IMPORTANT: This syllabus form should be submitted to OAA (gsbs_academic_affairs@uth.tmc.edu) a week before the start of each semester.

NOTE to STUDENTS: If you need any accommodations related to attending/enrolling in this course, please contact one of the Graduate School's 504 Coordinators, Cheryl Spitzenberger or Natalie Sirisaengtaksin. We ask that you notify GSBS in advance (preferably at least 3 days before the start of the semester) so we can make appropriate arrangements.

Term and Year: **Spring 2023**

Course Number and Course Title:
GS04 1103: Principles of Therapeutics

Credit Hours: **3**

Meeting Location: **GSBS**

Building/Room#: **BSRB S3.8112**

WebEx/Zoom Link: **N/A**

Program Required Course: **Yes**

Approval Code: **No**

Audit Permitted: **Yes**

Classes Begin: **January 9, 2023**

Classes End: **April 28, 2023**

Final Exam Week: **May 2-6, 2023**

Class Meeting Schedule

Day	Time
Monday	**1-2 PM**
Wednesday	**1-2 PM**
Friday	**1-2 PM**

Course Director
Name and Degree: **Walter N. Hittelman, PhD**

Title: Professor

Department: Experimental Therapeutics

Institution: *MDACC*

Email Address: whittelm@mdanderson.org

Contact Number: 713-792-2076

Course Co-Director/s:

Name and Degree: **Shuxing Zhang, PhD**

Title: Associate Professor

Department: Experimental Therapeutics

Institution: *MDACC*

Email Address: shuzhang@mdanderson.org

Contact Number: 713-745-2958

Instructors *(see attached schedule)*

1.
Name and Degree

Institution:

Email Address :

2.
Name and Degree

Institution:

Email Address :

3.
Name and Degree

Institution:

Email Address

NOTE: Office hours are available by request. Please email me to arrange a time to meet.	

Course Description:

The course establishes a foundation of *therapeutic principles* from understanding disease pathophysiology to the whole pipeline of drug discovery and moving a drug from laboratory to regulatory filing and clinical implementation. This course includes didactic lectures from >35 experts including 1/3 basic research faculty, 1/3 clinical faculty, and 1/3 pharma/biotech industry veterans. It starts with discussions on disease processes, through therapy development, then to clinical translation. The course is grouped into a series of general topics. The first topic includes disease mechanisms in microbial, viral, fungal, neurodegenerative, cardiovascular, aging, and malignant settings in order to better understand the nature of the problems. The second topic focuses on the development of lead molecules and drug design, including x-ray crystallography, molecular modeling, hit identification, lead optimization, and pharmacokinetic/pharmacodynamic studies. The third topic puts emphasis on drug screening methodologies, including high-throughput/content technologies and molecular imaging as well as in vitro and in vivo preclinical model systems. The fourth topic covers different therapeutic modalities and improved drug delivery systems. It also describes the latest development in immunotherapy, cell therapy, gene therapy, and stem cell transplantation. The fifth topic focuses on the identification of novel molecular targeting strategies and efforts toward individualization of therapy with state-of-the-art –omics technologies and biomarker development. The final topic group focuses on translating therapeutic strategies to the clinic, including the phases of preclinical studies, clinical trial design and execution, and regulatory considerations.

Textbook/Supplemental Reading Materials (if any)

- **No textbook but lecturers will provide supplemental reading materials relevant to their topic.**

<u>Course Objective/s</u>:

The goals of this class include the following:

- Establish a conceptual idea of therapeutics as a *discipline* and a *process* that transcends specific disease processes
- Develop an understanding of the general principles underlying the development of new therapeutics. These concepts are useful for students interested in therapeutic development, whether in an academic, biotech, industrial, or regulatory setting.
- Expose students to current approaches used to discover and develop new therapeutic agents for clinical use
- Provide students with the knowledge tools to cultivate critical thinking for therapeutics discovery
- Enable students to network with numerous faculty/PI members and experts for dissertation research, committee membership, and future career opportunities.

***Specific Learning Objectives*:**

1. Gain knowledge on disease mechanisms in microbial, viral, fungal, neurodegenerative, metabolic, and malignant settings to better understand potential targets for therapeutic development.

2. Understand the approaches used in the identification and development of hit and lead molecules as well as their optimization, including structural biology, molecular modeling, chemical library development with medicinal chemistry and structure-activity relationship (SAR), pharmacokinetics and pharmacodynamics (PK/PD), high-throughput and high-content screening approaches, along with a variety of cellular and animal models to evaluate and elucidate drug mode of action (MOA).

3. Obtain an appreciation of complementary therapeutic approaches including surgery, radiotherapy, immunotherapy, anti-viral therapy, gene and siRNA therapy, and stem cell transplantation.

4. Develop in-depth knowledge of current problems and approaches for improving the current therapies including the need to: identify new therapeutic targets, understand pharmacogenomic characteristics, individualize treatment for each patient's heterogeneous disease, and develop strategies to minimize side effects through normal tissue protection and improved drug delivery.

5. Comprehend how therapeutic strategies developed in the preclinical setting are translated into clinical trials, including the phases of clinical trial design and execution, regulatory considerations, and the use of molecular imaging and biomarkers.

Student responsibilities and expectations:

Students enrolled in this course will be expected to perform the following activities each week.

1. Attend three lectures each week
2. Participate in class discussions
3. Take 3 essay type exams based on material covered

Grading System: **Letter Grade (A-F)**

Student Assessment and Grading Criteria : *(May include the following:)*

Percentage	Description
Midterm Exams (30% and 30%)	2 midterm exams @30% each
Final Exam (30%)	
Participation and/or Attendance (10%)	

CLASS SCHEDULE – Spring 2023

Date	Duration (Hour(s) taught by lecturer)	Lecture Topic	Lecturer/s
Topic I. Disease Mechanisms			
Monday, January 9	**1**	Course Introduction	Walter Hittelman
Wednesday, January 11	**1**	Principles of Drug Development	Michael Pavia
Friday, January 13	**1**	Mechanisms of Microbial Diseases	Sam Shelburne

Monday, January 16	**Martin Luther King Day - no class**		
Wednesday, January 18	1	Antifungal Therapy	Sebastian Thomas Wurster
Friday, January 20	1	Viral Diseases and Therapies	Jagan Sastry
Monday, January 23	1	Malignant Disease Development	Walter Hittelman
Wednesday, January 25	1	Cardiovascular Diseases and Therapy	
Friday, January 27	1	CNS Diseases and Therapy	Jim Ray
Monday, January 30	1	Aging and development of therapeutic approaches	
Wednesday, February 1	1	Biological Basis for Therapeutic Targets	Walter Hittelman
Topic II. Lead Molecules, Drug Design, and Pharmacology			
Friday, February 3	1	Protein Crystallography for Drug Discovery	John Horton
Monday, February 6	1	Molecular Modeling in Drug Design	Jason Cross
Wednesday, February 8	1	Hit Discovery, Hit to Lead, and Lead optimization	Michael Soth
Friday, February 10	1	Pharmacokinetics and Pharmacodynamics in Drug Development	Phil Jones
Monday, February 13	**Exam 1: Topics I and II**		
Topic III. Models and Drug Screening			
Wednesday, February 15	1	High Throughput–High Content Screening	Clifford Stephan

Friday, February 17	1	Functional Genomics and Genetic Screening	Traver Hart
Monday, February 20	1	Model Organisms for Drug Target Discovery	Kartik Venkatachalam
Wednesday, February 22	1	Animal Models for Therapeutics Development	Joe Marszalek
Friday, February 24	1	In Vivo Imaging in Drug Development	Ali Azhdarinia
Topic IV. Therapeutic Approaches			
Monday, February 27	1	Immunology	Greg Lizee
Wednesday, March 1	1	Immunotherapy	Greg Lizee
Friday, March 3	1	Stem Cell Transplantation	Muzaffar Qazilbash
Monday, March 6	1	Particle-based Drug Delivery 1	Chun Li
Wednesday, March 8	1	Particle-based Drug Delivery 2	Anil Sood
Friday, March 10	1	Antibody-drug conjugates and aptimers	Anil Sood
Monday, March 13-17		**Spring Break - no class**	
Monday, March 20			
Wednesday, March 22	1	microRNAs and Long Noncoding RNAs	Don Gibbons
Friday, March 24		**Exam 2: Topics III and IV**	

Topic V. -Omics, Targets, and Individualization			
Monday, March 27	1	Genomics Medicine	Christopher Bristow
Wednesday, March 29	1	Pharmacogenetics and Pharmacoinformatics	Michelle Hildebrandt
Friday, March 31	1	Metabolomics in Drug Discovery	Daniel Frigo
Monday, April 3	1	Proteomics for Cancer Therapeutics Development	Sam Hanash
Wednesday, April 5	1	Cancer Chemoprevention	Powel Brown
Friday, April 7	1	Single-cell Studies for Cancer Therapy	Nick Navin
Monday, April 10	1	Targeting Epigenetics for Drug Discovery	Mark Bedford
Wednesday, April 12	1	Antiviral and Gene Therapy	Jagan Sastry
Friday, April 14	1	Precision Cancer Therapy	Jordi Rodon
Topic VI. Preclinical and Clinical Considerations			
Monday, April 17	1	Biostatistics and Clinical Trial Design	Jack Lee
Wednesday, April 19	1	Preclinical and IND-enabling Studies	Michael Soth
Friday, April 21	1	Biomarkers for Diagnosis and Treatment	John Heymach
Monday, April 24	1	Development of Phase I, II, and III Trials	Vivek Subbiah

Wednesday, April 26	1	Case History- Discovery and Development of PARP Inhibitors	Phil Jones
Friday, April 28	1	Intellectual Property Protection and Regulatory Filing	Andrew Dennis and Sean O'Connor
May 1-5 2023 Final Exam Week		**Exam 3: Topics V and VI**	

WH/jal