountered in the clinical practice setting. The process of using drug concentrations, pharmacokinetic, and pharmacodynamic criteria to optimize therapy in individual patients will be illustrated and reinforced through discussions of pertinent drugs and case examples. Finally, principles and the underlying mechanisms of drug-receptor interaction will be discussed.

CTS 716 **Molecular Medicine & Molecular Genetics** (2)

The overall objective of this course is to familiarize the student with current aspects of molecular medicine in the clinical setting. The course will consist of 36 lecture sessions. Two thirds of these sessions will cover classical Mendelian molecular genetics, modern genetic testing and genetic diseases. The remaining lectures will cover the genetic aspects of cell inflammation, cell death and neoplasia. These lectures will be presented by members of the Departments of Pathology and Biomedical Sciences. Also, each student will be assigned a separate genetic disease and will “present” it to the class—similar to the way one would do it at a clinical grand rounds conference.

CTS 718 **Medical Anthropology Research Strategies** (1)

This course is about doing research not about results obtained. Those initiating their first medical anthropological research experiences may understand some of the techniques and results of other research related to their proposed study, but many have limited knowledge of actual strategies by which such research is undertaken as well as the many limitations that constrain anthropological inquiries into the medical sciences.

CTS 719 **Translation of Research Innovation to Commercial Entities: Academic Entrepreneurship** (2)

Relationships between academic medical centers and corporate entities have become increasingly important in bringing new biotechnologies into clinical practice. These relationships have become part of a complex innovation ecosystem comprised of entrepreneurs, universities, corporate partners and others in a collaborative/competitive environment. This course will cover critical issues in intellectual property management, disclosure, patents, and discuss ethical dilemmas in academic corporate relationships. It will describe various models for translating biotechnology innovation into commercial products including University start-ups and University/Corporate partnerships. Issues related to the FDA regulatory process will be explored to assist investigators in determining whether the potential product is considered a drug, a biological therapeutic, or a biologic. Finally NIH funding mechanisms via the STTR and SBIR will be explored and include eligibility considerations, new NIH funding opportunities, and enhancements to the program.

CTS 791 **Seminars in Clinical and Translational Science** (1)

Regular seminars will be arranged in conjunction with the Grand Rounds and Research Presentations in the Department of Medicine. The seminar topics will relate to clinical and translational science, including issues in clinical research design and conduct, community engagement in clinical research, research methodologic issues, Web-based Technology: Implications for Data Collection in Clinical Research, gene and stem cell therapy, nanotechnology, etc. Seminars will be held at least once a week. Outside qualified speakers will be invited. This course can be taken every semester.
CTS 795  Directed Independent Study (2-3)
In this course, each scholar will be supervised by faculty members; will pursue in-depth reading and discussions on current research topics of interest to faculty and students. The purpose is to provide an environment whereby the student is introduced to scientific research methods and can improve critical thinking and reading skills as well as exchanging scientific information.

CTS 797  Directed Independent Research (3-6)
Original investigation under supervision and guidance of individual faculty members. The course will require laboratory work and conferences. The CTS graduate students will have choice to select research projects in many different disciplines of clinical and translational science and will select a major advisor. If necessary, a co-major advisor may also be selected.

CTS 799  Master’s Thesis (1-6)
Review of literature and research data; writing of the thesis. The scholars must register for this course in any term when engaged in formal preparation of the Master’s thesis. However, six credit hours are the maximum applicable towards the degree.

COUNSELOR EDUCATION (COU)
M.S. in Counselor Education Director: Debra L. Ponec

GRADUATE STUDY IN COUNSELING
This program is organized on the assumption that an effective counselor must be a personally adequate person who has a cognitive understanding of humankind and counseling theory. In addition to intellectual understanding, the counselor must continually develop proficiencies and competence in specific skills germane to the helping relationship. It is important for the student beginning this program to understand that he or she is expected to further his or her maturity in all three areas — personal growth, cognitive understanding, and technical competence. Programs are designed to meet the needs, on the Master’s level, of those interested in various counseling roles and student personnel services. These programs are designed to develop the competencies demanded of an individual embarking on a career in one of these areas. Such individuals are usually employed by school systems, employment services, colleges, and community agencies. To be employed in a school system, a counselor must be certified by a State Department of Education. In many states, counselor certification demands a teaching certificate and teaching experience. It should also be noted that potential employers frequently impose additional requirements above those needed for certification, e.g., teaching experience within that system.

Program Goals
Using the Counselor-Researcher/Scientist model of training, the graduates will demonstrate:
1. Content and pedagogical knowledge required to counsel in educational and agency settings, including:
   a. elements that make counseling a profession,
   b. social and cultural contexts of relationships,
   c. nature and needs of individuals at all developmental stages,
   d. counseling and consultation process,
   e. career development and related life factors,
   f. group approaches to counseling,
   g. individual and group approaches to assessment,
   h. research and program evaluation,
   i. ethics of professional counseling practice and commitment to that end,
   j. organizational, political, and social structures that specialty area, and
   k. self and others as spiritual beings
   l. Jesuit charisms that impact practice;
2. Skills required to counsel in educational and agency settings; and
3. Dispositions favorable to working in educational and agency settings.