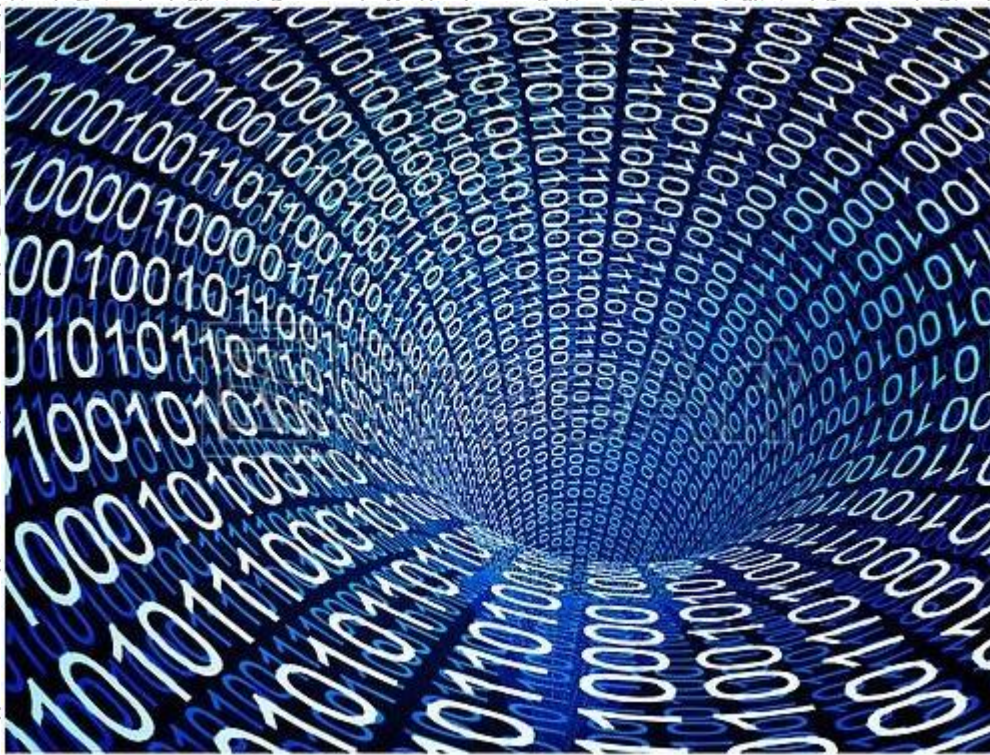# 2023-2024
Program, Policies, and Guidelines

Certificate in Biomedical Data Science (CBDS)

Graduate School of Biomedical Sciences
UT Health San Antonio

Certificate in Biomedical Data Science (CBDS) Program policies and guidelines are in compliance with those established by the UT System (http://www.utsystem.edu/) Board of Regents (http://www.utsystem.edu/bor/rules/), The UTHSCSA (http://www.uthscsa.edu/hop2000/), and the Graduate School of Biomedical Sciences (http://gsbs.uthscsa.edu/). The *Catalog* (http://catalog.uthscsa.edu/) of The UTHSCSA provides general information and regulations that relate to students. In the event of discrepancies between MSCI-TS Program policies/guidelines and those established by UT governing components, those described by the governing components will prevail.

Please note that the policies of the CBDS Program are regularly reviewed and updated; therefore, this printed copy may not be the most current. Current policies are provided in the CBDS Handbook that is electronically available at the CBDS website: (https://iims.uthscsa.edu/ed_certificate_in_bds.html)

CBDS Program
UT Health San Antonio
7703 Floyd Curl Drive
San Antonio, Texas 78229-3900
210-567-4304 (voice)
E-mail: machuca@uthscsa.edu

Certificate in Biomedical Data Science (CBDS)

Program, Policies, and Guidelines

Table of Contents

THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT SAN ANTONIO
GRADUATE SCHOOL OF BIOMEDICAL SCIENCES (GSBS)

Certificate in Biomedical Data Science

AIMS/OBJECTIVES

The goal of this program is to provide graduate students, postdoctoral fellows, faculty, and other healthcare professionals with the fundamental understanding and abilities to utilize data science programming and tools to make data driven discoveries and develop user friendly and powerful data science applications, cross-cutting best practices for developing informative visualizations, application of supervised and unsupervised techniques for machine learning, and the ability to assess and optimize artificial intelligence solutions for real-world performance.

The specific aims of the Biomedical Data Science Certificate Program are to:

- Support the intellectual environment at the UT Health Science Center at San Antonio for biomedical data centric and informatics research.

- Provide fundamental curricular activities in the biomedical data science to UT Health Science Center at San Antonio students, postdoctoral trainees, clinical residents and fellows, and faculty from the Schools of Medicine, Nursing, Dentistry, Health Professions, and Graduate School of Biomedical Sciences (GSBS) as well as from local organizations that are partnered with UT Health Science Center at San Antonio.

The aims of the CBDS program will be achieved *via* participation and successful completion of required didactic coursework.

Certificate Program Governance

Oversight for the routine operations and implementation of the Biomedical Data Science Certificate Program will be provided by the Master of Science in Clinical Investigation and Translational Science (MSCI-TS) Program and the corresponding MSCI-TS Committee on Graduate Studies (COGS).

Admission Requirements

All students should have a sufficient educational background in the quantitative computational or biomedical sciences prior to admission to the program. It is expected that most students will have a health professional degree (*e.g.*, MD, DDS/DMD, DVM, or BS in nursing and/or allied health) or a BS/BA, MS, or PhD degree with emphasis in statistics, data science or a health-related discipline. The following general requirements will be applied:

- A medical, dental, masters and/or baccalaureate **degree** from an accredited institution in the United States or an U.S. equivalent degree and training at an international institution. All transcripts from international institutions (including GPA) must be evaluated and submitted by an approved NACES member foreign credentialing evaluation agency. The CTS preferred agencies are: The Educational Credential Evaluators, Inc. **(ECE)** or the World Education Services, Inc. **(WES)**.

- A **Grade Point Average** (GPA) no lower than a B (3.00 in a 4.00 system) in the last 60 hours of coursework for a BS/BA degree or a GPA of at least 3.0 for applicants with a MS degree.

- A minimum score of 84 on the internet-based version of the Test of English as a Foreign Language (TOEFL), a band score of 7.0 on the Academic version of the International English Language Testing System (IELTS) or a minimum score of 115 on the Duolingo English Test for applicants from countries where English is not the native language.

Applicant Documentation Requirements

Applicants should utilize the checklist of required documentation for admission that is provided in the Appendix of this Handbook.

All the **required** information previously described must be submitted in order for an applicant to be considered by the MSCI-TS Student Admissions Committee. Requests for an exemption to any of these general admission requirements should be addressed to the CBDS Program Director and sent directly to the CBDS Program Coordinator at the address below.

Required Documentation:

1. **Completed and submitted GSBS on-line application.** The GSBS on-line application can be found on the GSBS homepage at http://gsbs.uthscsa.edu/.
2. **Official transcripts** from **ALL** colleges and universities attended.

3. **Course by Course Translation of foreign** transcripts to include GPA and U.S. degree equivalency by the ECE or WES agencies.

4. **Official TOEFL/IELTS (academic version) or Duo-Lingo scores** taken within the past two (2) years for international applicants.

5. **Three (3) Letters of Recommendation** attesting to the applicant's readiness for graduate level studies in biomedical data science. These letters should be uploaded to the Recommendation Form by the individual recommenders who will receive an email from the on-line application system (EMBARK) with a link to the Recommendation Form.

   - Residents or fellows in an approved UT Health San Antonio residency or fellowship program are required to submit one (1) of the three (3) letters from their departmental chair or program director with a statement indicating the availability and approval of release of time for the completion of the CBDS educational activities.

   - Staff employed at UT Health San Antonio are required to submit one (1) of the three (3) letters from their authorized supervisor with a statement indicating the availability and approval of release time for the completion of the CBDS educational activities.

   - Faculty (*non-tenured only*) at UT Health San Antonio are required to submit one (1) of the three (3) letters from the Chair of their department. In addition, the Chair's letter must have the approval of both the Dean of the school that houses the department and the President (or his designee) of UT Health San Antonio. (See the Handbook of Operating Procedures (HOP), Policy 3.2.5)

6. A **Statement of Purpose (a.k.a. Personal Statement)** (1-2 pages) that includes a brief description of the applicant's background, long term research and/or career goals, and an indication of the basis for application into the CBDS Program including how this program fits into the applicant's career objectives. The Statement of Purpose should be submitted with the on-line application to the GSBS.

7. A **current curriculum vitae.** This should be submitted with the on-line application to the GSBS.

8. **Copy of U.S. Medical License/Certificate** for licensed health care professionals.

Official test scores, transcripts, and international transcript translations, mentioned above, should be sent to:

Registrar's Office-Graduate Admissions MSC 7702
The UT Health Science Center at San Antonio
7703 Floyd Curl Drive
San Antonio, Texas 78229-3900

gsprospect@uthscsa.edu
Phone: 210-567-2667

Academic Coordinator
CBDS Program
(210) 567-4304

Application Process

Application. An [online application](http://gsbs.uthscsa.edu/) for admission into the CBDS Program must be processed through the UT Health Science Center at San Antonio Graduate School of Biomedical Sciences (GSBS). This application is available at: : http://gsbs.uthscsa.edu/**.**

As described in the on-line application for admission into the GSBS, official transcripts from **ALL** colleges and universities attended by the applicant are required; these must be submitted in sealed institutional envelopes. In addition, all transcripts from foreign institutions must be evaluated and submitted by one of the above mentioned approved foreign credentialing evaluation agencies. Official GRE and TOEFL or IELTS (academic version) test scores must also be submitted

Deadlines. The CBDS Program has an open application policy and will accept applications for admission at any time. However, *GSBS deadlines* (for submission of application and required documentation) for matriculation in a specific academic semester are listed below.

- Fall Semester   April 1

Applicants will have the responsibility for the timely submission of application materials in order to meet the deadlines established by the GSBS for registration and course enrollment.

Application Review. Operational processes used by the CBDS Program are provided by the Master of Science in Clinical Investigation and Translational Science (MSCI-TS) Student Admissions Committee (SAC). Thus, after receipt of the on-line application together with all of the required admission materials outlined above, the MSCI-TS SAC will review and provide a recommendation to the Dean of the GSBS.

Each application will be individually reviewed to consider: the applicant's undergraduate and graduate course work and degree(s), scores on the TOEFL or IELTS (academic version), if applicable tests, research experience, and all other required documentation submitted with the online application. Research experience is not required but may be beneficial. The admission decision is based on the personal statement as well as record of academic achievement, professional experience, coursework, and letters of recommendation.

After sequential review by the MSCI-TS SAC, and the GSBS, applicants will be formally notified of the outcome by the Graduate Dean of the UT Health Science Center at San Antonio. The MSCI-TS SAC recommends admission to the most highly qualified applicants regardless of ethnicity, gender, age, sexual orientation, nation of origin, or disability.

After acceptance, students may complete the requirements for certificate completion while enrolled as either a full-time or part-time student.

Graduate students who are enrolled in the Master of Science in Clinical Investigation and Translational Science (MSCI-TS) Program or the Certificate in Translational Science (CTS) Program are ineligible to concurrently enroll in the CBDS Program. However, coursework accomplished towards the Certificate in Biomedical Data Science may be applied to the MSCI-TS degree or the CTS.

Dual Enrollment

Graduate students who are enrolled in the Master of Science in Clinical Investigation and Translational Science (MSCI-TS) Program or other graduate programs within the Graduate School for Biomedical Science (GSBS) are eligible to concurrently enroll in the CBDS program. Dual enrollment allows current and prospective students to tailor a unique educational and specialty training experience for themselves by simultaneously enrolling in our Biomedical Data Science Certificate program and another GSBS graduate degree program.

Tuition and Fees

Tuition and Fees. Rates for in state and out-of-state graduate student tuition and fees are established by the institution and subject to adjustment. A summary of current rates is provided in the Appendix.

Student Pathways in the CBDS Program

After acceptance as a student working towards the certificate, you may undertake course requirements for graduation while enrolled as either a full-time or part-time student.

Full-Time Students. Full-time students are enrolled in at least eight (8) semester credit hours (SCH) during the Fall and Spring semesters.

Part-time Students. Part-time students are enrolled for **less than** eight (8) SCH credit hours per semester during the Fall or Spring semesters. A part-time student must enroll in **at least** four (4) SCH per semester.

UT Health Science Center at San Antonio Faculty and Staff as Students in the CBDS Program. UT Health Science Center at San Antonio faculty and staff may apply for admission in the CBDS Program. The amount of course work that can be taken by faculty or staff in a given semester is subject to the 'quantity of work' rules outlined in the current UT Health Science Center at San Antonio Catalog and Handbook of Operating Procedures (HOP).

UTHSA/GSBS Students in the CBDS Program.
UT Health San Antonio students already enrolled in an Academic Program within the GSBS or other school(s) at UTHSA may apply for admission in the CBDS Program. The course work completed for the CBDS will be independent of the students' main educational program and cannot be used to fulfil SCH requirements within other GSBS programs. The student will be required to submit three letters of recommendation from their current supervising professor/mentor, from the home program director and, the dean of the school outlining their approval of enrollment into the CBDS program.

Non-Degree Seeking Students in the GSBS. Non-degree seeking students may enroll in courses and receive GSBS course credit *without* matriculation (admission) into a graduate program. For those not already matriculated into other GSBS graduate programs, an on-line application must be submitted to the GSBS for approval by the Dean [this would also include faculty, staff, or others]. The appropriate course director or the MSCI-TS Academic Programs Coordinator must approve the enrollment of any

non-degree seeking student in all MSCI-TS courses and sign course cards (provided by the GSBS Dean's Office).

Course credit earned as a non-degree seeking student can be applied towards a Certificate in Biomedical Data Science following formal application and acceptance into the CBDS Program. Note that enrollment as a non-degree seeking student in the GSBS is limited to four (4) semesters. Additional details about non-degree seeking students are available at: UT Health Science Center at San Antonio GSBS website

Certificate Requirements

Coursework. Completion of the CBDS Program requires the satisfactory completion of required and elective coursework. Sixteen (16) semester credit hours (SCH) of didactic coursework are required to obtain the CBDS. All course-related rules established by the CBDS program and listed in the CBDS Handbook will be endorsed and followed by the CBDS Program.

Required Courses. Students in the CBDS Program must successfully complete the following didactic courses.

TSCI 5070 (2 SCH)	*Responsible Conduct of Research*
TSCI 5201 (3 SCH)	*Advanced Statistics for Machine Learning Methods: Statistical Principles of Machine Learning applied to biomedical data*
TSCI 5230 (3 SCH)	*Programing for Biomedical Data Science*
TSCI 6202 (2 SCH)	*Data Visualization and Real-Time Analytics*
TSCI 6201 (1 SCH)	*Data Science Leadership in Healthcare*
TSCI 6203 (1 SCH)	*Practicum in Biomedical Data Science*
CSAT 6005 (1 SCH)	*Rigor & Reproducibility*

Elective Courses. Diverse elective courses are available to CBDS graduate students. These courses may be taken in any semester when offered and include:

TSCI 5050 (1 SCH)	*Introduction to Data Science*
TSCI 5073 (1 SCH)	*Integrating Molecular Biology with Patient-Oriented Clinical Research*
TSCI 5074 (2 SCH)	*Data Management, Quality Control, and Regulatory Issues*
TSCI 5075 (2 SCH)	*Scientific Communication*
TSCI 5077 (1-3 SCH)	*Practicum in Translation Science*

CSBL 6095 (2 SCH)	*Functional Genomics and Bioinformatics*
TSCI 6060 (2 SCH)	*Patient-Oriented Clinical Research Methods -2*
TSCI 6061 (2 SCH)	*Patient-Oriented Clinical Research Biostatistics - 2*
TSCI 6065 (2 SCH)	*Health Services Research*
TSCI 6067 (1 SCH)	*Genomic Healthcare*
TSCI 6069 (2 SCH)	*Statistical Issues, Planning, & Analysis of Contemporary Clinical Trials*
TSCI 6070 (2.5 SCH)	*Biostatistics Methods for Longitudinal Studies*
TSCI 6100 (1 SCH)	*Practicum in IACUC Procedures*
TSCI 6101 (1 SCH)	*Topics in Translational Science*
TSCI 6102 (1 SCH)	*Practicum in IRB Procedures*

Timeline for Coursework. A typical schedule for a full-time CBDS student is provided in the Appendix of this handbook.

Coursework towards a Certificate in Biomedical Data Science must be accomplished within three (3) or less years prior to request for certification. Exceptions to this requirement will be considered by the MSCI-TS COGS on a case-by-case basis. A written request for exemption must be submitted to the CBDS Program Director through the CBDS Program Coordinator and should include a brief description of the reason(s) for the request. The CBDS Program Director will make a recommendation to the MSCI-TS COGS who will provide the final program approval. It will then be submitted to the Graduate School Dean for final institutional approval.

Grade Requirement. As detailed by the MSCI-TS/CBDS Program, student performance in our courses are assessed on a satisfactory (S) / unsatisfactory (U) basis. Any student who receives less than a Satisfactory **(S)** assessment on any CBDS required course will be required to re-take the course and receive a passing grade during the next academic year. In the event of a second failure in the same course, the MSCI-TS COGS will provide a recommendation to the GSBS Dean as to whether or not the student should be dismissed from the CBDS Program.

Exemption of a Required Course. Exemption of the requirement for completion of a *required* course will be considered by the MSCI-TS COGS on a case-by-case basis. A written request for exemption must be submitted to the CBDS Program Director through the CBDS Program Coordinator and should include a brief description of the reason(s) for the request as well as documentation (publication copies, meeting abstracts, etc.) supporting the reason(s) for the request.

In the event that prior coursework is the basis for the request, the following documentation must be submitted to the CBDS Program Director through the CBDS Program Coordinator.

1. A written request that includes a comprehensive description of the prior course detailing when and where completed, course semester credit hours, and details of course content and objectives.

2. An official copy of the student's transcript that indicates successful course completion and the grade issued.
3. A copy of the course description from the catalog that was in effect during the semester the course was taken.
4. A course syllabus is suggested but not required.

MSCI-TS COGS approval of a request for course exemption does not grant the student credit for the semester credit hours associated with the course. The semester credit hours for the exempted course can be obtained by taking a MSCI-TS/CBDS elective course or additional mentored research hours. Transfer of coursework for credit is described below.

Transfer of Coursework for Credit. If a student has successfully completed graduate level coursework that is duplicative of required or elective CBDS courses, it is possible that transfer of course credit may be allowed. A written request for consideration of transfer of course credit in substitution for a given CBDS course must include the following documentation and be submitted to the CBDS Program Director through the CBDS Program Coordinator.

1. A written request that includes a comprehensive description of the prior course detailing when and where completed, course semester credit hours, and details of course content and objectives.
2. An official copy of the student's transcript that indicates successful course completion and the grade issued.
3. A copy of the course description from the catalog that was in effect during the semester the course was taken.
4. A course syllabus is suggested but not required.

If the transfer of credit request is approved by the MSCI-TS COGS, the CBDS Program Coordinator will prepare a request for transfer of course credit (on GSBS form) and submit it to the GSBS for consideration/approval by the Dean. In no case will the allowable semester credit hour(s) of transfer for a given course exceed that of the corresponding CBDS course. No more than three (3) semester credit hours may be transferred towards the completion of a Certificate in Biomedical Data Science program.

Class Attendance and Make-up Policy

Attendance. The UT Health Science Center at San Antonio MSCI-TS faculty believe that attendance at scheduled classes and examinations is crucial to meeting course and program objectives. Therefore, regular attendance in class is expected of each student. Attendance is defined as being present within 15 minutes after the scheduled beginning of the class and until 15 minutes before the scheduled ending of the class.

Excused absences may be granted by the Course Director in cases such as formal presentations at scientific meetings, illness, or personal emergency. Excused absences are considered on an individual basis and require electronic communication with the Course Director to request an excused absence. The e-mail request to the Course Director for consideration of an excused absence must provide details regarding the circumstances and specific dates. It is expected that students will provide *advanced notice* of absence for scheduled events.

Repeated unexcused absences make it impossible to achieve course objectives. Thus, if a student has excessive unexcused absences in a given course, they will automatically receive a grade of *unsatisfactory* unless *makeup* has been approved by the Course Director (see below). Allowable unexcused absences will be determined by the credit hours of the course as follows:

Course (Semester Credit Hours)	Allowable Unexcused Absences
3	3
2	2
1	1

Absence Makeup. Makeup of absences (both excused and unexcused) is allowed at the discretion of the Course Director.

Other CBDS Program Requirements

Laptop Computers. The CBDS Program requires each student to have a laptop computer that can connect to and operate over a wireless network. Software required:

- Microsoft Office Suite (can be purchased at the UTHSCSA bookstore with a student ID)

- R & RStudio (Open source, free, latest version)
  https://www.rstudio.com/products/RStudio/
  https://www.r-project.org/

Laptops with an Apple Mac-based operating system must be able to also perform as a PC-based operating system.

All laptops will connect to The UTHSCSA network via the HSCwave broadcast wireless connection. Authentication for wireless use is based on The UTHSCSA domain username and password. Verification of proper operation **prior** to the start of class is highly recommended.

Assistance is available thru the IMS Service Desk (210-567-7777 or ims-servicedesk@uthscsa.edu). Assistance is also available at the IMS Student Support Center (4.421T, DTL).

Ethics/Professionalism Policy

The CBDS Program expects all students to exhibit the highest standards of conduct, honesty, and professionalism. Academic misconduct includes activities that undermine the academic integrity of the

institution. The University may discipline a student for academic misconduct as outlined in the UT Health Science Center at San Antonio [Catalog](#) and [Handbook of Operating Procedures](#). Academic misconduct may involve human, hard-copy, or electronic resources. Policies of academic misconduct apply to all course-, department-, school-, and university-related activities including conferences and off-campus performances. All cases of academic misconduct must be reported to the Dean of the Graduate School of Biomedical Sciences (GSBS) and the seriousness of the violation may be taken into account in assessing a penalty. Academic misconduct includes, but is not limited to, the following:

- *Cheating*. Any attempt to use or provide unauthorized assistance, materials, information, or access in any form and in any academic exercise or environment is considered cheating and is expressly forbidden. All students commit to not receiving or giving any aid on the completion of their work in this course including the use of AI text generators. If you are unsure how this might pertain to this course, please contact the course director before submission of any assigned work.

- *Fabrication*. A student must not falsify or invent any information or data including, but not limited to, records or reports, data analyses, and citation to the sources of information.

- *Plagiarism*. Plagiarism is defined as presenting someone else's work as one's own. Ideas or materials taken from another source for either written or oral use must be fully acknowledged. The adoption or reproduction of ideas, opinions, theories, formulas, graphics, or research results of another person without acknowledgment is expressly forbidden. Credit must be given to the originality of others whenever:
  - Quoting the works of another
  - Using another person's ideas, opinions, or theories
  - Paraphrasing the words, ideas, opinions, results, or theories of others
  - Borrowing facts, statistics, or illustrative material
  - Offering materials assembled or collected by others

Facilitating Academic Dishonesty. A student must not intentionally or knowingly help another student commit an act of academic misconduct, nor allow another student to use his/her work or resources to commit an act of misconduct.

Completion of the CBDS Program

Recommendation for Granting the Certificate in Biomedical Data Science. A graduate student must be accepted into in the CBDS program to be eligible to receive a certificate. Upon satisfactory completion of all required didactic and elective coursework, the CBDS student will complete and submit the CBDS Request for Certification form to the Academic Coordinator for review and approval by the MSCI-TS COGS. Once approved by the MSCI-TS Chair and COGS, the Chair will then submit a recommendation form to the *Graduate Faculty Council* (GFC) of the Graduate School of Biomedical Sciences (GSBS) through the Dean of the GSBS for further consideration and approval.

Time-to-Certificate. The CBDS Program can be completed within 1 year of study. Some students may require two (2) to three (3) years to complete certificate requirements. If a CBDS student has not completed the necessary coursework within three (3) years, the MSCI-TS COGS Chair will form a special committee to review progress with the student. The special committee's responsibility will be to

either recommend a course of action to expedite completion or recommend termination of the enrollment of the student in the program.

Helpful Online Links

Certificate in Biomedical Data Science (CBDS) Program

CBDS Forms

CBDS Plan of Study

Graduate School of Biomedical Sciences (GSBS)

GSBS Application for Admission

GSBS Academic Calendar

GSBS Syllabus Depot

CANVAS

UTHSCSA Catalog

UTHSCSA Handbook of Operating Procedures (HOP)

Office of Research Educating and Mentoring

Institute for the Integration of Medicine and Science

Appendices

2023-2024
Committee on Graduate Studies

Helen P. Hazuda, PhD
MSCI-TS COGS Chair

Alex Bokov, PhD
Population Health Sciences

Carrie Jo Braden, RN, PhD
Nursing

Andrew Cap, MD, PhD, FACP
Clinical Investigation Fellowship
San Antonio Military Medical Center

Bandana Chatterjee, PhD
Molecular Medicine

Byeongyeob Choi, PhD
Population Health Sciences

Yong-Hee P. Chun, DDS, MS, PhD
Periodontics

Robert A. Clark, MD
Office of the VP for Research

Bertha E. Flores, PhD, APRN
School of Nursing

Christopher Frei, PharmD, MSc
Pharmacology Ed& Research Cntr

Jonathan Gelfond, MD, PhD
Population Health Sciences

Goutam Ghosh-Choudhury, PhD
Medicine/Renal Diseases

Helen P. Hazuda, PhD
Medicine/Renal Diseases

Teresa Johnson-Pais, PhD
Urology

Krista Kilpadi, PhD
Office of Clinical Research/IRB

Addanki Pratap Kumar, PhD
Molecular Medicine

Donna M. Lehman, PhD
Medicine/Cardiology

Kelly C. Lemke, DDS, MSCI-TS
Developmental Dentistry

Timothy D. Raabe, PhD
Graduate School for Biomedical
Sciences

Susanne Schmidt, PhD
Population Health Sciences

Joseph O. Schmelz, PhD
Office of the VP for Research

Rudy J. Trevino, MS, CPIA
Research Regulatory Program

Chen-Pin Wang, PhD
Population Health Sciences

CBDS Plan of Study

First Year		
Fall		**Credit Hours**
TSCI 5070	Responsible Conduct of Research	2
TSCI 5201	Advanced Statistics for Machine Learning Methods	3
TSCI 5230	Programing for Biomedical Data Science	3
CSAT 6005	Rigor & Reproducibility* (Credit by Exam)	1
	Total Credit Hours:	**9.0**

First Year		
Spring		**Credit Hours**
TSCI 6201	Data Science Leadership in Healthcare	1
TSCI 6202	Data Visualization and Building Application	2
TSCI 6203	Practicum in Biomedical Data Science	1
TSCI	Elective Hours	3
	Total Credit Hours:	**7.0**

CBDS Elective Courses (may be taken in any semester when offered)

TSCI 5050 (1 SCH) – Introduction to Data Science

TSCI 5073 (1 SCH) – Integrating Molecular Biology with Patient Oriented Clinical Research

TSCI 5074 (2 SCH) – Data Management, Quality Control, and Regulatory Issues

TSCI 5075 (2 SCH) – Scientific Communications

TSCI 5076 (2 SCH) – Introduction to Informatics

TSCI 5077 (1 SCH) – Practicum in Translational Science

TSCI5080 (1 SCH) – Practicum in Integrating Molec Biology with Pt-Orient. Clin. Research

TSCI 6060 (2 SCH) – Patient Oriented Clinical Research Methods -2

TSCI 6061 (2 SCH) – Patient Oriented Clinical Research Biostatistics -2

TSCI 6065 (2 SCH) – Health Services Research

TSCI 6067 (1 SCH) – Genomic Healthcare

TSCI 6069 (2 SCH) – Statistical Issues, Planning, & Analysis of Contemporary Clin. Trials

TSCI 6070 (2 SCH) – Biostatistics Methods for Longitudinal Studies

TSCI 6100 (1 SCH) – Practicum in IACUC Procedures

TSCI 6102 (1 SCH) – Practicum in IRB Procedures

Sixteen (16) semester credit hours (SCH) are required to obtain the Certificate in Biomedical Data Science (CBDS). Students **must** be admitted to the CBDS Program to be eligible for certification.

Tuition and Fees - Degree Cost Estimate

CBDS Requires the Completion of 16.0 SCH Coursework: 13.0 Required/3.0 Elective.

TX Resident – Full Time Student Estimated Cost of Certificate				
Semester	**SCH**	**Tuition per SCH**	**Fees per Semester**	**Estimated Cost per Semester**
Fall 2021	9	$179.94	$2207.50	**$3,826.96**
Spring 2022	7	$179.94	$2307.50*	**$3,207.20**
Estimated Total Cost of Certificate				**$7,034.16**

Non-TX Resident – Full Time Student Estimated Cost of Certificate				
Semester	**SCH**	**Tuition per SCH**	**Fees per Semester**	**Estimated Cost per Semester**
Fall 2021	9	$679.07	$2207.50	**$8,319.13**
Spring 2022	7	$679.07	$2307.50*	**$5,702.85**
Estimated Total Cost of Certificate				**$14,021.98**

UTHSA Faculty/Staff or Students with Private/Employer Health Insurance - TX Resident – Full Time Student Estimated Cost of Degree				
Semester	**SCH**	**Tuition per SCH**	**Fees per Semester**	**Estimated Cost per Semester**
Fall 2021	9	$179.94	$612.50	**$2,231.96**
Spring 2022	7	$179.94	$712.50*	**$1,612.20**
Estimated Total Cost of Degree				**$3,844.16**

*= Includes $100 Graduation Fee

- **Texas Resident Tuition per Semester Credit Hour (SCH) = $179.94** (Tuition estimate is a combination of Statutory, Differential, Designated, and Designated (Deregulated) Tuition Fees).

- **Non-Texas Resident Tuition per Semester Credit Hour (SCH) = $680.07** (Tuition estimate is a combination of Statutory, Differential, Designated, and Designated (Deregulated) Tuition Fees).

- **Estimated Fees Per Semester W/GSBS Health Ins = $2207.50**
  Note: Estimate includes, Fitness Center, Student Service, Medical Service, Library, GSBS Health Insurance Fees ($1,595).

Tuition and Fees subject to change without notice.
Press CNTRL + Click Here for a detailed breakdown of Tuition and Fees.

For questions regarding UTHSA Tuition and Fees Policy,
Press CNTRL + Click Here for explanation of tuition types and fees.

CBDS Program Forms

Forms - Certificate in Biomedical Data Science
- CBDS Tuition and Fees Breakdown of Cost
- CBDS Application Checklist
- CBDS Certification Form

Translational Science and Clinical Investigation (TSCI) Course Descriptions

TSCI 5050 Introduction to Data Science
1.0 Semester Credit Hour (SCH) (Elective)
Course Director: Alex Bokov, PhD

This elective course is designed to train participants to use programing languages such as R and SQL to extract, prepare, and analyze data. This course is designed to be self-contained: statistical methods and theory relevant to analyzing large datasets will be covered with the computer-related course content providing tangible applications and motivating examples. In addition, the course will include organizational skill training and best practices needed to run a successful collaboration between researchers conducting patient-oriented clinical research and the researchers in the computational fields.

TSCI 5070 Responsible Conduct of Research
2.0 Semester Credit Hours (SCH) (CBDS Required)
Course Director: Krista L. Kilpadi, MD/PhD and Babatunde Oyajobi, MD/PhD

This interdisciplinary course is designed to train participants in the responsible conduct of patient-oriented clinical research. Students will have the opportunity to learn to and, by the end of the course, be required to: (1) delineate a history of hallmark abuses of humans enrolled in clinical research, (2) describe the evolution of national and international codes and regulations guiding inclusion of human subjects in clinical investigations, (3) list the elements of informed consent and describe procedures and precautions for enrolling special populations into clinical investigation, (4) write a consent form in understandable language, (5) recognize different forms of scientific misconduct, (6) describe the role and processes of a peer review board to judge violations in research ethics, (7) develop strategies for self-assessment and validation of scientific objectivity in one's own research, and (8) recognize the ethical responsibilities and consequences of whistle blowing.

TSCI 5071 Patient-Oriented Clinical Research Methods-1
2.0 Semester Credit Hours (SCH) (Elective)
Course Director: Byeongyeob Choi, PhD

This interdisciplinary course is the first in a two-semester sequence designed to train participants in the conduct of patient-oriented clinical research. Students will have the opportunity to learn to and, by the end of the course, be required to: (1) define a research question, (2) effectively conduct a systematic review of the scientific literature, (3) design strategies for recruitment into a study, (4) delineate strategies for minimizing bias in cross-sectional and retrospective studies, and (5) read and interpret research reports of cross-sectional and case control investigations.

TSCI 5072 Patient-Oriented Clinical Research Biostatistics-1

2.0 Semester Credit Hours (SCH) (Elective)
Course Directors: Jonathan Gelfond, MD, PhD

This interdisciplinary course is the first in a two-semester sequence designed to train participants in the analysis and biostatistics of patient-oriented clinical research. Students will have the opportunity to learn to and, by the end of the course, be required to: (1) identify and summarize different categories of data; (2) set up and perform tests of hypotheses; (3) estimate sample sizes for survey and case-control studies; and (4) use statistical software packages to enter, summarize, graph, visualize, and analyze data.

TSCI 5073 Integrating Molecular Biology with Patient-Oriented Clinical Research

1.0 Semester Credit Hours (SCH) (Elective)
Course Directors: Teresa L. Johnson-Pais, PhD

This interdisciplinary course is designed to train participants on integrating molecular biology methods into patient-oriented clinical research. Students will have the opportunity to learn to: (1) appropriately use molecular terms in clinical investigation; (2) describe the events involved in protein synthesis; (3) describe the principles involved in molecular techniques (e.g., polymerase chain reactions, Southern blots); (4) identify the appropriate specimens, collection, and handling requirements for each molecular technique; (5) identify and correct common sources of error in performing molecular techniques; (6) cite examples of clinical applications of molecular techniques in clinical medicine; and (7) apply molecular techniques in the laboratory to specific clinical problems.

TSCI 5074 Data Management, Quality Control, and Regulatory Issues

2.0 Semester Credit Hours (SCH) (Elective)
Course Director: Schmidt, Susanne, PhD

This interdisciplinary course is designed to train participants in the necessary data management and quality control procedures required for the conduct of patient-oriented clinical research.

By the end of this course, each student should be able to:
1. Understand the principles of data management as they pertain to clinical research
   a. Using and Defining meta data
   b. Research logistics
   c. Data Security
   d. Randomization
2. Understand supporting principles
   a. Data management and Analysis ethics
   b. Compliance
   c. Quality Control
   d. Program Evaluation
3. Using the REDCap Electronic Data Capture (EDC) tool
   a. Design and build a data collection instrument
   b. Design and build a survey
   c. Design and build a longitudinal study
   d. Build a report
   e. Import external data from Excel
   f. Export data to Excel

4. Be able to identify individuals and resources within the institution that can provide guidance in all areas covered.

TSCI 5075 Scientific Communication

2.0 Semester Credit Hour (SCH) (Elective)
Course Directors: Bandana Chatterjee, PhD

This interdisciplinary course is designed to train participants to write effectively in all aspects of conducting patient-oriented clinical research. Students will have the opportunity to learn to and, by the end of the course, be required to: (1) recognize and avoid errors in grammar, punctuation, and usage that are common in scientific writing; (2) construct units of writing whose structure, style, and logical continuity allows instant and clear comprehension; (3) construct concise, informative titles; (4) develop clear, comprehensive, abstracts for papers and grant proposals; (5) construct complete, well-rationalized sets of specific aims for grant proposals; and (6) effectively apply the 4-Point Rule (What is the question? How did we approach it? What happened? What does it mean?) to all forms of scientific writing.

TSCI 5077 Practicum in Translational Science

1.0 Semester Credit Hours (SCH) (Elective)
Prerequisite: Consent of the Course Director
Course Director: Yong-Hee Chun, DDS, MS, PhD

This *elective* course provides an opportunity for participation in unique clinical and translational research activities that are highly individualized for each student on the basis of prior experience and research interests.

TSCI 5080 Integrating Molecular Biology with Patient Oriented Clinical Research Practicum

1.0 Semester Credit Hour (SCH) (Elective)
Prerequisite: TSCI 5073
Course Director: Goutam Ghosh-Choudhury, PhD

This is the required practicum to TSCI 5073 (Integrating Molecular Biology with Patient-Oriented Clinical Research Practicum. This practicum is designed to provide the opportunity for highly individualized research activities for integrating molecular biology methods into patient-oriented clinical research.

TSCI 5201 Advanced Statistics for Machine Learning Methods: Statistical Principles of Machine Learning Applied to Biomedical Data

3.0 Semester Credit Hour (SCH) (CBDS Required)
Prerequisite: Consent of the Course Director
Course Director: Zhu Wang, PhD

This class offers a hands-on approach to machine learning and data science. The class discusses the application of supervised and unsupervised techniques for machine learning including random forests, support vector machines, boosting, deep learning, K-means clustering and mixture models. The course focuses on real data application with open-source implementations in Python and R.

TSCI 5230 Programing for Biomedical Data Science

3.0 Semester Credit Hour (SCH) (CBDS Required)
Prerequisite: Consent of the Course Director
Course Director: Alex Bokov, PhD

This class offers a hands-on approach to data science programming for biomedical research. We will introduce R, Python, SQL, and the software tools that interoperate with them. We will also cover cross-cutting best practices for organizing one's work to facilitate collaboration, reproducibility, and portability. Students who already have data they want to analyze are encouraged to use it in their assignments.

TSCI 6001 Introduction to Translational Science

1.0 Semester Credit Hour (SCH) (Elective)
Course Director: Bertha E. "Penny" Flores, RN, PhD

This elective course provides an in-depth overview of the essential components encompassed by translational science. Content is provided through a series of lectures, assigned readings, literature reviews, class presentations, and discussions with faculty

TSCI 6060 Patient-Oriented Clinical Research Methods-2

2.0 Semester Credit Hours (SCH) (Elective)
Prerequisite: TSCI 5071
Course Director: Byeongyeob Choi, PhD

This interdisciplinary course is the second in a two-semester sequence designed to train participants in the conduct of patient-oriented clinical research. Students will have the opportunity to learn to and, by the end of the course, be required to: (1) define criteria for inferring causation from observational studies; (2) design strategies for subject retention in a prospective study; (3) design strategies for monitoring progress in a randomized control trial; (4) delineate strategies for minimizing bias in cohort studies and randomized control trials; (5) compare and contrast the uses, strengths, and weaknesses of different clinical trial designs; (6) read and interpret research reports of cohort studies and randomized control trials; and (7) describe the steps in conducting a meta-analysis.

TSCI 6061 Patient-Oriented Clinical Research Biostatistics 2

2.0 Semester Credit Hours (SCH) (Elective)
Prerequisite: TSCI 5072
Course Director: Jonathan Gelfond, MD, PhD

This interdisciplinary course is the second in a two-semester sequence designed to train participants in the biostatistical analysis of patient-oriented clinical research. Students will have the opportunity to learn to and, by the end of the course, be required to: (1) perform a two-way analysis of variance and explain the results;

(2) perform survival analysis; (3) compare and contrast the purpose and characteristics of different forms of interventional trials; and (4) plan the sample size, analysis, and stopping rules of a randomized clinical trial.

TSCI 6065 Health Services Research
2.0 Semester Credit Hours (SCH) (Elective)
Prerequisite: TSCI 5071 and TSCI 6060
Course Director: Helen P. Hazuda, PhD

This course focuses on concepts and methods used in research focusing on health care quality, utilization, access, and safety. The seminar will utilize skills-based learning, small group activities, and outside assignments. By the end of the course, candidates will be required to:
- articulate underlying core concepts
- describe basic methods used in health services research
- identify relevant databases and data sources for health services research
- critically appraise and interpret published reports of health services research
- discuss current issues in HSR
- understand how to incorporate health services concepts, methods, or tools, into current research

TSCI 6067 Genomic Healthcare
1.0 Semester Credit Hour (SCH) (Elective)
Course Director: Donna Lehman, PhD

This elective course prepares students to integrate genomic and other omics technology into patient care and clinical research. It begins with an introduction to genomics and overview of omics technologies. Students will explore the different resources of genomic information and have opportunities to apply these resources to keep abreast of current knowledge in their health topic of interest including the ethical individual and societal challenges ahead. Genomics in cancers is an active area in personalized medicine, and this topic will be discussed by a local cancer genomics expert. The course will also provide an introduction and overview of current applications of gene therapeutics to a variety of disorders. By the end of the course, students will have a working knowledge of the human genome and the tools for integrating this information into clinical research as well as conveying it to patients.

TSCI 6069 Statistical Issues, Planning, and Analysis of Contemporary Clinical Trials
2.0 Semester Credit Hour (SCH) (Elective)
Prerequisite: TSCI 5072 and TSCI 6061
Course Director: Joel Michalek, PhD

This elective course will serve as an in-depth survey of the various clinical trial designs, analysis, and regulatory issues. Students will learn to apply statistical principles in designing clinical trials to minimize risk to patients while maximizing generalizable discovery. Specific topics include Phase I-V studies, adaptive designs, longitudinal and survival studies. Students will learn to specify the primary outcome and to estimate the required sample size for common trial designs. Clinical trial design and analysis is often complicated by idiosyncrasies such as missing data, and the methodology for handling these will be covered.

TSCI 6070 Biostatistics Methods for Longitudinal Studies
2.0 Semester Credit Hour (SCH) (Elective)
Prerequisite: TSCI 5071 and TSCI 5072
Course Director: Chen-Pin Wang, PhD

This elective course will discuss a broad range of statistical techniques for deriving statistical inference from longitudinal studies. Main topics include design of longitudinal studies (power analyses and sample size estimation), analyses of repeated measured outcomes (continuous and discrete), analyses of time-to-event outcomes, techniques to address challenges associated with missing data and confounding data, and rigorous casual modeling approaches. Students will learn to identify feasible and efficient statistical designs for longitudinal studies and to conduct rigorous and robust statistical methods to analyze data from longitudinal studies. The goal is to develop students' biostatistical competencies in conducting high-quality longitudinal studies in medical research.

TSCI 6100 Practicum in IACUC Procedures
1.0 Semester Credit Hour (SCH) (Elective)
Prerequisite: Consent of the Course Director
Course Director: Rodolfo Trevino, MS, CPIA

This elective course presents an in-depth introduction to the institutional program that provides oversight and regular review of projects that involve the care and use of animals. This includes consideration of the operational procedures of the Institutional Animal Care and Use Committee (IACUC) of the UTHSCSA. Course objectives are achieved through a combination of readings, monthly attendance at selected IACUC meetings, and discussions with faculty.

TSCI 6101 Topics in Translational Science
1.0 Semester Credit Hour (SCH) (Elective)
Prerequisite: Consent of the Course Director
Course Director: Christopher Frei, PharmD, MSc

This elective course addresses selected topics in translational science through a series of lectures, assigned readings, literature reviews, class presentations, and discussions with faculty.

TSCI 6102 Practicum in IRB Procedures
1.0 Semester Credit Hour (SCH) (Elective)
Course Director: Krista L. Kilpadi, MD/PhD

This elective course presents an in-depth introduction to the institutional program that provides oversight and regular review of research projects that involve human subjects. This includes consideration of the operational procedures of the multiple Institutional Review Boards (IRB) of the UTHSCSA. Course objectives are achieved through a combination of readings, monthly attendance at selected IRB meetings, and discussions with faculty.

TSCI 6105 Topics in Cancer Prevention
1.0 Semester Credit Hour (SCH) (Elective)
Course Director: Addanki Pratap Kumar, PhD

This course address current topics in cancer prevention science through a series of didactic lectures and discussions with cancer prevention faculty. Topics span the continuum of cancer prevention from basic cancer epidemiology and carcinogenesis, to cancers of special relevance in South Texas and interventions. An exposure to prevention clinical trials and disparity research will also be presented. Consent of instructor is required for registration.

TSCI 6106 Practicum in Cancer Prevention Sciences

1.0 Semester Credit Hour (SCH) (Elective)
Course Director: Addanki Pratap Kumar, PhD

This course allows for practical experience in the area of cancer prevention and cancer prevention science. It is designed to be a one-on-one experience in which the student experiences the practice of cancer prevention science. Examples include following a dermatologist in screening patients for skin cancer, working on datasets derived from cancer prevention trials, participating in cancer prevention trials, spending time with a preceptor at the City of San Antonio Metropolitan Health District or a state health agency as examples.

TSCI 6201 Data Science Leadership in Healthcare

1.0 Semester Credit Hour (SCH) (CBDS Required)
Course Director: Jonathan Gelfond, MD, PhD

This offers a hands-on approach to data science operations in biomedical science. The class discusses the management of data science teams, collaboration within healthcare organizations, and the social and ethical responsibility of data scientists. The course focuses on real world applications.

TSCI 6202 Data Visualization and Building Applications

2.0 Semester Credit Hour (SCH) (CBDS Required)
Prerequisite: TSCI 5230/Consent of the Course Director
Course Director: Alex Bokov, PhD

This course offers a hands-on approach to data visualization for biomedical data science. The class uses R, Python and JavaScript and the software tools that interoperate with them. Some cross-cutting best practices. The course focuses on real world applications.

TSCI 6203 Practicum in Biomedical Data Science

2.0 Semester Credit Hour (SCH) (CBDS Required)
Prerequisite: TSCI 5201/Consent of the Course Director
Course Director: Zhu Wang, PhD/Alex Bokov, PhD/ Jonathan Gelfond, MD/PhD

This course provides an opportunity for participation in unique biomedical data science and translational research activities that are highly individualized for each student on the basis of prior experience and research interests.

CBDS Contact Information

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Introduction to Translational Science ● Responsible Conduct of Patient-Oriented Clinical Research ● Patient-Oriented Clinical Research Methods ● Patient-Oriented Clinical Research Biostatistics ● Integrating Molecular Biology with Patient-Oriented Clinical Research ● Data Management, Quality Control, and Regulatory Issues ● Grantsmanship and Peer Review ● Health Services Research ● Instrument Validation and Development ● Genetics and Genetic Epidemiology ● Cross Cultural Adaptation of Research Instruments ● Introduction to Translational Science ● Responsible Conduct of Patient-Oriented Clinical Research ● Patient-Oriented Clinical Research Methods ● Patient-Oriented Clinical Research Biostatistics ● Integrating Molecular Biology with Patient-Oriented Clinical Research ● Data Management, Quality Control, and Regulatory Issues ● Grantsmanship and Peer Review ● Health Services Research ● Instrument Validation and Development ● Genetics and Genetic Epidemiology ● Cross Cultural Adaptation 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