TOURO UNIVERSITY
CALIFORNIA

M.Sc. Program in Medical Health Sciences of the College of Pharmacy (MS-MHS-COP)

Curriculum for 2018-2019

Disclaimer: The following information may be subject to changes

Fall Semester 2017: 08/07/2018 to 12/14/2018
Spring Semester 2018: 01/02/2019 to 05/17/2019

Program Director: **Daniel Keppler, PhD** Office: Bldg. H-84, Rm. 111 Phone: (707) 638-5956 E-mail: daniel.keppler@tu.edu	Program Vice-Director: **Susan R. Heimer, PhD** Office: Bldg. H-84, Rm. 205 Phone: (707) 638-5929 E-mail: susan.heimer@tu.edu
Educational Technical Support: IT Department, Library Annex Phone: (707) 638-5424 E-mail: servicedesk@tu.edu	IT Office Hours: Mon.-Thur. 8:00 am – 7:00 pm Friday 8:00 am – 3:00 pm Sunday 9:00 am – 4:00 pm
MS & Residency Programs Coordinator: **Ms. Christina Alvarez** Office: Bldg. H-84, Rm. 216 Phone: (707) 638-5868 E-mail: christina.alvarez@tu.edu	Recruiter: **Mr. Anthony Williams** E-mail: anthony.williams@tu.edu Phone: (707) 373-4421 Webmaster: **Ms. Bridget Canfield, BSc** E-mail: bridget.canfield@tu.edu

Course Instructors:	**Schoolyear**
Dr. Shankar Chinta (Pharmaceutical Sciences)	2016-present
Dr. Chong He (Buck Institute for Aging Research)	2017-present
Dr. Susan Heimer (Biological Sciences)	2015-present
Dr. John Inciardi (UCSF)	2015-present
Dr. Daniel Keppler (Biological Sciences)	2012-present
Dr. David Madden (Pharmaceutical Sciences)	2012-present
Dr. Alison McCormick (Pharmaceutical Sciences)	2012-present
Dr. Shona Mookerjee (Pharmaceutical Sciences)	2012-present
Dr. Vanishree Rajagopalan (Pharmaceutical Sciences)	2012-present
Dr. Patricia Shane (Social, Behavioral & Administrative Sciences)	2018-present

Current Student Advisors:	
Dr. Shankar Chinta (Pharmaceutical Sciences)	2016-present
Dr. Kevin Ita (Pharmaceutical Sciences)	2012-present
Dr. Hardeep Kaur (Biological Sciences)	2017-present
Dr. Daniel Keppler (Biological Sciences)	2012-present
Dr. Athena W. Lin (COM, Basic Sciences)	2012-present
Dr. Shengquan Liu (Pharmaceutical Sciences)	2012-present
Dr. Gordon McCarter (Biological Sciences)	2016-present
Dr. Alison McCormick (Pharmaceutical Sciences)	2012-present
Dr. Shona Mookerjee (Pharmaceutical Sciences)	2012-present
Dr. Vanishree Rajagopalan (Pharmaceutical Sciences)	2015-present
Dr. Patricia Shane (Social, Behavioral & Administrative Sciences)	2012-present
Dr. Jay Shubrook (COM, Primary Care Department)	2015-present
Dr. Clipper Young (COM, Primary Care Department)	2015-present

Goals of the MS Program:

The goals of this 47-credit MS Program are:

- To promote/establish sound understanding of scientific research, critical analytical skills, effective communication skills, good work ethics, and high professionalism.
- To prepare/enhance students' qualification and competency in pursuing advanced training or careers which require the above skills, including entering pharmacy schools.

MS Program Student Learning Outcomes (PSLOs):

Students who complete this MS Program in Medical Health Sciences with emphasis in Pharmacy Sciences at Touro University California - College of Pharmacy will be able to...

1. Demonstrate the ability to critically assess the scientific literature
2. Engage in and conduct original research
3. Design and implement research experiments to critically test hypotheses in pharmaceutical sciences and health outcomes
4. Demonstrate the ability to present scientific data
5. Develop strong verbal and written communication skills
6. Behave in a professional and ethical manner

Fall Semester 2017:
4 required courses (24 credits) + 1 elective course (1 credit, Basic Sciences/Biotech track)

Required courses:			Primary Instructor(s)
HSPC601	Biostatistics & Epidemiology	(2 credits)	Dr. Inciardi
HSPC602	Mentored Research-1	(19 credits)	Student Advisors
HSPC603	Scientific Writing-1	(2 credits)	Dr. Mookerjee
HSPC604	Journal Club	(1 credit)	Dr. Keppler

Elective course (Biotech track):			Primary Instructor(s)
HSPC600	Introduction to Biotechnology	(1 credit)	Dr. He

Fall Semester 2018
24 +/- 1 credits

	Monday	Tuesday	Wednesday	Thursday	Friday	
08:00 am - 09:00 am	Preparation Time	Preparation Time	Preparation Time	Preparation Time	Preparation Time	08:00 am - 09:00 am
09:00 am - 10:00 am	HSPC602 Mentored Research-1	HSPC602 Mentored Research-1	HSPC602 Mentored Research-1 (19 Cr)	HSPC602 Mentored Research-1	HSPC602 Mentored Research-1	09:00 am - 10:00 am
10:00 am - 11:00 am						10:00 am - 11:00 am
11:00 am - 12:00 pm						11:00 am - 12:00 pm
12:00 pm - 01:00 pm	Break	Break	Break	Break	Break	12:00 pm - 01:00 pm
01:00 pm - 02:00 pm	HSPC602 Mentored Research-1 (cont'd)	HSPC602 Mentored Research-1 (cont'd)	HSPC602 Mentored Research-1 (cont'd)	HSPC602 Mentored Research-1 (cont'd)	HSPC602 Mentored Research-1 (cont'd)	01:00 pm - 02:00 pm
02:00 pm - 03:00 pm						02:00 pm - 03:00 pm
03:00 pm - 04:00 pm						03:00 pm - 04:00 pm
04:30 pm - 05:30 pm	HSPC601 (2 Cr) Biostatistics & Epidemiology	HSPC603 (2 Cr) Scient. Writing-1	HSPC600 (1 Cr) Intro Biotechnol			04:30 pm - 05:30 pm
05:30 pm - 06:30 pm		HSPC604 (1 Cr) Journal Club-1				05:30 pm - 06:30 pm

Spring Semester 2018:
4 required courses (23 credits) + 1 elective course (1 credit, PharmD track)

Required courses *(Students take all 4 required courses)*:			Primary Instructor(s)
HSPC606	Scientific Writing-2	(2 credits)	Dr. Shane
HSPC607	Scientific Presentation	(2 credits)	Dr. Rajagopalan
HSPC608	Mentored Research-2	(18 credits)	Student Advisors
HSPC609	Journal Club	(1 credit)	Dr. Heimer

Elective course (PharmD track):			Primary Instructor(s)
HSPC610	Integrated Pharmaceutical Sciences	(1 credit)	Dr. Liu

Spring Semester 2019
23 +/- 1 credits

	Monday	Tuesday	Wednesday	Thursday	Friday	
08:00 am - 09:00 am	Preparation Time	Preparation Time	Preparation Time	Preparation Time	Preparation Time	08:00 am - 09:00 am
09:00 am - 10:00 am	HSPC608 Mentored Research-2	HSPC608 Mentored Research-2	HSPC608 Mentored Research-2 (18 Cr)	HSPC608 Mentored Research-2	HSPC608 Mentored Research-2	09:00 am - 10:00 am
10:00 am - 11:00 am						10:00 am - 11:00 am
11:00 am - 12:00 pm						11:00 am - 12:00 pm
12:00 pm - 01:00 pm	Break	Break	Break	Break	Break	12:00 pm - 01:00 pm
01:00 pm - 02:00 pm	HSPC608 Mentored Research-2 (cont'd)	HSPC608 Mentored Research-2 (cont'd)	HSPC608 Mentored Research-2 (cont'd)	HSPC608 Mentored Research-2 (cont'd)	HSPC608 Mentored Research-2 (cont'd)	01:00 pm - 02:00 pm
02:00 pm - 03:00 pm						02:00 pm - 03:00 pm
03:00 pm - 04:00 pm						03:00 pm - 04:00 pm
04:30 pm - 05:30 pm		HSPC606 (2 Cr) Scient. Writing-2	HSPC607 (2 Cr) Scient. Present.			04:30 pm - 05:30 pm
05:30 pm - 06:30 pm		HSPC609 (1 Cr) Journal Club	HSPC610 (1 Cr) Integr Pharm Sci			05:30 pm - 06:30 pm

All MS courses are classified as Science courses and will contribute towards your cumulative Science GPA.

Description of the Classroom Courses:

Fall Semester 2018

HSPC600 - Introduction to Biotechnology (1 cr): This course aims at both the principles and the applications of cutting-edge biotechnology. Upon successful completion of this course, the student should be equipped with foundation knowledge of modern biotechnology including laboratory calculations, the application of stem cells in modelling diseases and their therapeutic use, the biotechnology and applications of antibody engineering, fluorescence microscopy, technology used in drug discovery and drug design, molecular biology methods including PCR, gene editing especially the

use of CRISPR/Cas9 technology, as well as methodologies used in systems-level analysis of biomedical systems including RNA sequencing and mass spec-based proteomics.

HSPC601 - Biostatistics & Epidemiology (2 cr): Biostatistics and clinical epidemiology are closely intertwined disciplines that together form the foundation for conducting and interpreting clinical research. Understanding and applying the fundamental principles of these sciences will be emphasized throughout the lecture material. Critical evaluation, rather than mathematical computation, will be the primary emphasis. The topics selected for this course are intended to supplement the PharmD class in biostatistics and pharmacoepidemiology (PRMC611) which places a large emphasis on study design and evidenced based medicine. This course will begin with a survey of topics that biostatistics and epidemiology share in common before moving on to qualitative and quantitative methods that serve both the basic scientist as well as the clinical investigator. The benefits and pitfalls of employing statistical software will be demonstrated using STATA statistical software.

HSPC603 - Scientific Writing-1 (2 cr): The goal of this course is to develop clear and persuasive writing using scientific language. This is a discussion and critique-based class where we will be analyzing writing samples, identifying ways to improve our writing, and applying these insights to the composition of original pieces and the peer critique of those pieces. We will also discuss the structure and significance of the scientific paper, which is the starting format for the MS thesis. In-class participation and at-home preparation are required. Students are expected to complete all assignments on time, and come prepared to give constructive feedback to their peers in class with annotated documents.

HSPC604 - Journal Club-1 (1 cr): In this course, students will learn to search, critically read, interpret, present, and discuss primary literature in various fields of biomedical and pharmaceutical research. The intent of this course is also to immerse students in state-of-the-art research methodologies utilized in Basic Biomedical, Clinical and Outcomes Research. Article selection is pre-approved by the faculty advisor. Each student pairs up with another student and has the opportunity to present one or two papers taken from the primary literature using 30 minutes of the designated classroom time. Fifteen minutes of classroom time is then used for questions and answers and to engage the class in a discussion. Active participation is expected. A 10-15-minutes short-answer quiz is administered by the course coordinator at the end of the classroom time to assess the students' understanding of the paper.

Spring Semester 2019

HSPC606 - Scientific Writing-2 (2 cr): This course is devoted to further developing the MS students' writing skills acquired in HSPC603 Scientific Writing-1 during the fall semester. The goal of the course is the completion of the final paper required for obtaining the MS degree. Students work with their advisors to complete their research paper, which will include a title page, abstract, and introduction, materials and methods, results, discussion and references sections.

HSPC607 - Scientific Presentation (2 cr): The main objective of this course is to equip the students with essential elements of successful oral and poster presentation in their area of research. These include understanding the audience, working on the content and structure of the presentation, rehearsing presentation delivery and receiving feedback (with videotaping via Zoom), learning presentation techniques as well as guidelines to designing and producing effective scientific posters. Each student will give three presentations over the course of the semester: two oral presentations on their area of research, and a formal poster presentation at the TUC Annual Research Day. Each oral presentation will be moderated by a fellow classmate, who will be responsible for introducing the presenter and the presentation as well as initiate the question and answer session at the end of the presentation.

HSPC609 - Journal Club-2 (1 cr): The goal of this course is for attendees to become proficient in assessing primary research literature. This includes, but is not limited to identifying relevant publications, evaluating the research methods and data analyses, and presenting the findings to an audience of peers. In doing so, participants will also become acquainted with state-of-the-art methodologies used in Basic Biomedical, Clinical and Outcomes Research. This course is highly interactive. Participants should work together to analyze and critique the findings of a presented research study. Article selection should be pertinent to ongoing research interests and preapproved by a faculty advisor. Each participant is responsible for presenting one paper - using 35 minutes of the designated classroom time. The remaining 25 minutes of classroom time will be used to engage non-presenting attendees with discussion and a graded short-answer quiz, assessed by the course coordinator. Active participation is expected and will be taken into account in determining the course grade.

HSPC610 - Integrated Pharmaceutical Sciences (1 cr): This course provides MS students with a simple, integrated, coherent, introductory, yet comprehensive overview of pharmaceutical science concepts including physiology, biochemistry, medicinal chemistry, pharmacology, pharmacokinetics, and pharmacy practice. The fundamental principles that underlie all pharmaceutical science disciplines and the connection between them will be introduced and explained for their pharmaceutical and therapeutic applications. The goals are to discuss and explore pharmacodynamics, mechanisms of action, indications, side effects/toxicities, pharmacokinetics (ADME), drug metabolism, principles of functional group chemistry, structure activity relationship (SAR), and apply these principles to clinical settings. The main topics include top 200 drugs in major therapeutic areas. MS students who understand the language of the pharmaceutical sciences, the key concepts, and links between these concepts are better able to appreciate more advanced material.

Research Training (Mentored Research):

All MS students are required to take a total of 37 units of mentored research during their 10-month training period. These units correspond to 19 weeks of contact hours with one or two advisors in a given research setting in fall in **HSPC602 - Mentored Research-1 (19 cr)** and 18 weeks of contact hours with the same advisor(s) in spring in **HSPC608 - Mentored Research-2 (18 cr)**. In these two courses, MS students receive training in various aspects of academic research according to the expertise of their direct advisors. The course emphasizes training in oral and written scientific communication, professional behavior and work ethics, initiative and self-directed learning, as well as in designing and conducting independent research experiments.

Within the frame of Mentored Research-1 and -2, each student is paired with one or two faculty members at the very beginning of the fall semester *via* a double-blind matching process. The student then spends 30-36 hours per week for ten months in a specific academic research setting or a combination of settings (a research laboratory, an office, a field trip, the TUC library, a clinic). This research internship culminates with two important requirements for graduation:

1. Completion of a final 20-page manuscript, which is graded by the advisor and an independent reader.
2. Delivery of a final oral presentation (thesis defense) to the MS-MHS-COP faculty and students, which is evaluated by three attending faculty members including the advisor and the independent reader.

Major competencies assessed in Mentored Research:

- Communication Skills
- Professionalism

- Initiative & Self-Directed Learning
- Technical Skills

Overview of the MS Curriculum 2017-2018:

Fall 2018		
HSPC600 Elective Introduction to Biotechnology	Aug 07 - Dec 14 Dr. Chong He	Wed 4:30 - 5:30 pm Library, Rm-112
HSPC601 Biostatistics & Epidemiology	Aug 07 - Dec 14 Dr. John Inciardi	Mon 4:30 - 6:30 pm Library, Rm-112
HSPC602 Mentored Research-1	Aug 07 - Dec 14 Advisors	Mon - Fri 8 am - 5/3 pm Lab/Office/Site
HSPC603 Scientific Writing-1	Aug 07 - Dec 14 Dr. Shona Mookerjee	Tue 4:30 - 5:30 pm Library, Rm-112
HSPC604 Journal Club-1	Aug 07 - Dec 14 Dr. Daniel Keppler	Tue 5:30 - 6:30 pm Library, Rm-112
Spring 2019		
HSPC606 Scientific Writing-2	Jan 02 - May 17 Dr. Patricia Shane	Tue 4:30 – 5:30 pm Library, Rm-112
HSPC607 Scientific Presentations	Jan 02 - May 17 Dr. Vanishree Rajagopalan	Wed 4:30 - 5:30 pm Library, Rm-112
HSPC608 Mentored Research-2	Jan 02 - May 17 Advisors	Mon - Fri 8 am - 5/3 pm Lab/Office/Site
HSPC609 Journal Club-2	Jan 02 - May 17 Dr. Susan Heimer	Tue 5:30 - 6:30 pm Library, Rm-112
HSPC610 Elective Integrated Pharmaceut. Sciences	Jan 02 - May 17 Dr. Shengquan Liu	Wed 5:30 - 6:30 pm Library, Rm-112

Requirements for Graduation as a M.Sc. in Medical Health Sciences from the College of Pharmacy:

1. Satisfactory completion of all required and elective courses. Satisfactory completion is a grade of at least a 2.0 (or 70%) in each course. There can be no outstanding Unsatisfactory or Incomplete grade.

2. Completion of all graded and non-graded coursework and assignments, including but not limited to:
    a. a final report on research results, written in the style of a journal article and
    b. a final oral presentation (similar to a thesis defense)

3. Satisfactory demonstration of research competencies
4. Recommendation by the MS-MHS-COP administration for graduation
5. Fulfillment of all legal and financial obligations to TUC.

MS Seminar Series for 2018-2019:

- Buck Institute Formal Research Seminar Fridays 11 am – 12 noon
  Buck Institute, Novato, California. E-mail: shona.mookerjee@tu.edu
- COP Residency Research Seminar Series.
  Schedule and materials coordinated by Dr. Shadi Doroudgar. E mail: shadi.doroudgar@tu.edu
- Other seminars on the TUC campus as per announcements

MS Workshops for 2018-2019:

- Career and Residency Day. September, 2018
- How to apply to Pharmacy School. Office of Admissions. October, 2018
- Mock Interviews with PharmD Faculty. November 2018
- Mock Interviews with PharmD Faculty. January 2019

Important Dates Near the End of the Spring Semester 2019

Mon Apr 15	First complete draft of manuscript (version 1) submitted to Advisor
Sun Apr 21	Advisor returns draft to student with revisions and comments
Wed Apr 24	Poster Presentation at 18th Annual TUC Research Day
Mon Apr 29	Revised draft (version 2) submitted to Independent Reader
Sun May 05	Reader returns draft with revisions and comments
Thu May 09	Final Research Presentation to faculty and students
Thu May 16	Final manuscript (version 3) due to Advisor and MS Office
Wed May 22	Graduation of the Class of 2019

Program and course evaluations:

Mandatory student evaluations of the overall program, individual courses and advisors are performed towards the end of the 10-months MS Program (in May 2019).

Program Outcomes:

The MS-MHS-COP Program has an average 98% retention rate and 98% completion rate since its inception in 2012. In addition, students consistently express high satisfaction with the program overall and the individual courses and instructors.

MS Graduates by Career Path:

Class of	Number of Grads	COP PharmD	Other PharmD	MD or DO	PhD	Other Doctorate	Biotech/ Pharma	Other
2013	10	7	2				1	
2014	11	5	1					3
2015	14	12	2			1 (DDS)		
2016	14	9	1				3	2
2017	9	3	3	1			1	
Total	**58**	**36 (62.1%)**	**9 (15.5%)**	**1 (1.7%)**		**1 (1.7%)**	**5 (8.6%)**	**5 (8.6%)**

The majority of our students choose to matriculate into a PharmD program. From 2012-2017, a total of 45/58 (77.6%) of graduates chose a career path in Pharmacy and enrolled or will be enrolling in a PharmD Program. Of those, 36/45 (80.0%) chose to enroll in the TUC-COP PharmD Program.