

# RADIOLOGICAL SCIENCES

The graduate program in Radiological Sciences trains students in: (1) the sciences and technologies that are used to produce radiant energy forms, (2) the scientific knowledge gained by using radiant energy forms to understand and modify biological processes, and (3) the application of radiant energy forms for the diagnosis and treatment of human diseases. The degree offered is a Ph.D. degree in Radiological Sciences. Students have the opportunity to specialize in the following specific tracks within the Ph.D. in Radiological Sciences: (1) Medical Physics, (2) Radiation Biology, (3) Neuroscience Imaging and (4) Human Imaging.

The curriculum provides an opportunity for students to acquire a core of fundamental knowledge through a synergistic program of formal courses, seminars, teaching opportunities, and hands-on research experience.

Each student is encouraged to design with the assistance of a research advisor, an individual course of study consistent with his/her career goals.

## Admissions Requirements

For all Radiological Sciences tracks a Baccalaureate degree in a natural science or engineering discipline is required. A degree in any other field must have provided sufficient science and mathematics courses to give the applicant the equivalent of a degree in natural science or engineering. Applicants must have undergraduate credit for the following courses: (1) Chemistry: One semester of general chemistry; (2) Physics: at least two semesters of general physics; (3) Mathematics: Through calculus and ordinary differential equations; and (4) Computer Science or Programming: One semester.

Graduate Record Exam (GRE) general test and a minimum GPA of 3.0 on a 4.0 scale are required along with three letters of recommendation. During the application process, essays stating (1) the reasons for your interest in Radiological Sciences, (2) description of professional goals and (3) an outline of any undergraduate, industry or summer research, as well as teaching and clinical experience must be submitted.

Students accepted into the CAMPEP-accredited ([www.campep.org](http://www.campep.org)) Ph.D. Medical Physics track shall have acquired a strong foundation in basic Physics. This should be documented by either an undergraduate degree in physics or a degree in a related engineering or physical science with coursework that is equivalent to a minor in Physics (includes at least three upper level undergraduate physics courses).

Students accepted into the Human Imaging track are required to have a medical degree (M.D., D.O., etc.) and typically are pursuing their Ph.D. while simultaneously completing a medical residency program.

The admission process includes a review of each applicant's academic history as well as the experiences and goals of the applicant. Virtual and/or on-campus interviews are conducted for qualified applicants by the Admissions Committee.

Applicants from countries where English is not the native language must submit test scores from either the Test of English as a Foreign Language (TOEFL: minimum score of 84 on the internet based test), a band score of 7 on the academic version of the the International English Language Testing System (IELTS) or a minimum score of 115 on the Duolingo English Test. Scores on TOEFL, IELTS or Duolingo tests taken more than two years prior to the date of application will not be accepted.

All transcripts from foreign institutions must be evaluated by an accredited credentialing service (<https://www.naces.org/>). Evaluations must include 1.) a listing of all courses in English; and 2.) a final grade point average (4.0 scale) for all courses taken (not just science courses).

International applicants who have completed or will complete their degree prior to matriculation at an accredited US Institution may be exempted from the TOEFL/IELTS requirement.

## Degree Requirements

A minimum of 72 credit hours and a minimum overall GPA of 3.0 is required for the Ph.D. degree. In addition, all doctoral candidates must register for RADI 7099 Dissertation for at least two semesters in order to graduate. The student is required to demonstrate intellectual command of the subject area of the graduate program and capability to carry out independent and original investigation in the area. The student must successfully defend a dissertation and be recommended by their program COGS for approval of their degree to the Dean of the Graduate School of Biomedical Sciences.

## Radiological Sciences - Medical Physics Imaging Concentration

First Year		Credit Hours
Fall		
RADI 5001	Basic Radiation Safety	1
RADI 5005	Fundamentals Of Radiation Dosimetry	3
RADI 5015	Physics Of Diagnostic Imaging 1	3
RADI 6049	Intro To Magnetic Resonance	2
RADI 7077	Ethics, Leadership and Vision	2
RADI 5090	Radiological Sciences Seminar	1
<b>Total Credit Hours:</b>		<b>12.0</b>

First Year		Credit Hours
Spring		
RADI 5007	Statistics in the Radiological Sciences	2
RADI 5020	Principles of Health Physics 1	3
RADI 5090	Radiological Sciences Seminar	1
RADI 6024	Radiological Anatomy & Physiology	3
Medical Physics Elective		3
<b>Total Credit Hours:</b>		<b>12.0</b>

Second Year		Credit Hours
Fall		
RADI 5025	Molecular Oncology & Radiobiology	3
RADI 6030	Physics Of Radiotherapy	3
Medical Physics Elective		3

Medical Physics Elective	3
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**Total Credit Hours: 12.0**

**Second Year  
Spring**

RADI 6097	Research	3
RADI 6012	Phys Nuclear Medi Imaging	3
Medical Physics Elective		3
Medical Physics Elective		3

**Total Credit Hours: 12.0**

**Third Year  
Fall**

RADI 5090	Radiological Sciences Seminar	1
RADI 6071	Supervised Teaching	1
RADI 6097	Research	10

**Total Credit Hours: 12.0**

**Third Year  
Spring**

RADI 6071	Supervised Teaching	1
RADI 5090	Radiological Sciences Seminar	1
RADI 6097	Research	10

**Total Credit Hours: 12.0**

**Fourth Year  
Fall**

RADI 7099	Dissertation	12
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**Total Credit Hours: 12.0**

**Fourth Year  
Spring**

RADI 7099	Dissertation	12
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**Total Credit Hours: 12.0**

**Medical Physics Electives**

RADI 5018	Physics Measurements In Imaging Lab	2
RADI 6015	Physics Measurements in Imaging 2	3
RADI 6016	Physics of Diagnostic Imaging 2	3
RADI 6017	Neuroimaging Methods	3
RADI 6022	Programming for Medical Physics	1
RADI 6031	Physics Measurements In Radiotherapy I	3

RADI 6033	Advanced Radiotherapy Physics	3
RADI 6035	Physics Measurements In Radiotherapy 2	3
RADI 6042	Non-Ionizing Radiation Biology	1-9
RADI 6050	Magnetic Resonance Imaging	2
RADI 6051	Statistical Parametric Mapping	3
RADI 6054	Introduction to Statistical Learning	2
RADI 6091	Special Topics	1-12
RADI 7005	Treatment Planning Techniques In Radiation Therapy	3
RADI 7006	Treatment Planning Techniques in Radiotherapy 2	3
RADI 7010	Motor Learning And Brain Imaging	3
INTD 7006	Biomarkers in Health Care Research and Delivery	1

**Therapy Concentration**

**First Year**

Fall		Credit Hours
RADI 5001	Basic Radiation Safety	1
RADI 5005	Fundamentals Of Radiation Dosimetry	3
RADI 5015	Physics Of Diagnostic Imaging 1	3
RADI 6030	Physics Of Radiotherapy	3
RADI 7077	Ethics, Leadership and Vision	2

**Total Credit Hours: 12.0**

**First Year**

Spring		Credit Hours
RADI 5007	Statistics in the Radiological Sciences	2
RADI 5020	Principles of Health Physics 1	3
RADI 5090	Radiological Sciences Seminar	1
RADI 6024	Radiological Anatomy & Physiology	3
Medical Physics Elective		3

**Total Credit Hours: 12.0**

**Second Year**

Fall		Credit Hours
RADI 5025	Molecular Oncology & Radiobiology	3
RADI 6049	Intro To Magnetic Resonance	2
RADI 5090	Radiological Sciences Seminar	1
Medical Physics Elective		3
Medical Physics Elective		3

**Total Credit Hours: 12.0**

**Second Year****Spring**

RADI 6097	Research	Credit Hours	3
RADI 6012	Phys Nuclear Medi Imaging		3
Medical Physics Elective			3
Medical Physics Elective			3
<b>Total Credit Hours:</b>			<b>12.0</b>

**Third Year****Fall**

RADI 5090	Radiological Sciences Seminar	Credit Hours	1
RADI 6071	Supervised Teaching		1
RADI 6097	Research		10
<b>Total Credit Hours:</b>			<b>12.0</b>

**Third Year****Spring**

RADI 6071	Supervised Teaching	Credit Hours	1
RADI 5090	Radiological Sciences Seminar		1
RADI 6097	Research		10
<b>Total Credit Hours:</b>			<b>12.0</b>

**Fourth Year****Fall**

RADI 7099	Dissertation	Credit Hours	12
<b>Total Credit Hours:</b>			<b>12.0</b>

**Fourth Year****Spring**

RADI 7099	Dissertation	Credit Hours	12
<b>Total Credit Hours:</b>			<b>12.0</b>

**Medical Physics Electives**

RADI 5018	Physics Measurements In Imaging Lab		2
RADI 6015	Physics Measurements in Imaging 2		3
RADI 6016	Physics of Diagnostic Imaging 2		3
RADI 6017	Neuroimaging Methods		3
RADI 6022	Programming for Medical Physics		1
RADI 6031	Physics Measurements In Radiotherapy I		3
RADI 6033	Advanced Radiotherapy Physics		3
RADI 6035	Physics Measurements In Radiotherapy 2		3
RADI 6042	Non-Ionizing Radiation Biology		1-9

RADI 6050	Magnetic Resonance Imaging		2
RADI 6051	Statistical Parametric Mapping		3
RADI 6054	Introduction to Statistical Learning		2
RADI 6091	Special Topics		1-12
RADI 7005	Treatment Planning Techniques In Radiation Therapy		3
RADI 7006	Treatment Planning Techniques in Radiotherapy 2		3
RADI 7010	Motor Learning And Brain Imaging		3
INTD 7006	Biomarkers in Health Care Research and Delivery		1

## Radiological Sciences - Neuroscience Imaging

**First Year****Fall**

RADI 5001	Basic Radiation Safety	Credit Hours	1
RADI 5015	Physics Of Diagnostic Imaging 1		3
RADI 6049	Intro To Magnetic Resonance		2
RADI 7077	Ethics, Leadership and Vision		2
RADI 6051	Statistical Parametric Mapping		3
Neuroscience Imaging Elective			1

**Total Credit Hours: 12.0**

**First Year****Spring**

RADI 5007	Statistics in the Radiological Sciences	Credit Hours	2
RADI 5090	Radiological Sciences Seminar		1
RADI 6012	Phys Nuclear Medi Imaging		3
RADI 6024	Radiological Anatomy & Physiology		3
RADI 6017	Neuroimaging Methods		3

**Total Credit Hours: 12.0**

**Second Year****Fall**

RADI 5090	Radiological Sciences Seminar	Credit Hours	1
RADI 6071	Supervised Teaching		2
RADI 6097	Research		7
Neuroscience Imaging Elective			2

**Total Credit Hours: 12.0**

**Second Year****Spring**

RADI 5090	Radiological Sciences Seminar	Credit Hours	1
RADI 6097	Research		8

Neuroscience Imaging Elective	3
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**Total Credit Hours: 12.0**

### Third Year Fall

RADI 5090	Radiological Sciences Seminar	1
RADI 6097	Research	11

**Total Credit Hours: 12.0**

### Third Year Spring

RADI 6097	Research	12
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**Total Credit Hours: 12.0**

### Fourth Year Fall

RADI 7099	Dissertation	12
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**Total Credit Hours: 12.0**

### Fourth Year Spring

RADI 7099	Dissertation	12
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**Total Credit Hours: 12.0**

### Neurosciences Imaging Electives

INTD 5046	Metanalysis In Cognitive Neuroimaging	2.5
INTD 6041	Basic Science Resident Lecture Series In Neurology	1.5
RADI 5030	Neuroscience Imaging Laboratory	1
RADI 6018	Foundations Of Neuroscience Imaging	3
RADI 6050	Magnetic Resonance Imaging	2
RADI 6022	Programming for Medical Physics	1
RADI 6054	Introduction to Statistical Learning	1
RADI 6015	Physics Measurements in Imaging	3
CSAT 5095	Experimental Design And Data Analysis	3
CSAT 6005	Rigor & Reproducibility	1
INTD 6040	Resident Lecture Series in Psychiatric Disorders and Psychopharmacology	1
INTD 5040	Fundamentals Of Neuroscience1: Molecular, Cellular, & Developmental Neuroscience	2
INTD 5043	Fundamentals Of Neuroscience 2: Systems Neuroscience	3
INTD 5047	Neuroanatomy	2
INTD 6045	Clinical Practicum In Neuroscience	1

INTD 7006	Biomarkers in Health Care Research and Delivery	1
PHYL 5041	Excitable Membranes	1
PHAR 6027	Fundamentals Of Neuroethics	1
PHYT 7009	Neuroscience	4

## Radiological Sciences - Human Imaging Track

### First Year Fall

RADI 6097	Research	4
RADI 5090	Radiological Sciences Seminar	1
RADI 5001	Basic Radiation Safety	1
<b>Total Credit Hours:</b>		<b>6.0</b>

### First Year Spring

RADI 6097	Research	4
RADI 6071	Supervised Teaching	2
<b>Total Credit Hours:</b>		<b>6.0</b>

### Second Year Fall

RADI 7077	Ethics, Leadership and Vision	2
RADI 6097	Research	4
<b>Total Credit Hours:</b>		<b>6.0</b>

### Second Year Spring

RADI 5007	Statistics in the Radiological Sciences	2
RADI 6097	Research	3
RADI 5090	Radiological Sciences Seminar	1
<b>Total Credit Hours:</b>		<b>6.0</b>

### Third Year Fall

RADI 6097	Research	4
RADI 5025	Molecular Oncology & Radiobiology	3
RADI 6049	Intro To Magnetic Resonance	2
RADI 5015	Physics Of Diagnostic Imaging 1	3
<b>Total Credit Hours:</b>		<b>12.0</b>

### Third Year Spring

RADI 6097	Research	6
RADI 6012	Phys Nuclear Medi Imaging	3

Human Imaging Elective	3
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**Total Credit Hours: 12.0**

#### Fourth Year Fall

RADI 7099	Dissertation	11
RADI 5090	Radiological Sciences Seminar	1

**Total Credit Hours: 12.0**

#### Fourth Year Spring

RADI 7099	Dissertation	11
RADI 5090	Radiological Sciences Seminar	1

**Total Credit Hours: 12.0**

#### Human Imaging Electives

RADI 6015	Physics Measurements in Imaging 2	3
RADI 6051	Statistical Parametric Mapping	3
TSCI 5078	Introduction to Intellectual Property, Technology Transfer and Commercialization	1
RADI 6017	Neuroimaging Methods	3
RADI 6091	Special Topics	1-12
TSCI 5071	Patient-Oriented Clinical Research Methods-1	2
TSCI 5073	Integrated Molecular Biology With Patient-Oriented Clinical Research	1
TSCI 5076	Applied Healthcare Informatics and Analytics	2
INTD 5046	Metanalysis In Cognitive Neuroimaging	2.5

## Radiological Sciences - Radiation Biology Track

#### First Year Fall

RADI 5001	Basic Radiation Safety	1
RADI 5025	Molecular Oncology & Radiobiology	3
IBMS 5000	Fundamentals Of Biomedical Sciences	8

**Total Credit Hours: 12.0**

#### First Year Spring

RADI 5007	Statistics in the Radiological Sciences	2
RADI 5020	Principles of Health Physics 1	3
RADI 5090	Radiological Sciences Seminar	1
RADI 6012	Phys Nuclear Medi Imaging	3

RADI 6024	Radiological Anatomy & Physiology	3
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**Total Credit Hours: 12.0**

#### Second Year Fall

RADI 5015	Physics Of Diagnostic Imaging 1	3
RADI 5090	Radiological Sciences Seminar	1
RADI 6049	Intro To Magnetic Resonance	2
RADI 6097	Research	4
RADI 7077	Ethics, Leadership and Vision	2

**Total Credit Hours: 12.0**

#### Second Year Spring

RADI 5090	Radiological Sciences Seminar	1
RADI 6097	Research	5
Radiation Biology Elective		3
Radiation Biology Elective		3

**Total Credit Hours: 12.0**

#### Third Year Fall

RADI 5090	Radiological Sciences Seminar	1
RADI 6071	Supervised Teaching	2
RADI 6097	Research	9

**Total Credit Hours: 12.0**

#### Third Year Spring

RADI 6097	Research	12
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**Total Credit Hours: 12.0**

#### Fourth Year Fall

RADI 7099	Dissertation	12
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**Total Credit Hours: 12.0**

#### Third Year Spring

RADI 7099	Dissertation	12
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**Total Credit Hours: 12.0**

#### Radiation Biology Electives

INTD 5007	Advanced Cellular And Molecular Biology	4
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RADI 6015	Physics Measurements in Imaging	3
	2	
RADI 6020	Advanced Topics In Cognitive Neuroscience	3
RADI 6050	Magnetic Resonance Imaging	2
RADI 6091	Special Topics	1-12

## Objectives/Program Outcomes

1. Proficiency in Core Biomedical and Radiological Science Principles.
2. Capacity to Conduct Biomedical Research.
3. Critically Review and Interpret Research Literature.
4. Demonstrate Competence in Written Communication.
5. Demonstrate Competence in Verbal Communication.
6. Conduct Research in an Ethical Manner.

## Courses

### IBMS 5000. Fundamentals Of Biomedical Sciences. 8 Credit Hours.

This core course covers the fundamentals of biochemistry, molecular biology, cell biology, organismal and systems biology, and microbiology and immunology. The course is designed for first-year graduate students matriculating into the Integrated Biomedical Sciences Program (IBMS).

### IBMS 5008. Lab Rotations. 1-3 Credit Hours.

This course provides an opportunity for students to participate in research activities in the laboratories of faculty members in different disciplines to learn laboratory skills and to gain an introduction to the research fields of faculty members.

### IBMS 6090. Seminar. 1.5 Credit Hour.

This course is required of all students in the IBMS program, except of those who have signed up for Final Hours. Students are required to attend a minimum of 16 seminars per semester and to complete a requirement to demonstrate their attendance and participation. To fulfill the minimum number of seminars, students may include seminars offered by disciplines other than their own in which they are enrolled. However, to enroll, students should obtain permission from the course Section Director affiliated with the appropriate discipline. The course numbers of the individual course sections are INTD 6090-1GEN, 6090-2BA, 6090-3CB, 6090-4CGM, 6090-5MIM, 6090-6MBB, 6090-7NS and 6090-8PP for the IBMS Disciplines: Biology of Aging (BA), Cancer Biology (CB), Cell Biology, Genetics & Molecular Medicine (CGM), Molecular Biophysics & Biochemistry (MBB), Molecular Immunology & Microbiology (MIM), Neuroscience (NS), and Physiology & Pharmacology (PP). Some students who have not declared a discipline, and have obtained the approval of their academic advisor and the Senior Associate Dean of the GSBS, may sign up for INTD 6090-1GEN. Grading will be Satisfactory or Unsatisfactory. A list of seminars from all disciplines will be posted on the Graduate School Web site. Each Section Director will determine, for the relevant IBMS-6090 section, the policy for tracking student's attendance and participation in seminars.

### IBMS 6097. Research. 0.5-12 Credit Hours.

This course involves independent, original research under the direction of a faculty advisor.

### IBMS 6098. Thesis. 1-9 Credit Hours.

Registration for at least one term is required for M.S. candidates.

Prerequisite: Admission to candidacy for the Master of Science degree is required.

### IBMS 7001. Qualifying Exam. 1 Credit Hour.

The objective of the Qualifying Examination (QE) is to determine if a student has met programmatic expectations with regard to: i) Acquiring a level of scientific reasoning and a knowledge base in his/her field of study appropriate for a graduate student at the current stage of training; ii) Demonstrating skills of problem-solving and development of experimental strategies designed to test hypotheses associated with a specific scientific problem; and iii) Demonstrating the ability to defend experimental strategies proposed for solving scientific problems. Successful completion of the QE is required for Advancement to Candidacy and continuation in the IBMS Ph.D. program. During the Spring semester of Year 2 (4th semester overall) of the student's program, the QE will be administered by a faculty committee approved by a student's Discipline leadership. Each IBMS discipline will administer the QE process for its students so as to achieve the goals of the discipline while satisfying the expectations of the IBMS graduate program. In general, the QE requires the solving of a relevant unsolved problem in the biomedical sciences by writing a research proposal based on an idea conceived and developed by the student, followed by an oral defense-of-proposal to explore the student's problem-solving process, and the soundness of the student's experimental design. Following the QE, a report will be submitted by the chair of the examination committee to the student's discipline leadership indicating the outcome of the exam and any recommendations that may be required to foster further academic progress by the student. IBMS 7001 is divided into 7 modules overseen by the 7 IBMS Disciplines, each that is responsible for providing its students with a detailed description of the examination process, and for ensuring that the programmatic expectations and goals of the QE are met.

### IBMS 7010. Student Journal Club & Research Presentation. 1-2 Credit Hours.

This course is designed to provide graduate students with experience in critical reading of the primary literature, seminar preparation and presentation, data analysis and interpretation, and group-based learning as they relate to the graduate program in Integrated Biomedical Sciences. This course is required of all students in the IBMS program starting in their second year except of those who have signed up for Final Hours. Students are required to attend a minimum of 16 total presentations per semester (journal club or research presentations) and to complete a requirement to demonstrate their attendance and participation. Students are also required to present one journal club presentation per semester until they are Advanced to Candidacy. Once Advanced to Candidacy, the student will present one journal club presentation per academic year and one research presentation per academic year such that the student is giving at least one presentation in each semester. To enroll, students should obtain permission from the course Section Director affiliated with the appropriate discipline. The course numbers of the individual course sections are INTD 7010-1GEN, 7010-2BA, 7010-3CB, 7010-4CGM, 7010-5MIM, 7010-6MBB, 7010-7NS and 7010-8PP for the IBMS Disciplines: Biology of Aging (BA), Cancer Biology (CB), Cell Biology, Genetics & Molecular Medicine (CGM), Molecular Biophysics & Biochemistry (MBB), Molecular Immunology & Microbiology (MIM), Neuroscience (NS), and Physiology & Pharmacology (PP). Some students who have not declared a discipline, and have obtained the approval of their academic advisor and the Senior Associate Dean of the GSBS, may sign up for INTD 7010-1GEN. Grading will be by letter grade (A, B, C, etc). A list of journal clubs from all disciplines will be posted on the Graduate School Web site. Each Section Director will determine, for the relevant IBMS 7010 section, the policy for tracking student's attendance and participation and will be responsible for assigning a final grade.



**IBMS 7099. Dissertation. 1-12 Credit Hours.**

This course involves independent, original research under the direction of a faculty advisor and is designed to allow graduate students time to write their doctoral dissertations and to receive guidance from their Dissertation Supervising Committees. Enrollment in IBMS 7099 with discipline designations typically requires course permissions which is granted by the discipline coordinator or director.

**Courses****INTD 1091. Independent Study. 4 Credit Hours.**

Students will work directly with a faculty advisor or assistant dean to develop an independent plan of study.

**INTD 3001. International Elective. 0 Credit Hours.**

Students will work with the course director and Assistant Director of Global Health to identify an appropriate international elective site, using established sites/programs or one that the student discovers on their own. All rotations must be vetted and approved by the course director and will adhere to a community service-learning model that is a structured educational experience combining community service with preparation and reflection. Students are expected to help shape the learning experience around community-identified needs and advance insight related to the context in which service is provided, the connection between service and academic coursework, and students' roles as citizens and professionals. Students will spend 4 weeks living and working at an international service site. Sites may allow for a range of experiences, such as participating in patient care, conducting clinical or public health research, and/or participating in a language immersion program. There may also be opportunities for patient education and emphasis on efforts of local empowerment, aiming to build up the communities in a sustainable way. Regardless of the focus, all sites must be supervised by qualified health care providers. Students are encouraged to integrate themselves into the health care delivery system, to explore community needs that they could address, and when possible, to strive to make an impact through community education, home visits, and research. Reflection essays serve as a way to process experiences, including clinical cases, new perspectives gained, and analysis of health care disparities, and strategies for the overcoming poverty-related health problems. Students are encouraged to share their experiences upon return through a formal presentation.

**INTD 3002. School of Medicine Research Elective. 0 Credit Hours.**

Students will participate in basic or clinical research projects under the supervision of university faculty. The goal of this elective is to immerse students in a rich research environment and provide an opportunity to work with research mentors to fully engage in the research process from writing the proposal to collecting the data to disseminating research results. This elective is open to students who already have an established working relationship with a faculty member and who wish time to continue their work, students who wish to establish a new project, and for students who are in the MD-MPH degree program and MD with Distinction in Research Program. Interested students must contact the course director prior to the enrollment date to express interest in the elective and receive further instructions on the application process for the research and identification/ confirmation of the faculty mentor.

**INTD 3030. Clinical Foundations. 3 Credit Hours.**

The purposes of this completely online course are to: 1. Prepare early clinical students to increase knowledge in clinical settings including: a. Exposure to healthcare team members, b. Exposure to roles on clerkship (H&Ps, orders, SOAP notes, prescriptions, etc.), c. Interpretation of EKGs and radiographs, d. Interpretation of normal/abnormal lab values, e. Recognition of fatigue/strategies to combat fatigue in clinical settings, f. Basic understanding of ventilator management/ICU care, g. Patient insurance issues/patient health care financial resources, h. Avoidance of medical legal problems, i. Better success on exams, j. Performance of evidence-based searches in medical literature, k. Understanding fundamentals of translational research; 2. Assist students in developing new skills expected of early clinical students including: a. Intravenous catheter placement, nasogastric catheter placement, urinary catheter placement, and O2 management, b. Sterile gloving and sterile technique, c. Basic suturing/staple placement and removal; and 3. Prepare early clinical students for their roles in clinical settings including: a. Patient care under supervision, b. Patient privacy-HIPAA, c. Professionalism and responsibility to team and patients, d. Patient safety, e. Proper use of social media in patient care, f. Strategies to be best student on the first clerkship, g. OSHA and hand hygiene, h. Proper professional attire, i. Completion of evaluations on residents and faculty. The students will complete credentials for major clinical sites.

**INTD 3031. Exploring Clinical Medicine- Module 1. 1 Credit Hour.**

Exploring Clinical Medicine (ECM) is a longitudinal course across the clerkship year in which third-year medical students will learn about fundamental topics that are transcendent across specialties and are essential to the practice of clinical medicine. Learning activities are divided into three modules of thematically related content over the clerkship year. Modules will include a combination of required synchronous and asynchronous content. Each module will incorporate an OSCE. In ECM Module 1, the focus is on "Professional Communication." Topics include Communication in the Clinical Learning Environment and Difficult Patient Encounters. Completion of pre-clinical curriculum is required.

**INTD 3032. Exploring Clinical Medicine- Module 2. 1 Credit Hour.**

Exploring Clinical Medicine (ECM) is a longitudinal course across the clerkship year in which third-year medical students will learn about fundamental topics that are transcendent across specialties and are essential to the practice of clinical medicine. Learning activities are divided into three modules of thematically related content over the clerkship year. Modules will include a combination of required synchronous and asynchronous content. Each module will incorporate an OSCE. In ECM Module 2, the focus is on "Quality, Safety, Value." Topics include Patient-Centered & Cost-effective Care, Quality Improvement and Patient Safety, and Transitions of Care. Completion of pre-clinical curriculum is required.

**INTD 3033. Exploring Clinical Medicine- Module 3. 1 Credit Hour.**

Exploring Clinical Medicine (ECM) is a longitudinal course across the clerkship year in which third-year medical students will learn about fundamental topics that are transcendent across specialties and are essential to the practice of clinical medicine. Learning activities are divided into three modules of thematically related content over the clerkship year. Modules will include a combination of required synchronous and asynchronous content. Each module will incorporate an OSCE. In ECM Module 3, the focus is on "Social Concerns in Medicine." Topics include Human Trafficking, Climate Change, and Systemic Barriers to Health Care/Racial Disparities in Health Care. Completion of pre-clinical curriculum is required.

**INTD 3058. Hospice and Palliative Medicine. 0 Credit Hours.**

This rotation offers clinical experience in Hospice and Palliative Medicine (HPM). Palliative care provides treatment for seriously ill hospitalized and ambulatory patients and focuses on symptom management, enhancement of function, physical comfort, quality of life, psychosocial support, and communication about the goals of medical care for the patients as well as their families.

**INTD 3091. Independent Study. 9 Credit Hours.**

Students will work directly with a faculty advisor or assistant dean to develop an independent plan of study.

**INTD 4007. Interprofessional Community Service Learning. 2 Credit Hours.**

This is an innovative interdisciplinary service learning (CSL) course offered in partnership with the UT School of Pharmacy, PHR 270S, to allow medical students to integrate meaningful community service with instruction, preparation, and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities. This course will provide the opportunity for students to examine social justice and social determinant of health issues and apply these principles in a structured serviced learning practicum. The student-led service learning project will address the social and health needs of a community partner and will be conducted with the partner agency in a culturally competent manner. Through online learning modules, readings, and discussion; monthly class sessions; a group service learning project; and a structured service learning practicum, this course combines community service with preparation and reflection to foster civic responsibility in the health professions. Open for Cross Enrollment on Space Available Basis.

**INTD 4008. Interprofessional Care in HIV. 0.5 Credit Hours.**

Students will have the opportunity to learn how to function as a member of an interprofessional team in HIV case management. The objective is for students to become familiar with issues of patient safety, health literacy, medication reconciliation, and interprofessional teamwork in HIV care. This is an elective didactic course.

**INTD 4009. Interprofessional Care in HIV. 2 Credit Hours.**

Students will have the opportunity to learn how to function as a member of an interprofessional team in HIV case management, and become familiar with issues of: patient safety, health literacy, medication reconciliation, treatment guidelines, and interprofessional teamwork in HIV care.

**INTD 4011. Capstone I: Machine Learning and Artificial Intelligence for Health and Medicine. 4 Credit Hours.**

This course is intended as a stand-alone demonstration of AI principles for completion of the MS in AI dual degree program. Project topics include applied machine learning, neural networks, or natural language processing in health and medicine. The course aims to give students the minimal requisite skills to carry out an independent research project in ML and AI, train students to write up their findings and ideas accurately, and clearly and coherently present their own findings. Each student must have a mentor with a primary appointment in UTHSCSA, and an additional mentor with a primary appointment in UTSA (and adjunct appointment in Medical Education at UTHSCSA). Project topics and data may be given by assigned mentors which include but not limited to Patient Risk Identification, Imaging Classification (either digital pathology, or radiology), Clinical Trials Research, Basic research in the health sciences with parametric and non-parametric data. Prerequisites include: completion of the one-year didactic coursework through UTSA is required for the MS in AI program, students must have at least an introductory level of data science understanding with preparation for a standard data science workflow, knowledge of basic R/Python/MATLAB programming, and select mentors from UTHSCSA and UTSA.

**INTD 4012. Capstone II: Machine Learning and Artificial Intelligence for Health and Medicine. 4 Credit Hours.**

The primary learning objective of this elective is to prepare students for the advanced use of machine learning (ML) and artificial intelligence (AI) techniques in the professional health field. Successful completion of this course will provide students with knowledge of applications of ML and AI to health and medicine with quarter long project approved by the instructor and mentor. This course is a requirement for students enrolling in the MD/MS in AI dual degree program but is available to all medical students in good standing at the LSOM. If time allows, topics on more advanced theories of machine learning and artificial intelligence will be introduced. This course is a continuation of Capstone I. The course is intended to take the experience students gained in Capstone I and apply to an original/novel research idea in the data science domain. The course aims to give students the skills to conduct original research with a mentor, write up their findings in preparation for publication to a journal, and ultimately submit them for publication. Completion of Capstone II qualifies the student for an MS in AI with a thesis. Original/Novel research ideas may be given to students by their mentors, or they may choose a topic of their which will then be approved by both the mentors. The students must first complete Capstone I, and must have the same mentors as Capstone I and II unless a request is made and approved. Prerequisites for this course include completion of the one-year didactic coursework through UTSA is required for the MS in AI program. Students must also have at least an introductory level of data science understanding with preparation for a standard data science workflow, knowledge of basic R/Python/MATLAB programming, and select mentors from UTHSCSA and UTSA. Completion of INTD 4011: Capstone I; Machine Learning and Artificial Intelligence for Health and Medicine.

**INTD 4015. Humanism in Medicine Fellowship. 2 Credit Hours.**

This is a longitudinal 4th-year elective to support and nourish the inherent altruism of our students. This elective will bring together like-minded students and faculty who have a passion for caring for the medically underserved in their communities. The students will take a leadership role in managing and directing the student-run clinics at the Alpha Home, SAMM Transitional Living and Learning Center, Haven for Hope, Travis Park Dermatology (under faculty supervision). Clinical experiences will be at these clinics. This elective will include a few evening seminars throughout the year in which students and faculty meet to discuss social justice, how to start a free clinic, homelessness and topics chosen by the students. Every student will complete a project of their choice over the year.

**INTD 4018. Independent Elective in Ethics. 2 Credit Hours.**

In this longitudinal course, students will be required to undertake an independent study into a specific issue in medical ethics or medical humanities. Students will be required to read on research methods in medical ethics as well as literature in their issue of interest, and then to propose and conduct an original study project, a literature review, a position paper, or an ethical analysis of a particular topic or case. Students will be expected to write an academically rigorous final research report of 10 to 15 pages. Students will be encouraged to produce a final paper that can be submitted for publication in a peer-reviewed bioethics or medical humanities journal. Students will be required to meet with the instructor and/or chosen faculty advisor over the course for assistance, guidance, and discussion. (Center for Medical Humanities and Ethics).



**INTD 4019. Clinical Ethics. 2 Credit Hours.**

Students in this two-week course will have the opportunity to focus on work in clinical ethics consultation. The student will be required to participate in rounds as an ethicist, do in-depth reading on clinical ethics consultation, observe clinical ethics consults, attend ethics committee meetings, and provide an educational seminar to hospital staff on an issue of ethical significance.

**INTD 4025. Healthcare Practice and Policy Elective. 0.5 Credit Hours.**

The Healthcare Practice Elective is an introductory-level, discussion-based, eight-hour course targeted to fourth-year medical students. The course focuses generally on practice and policy issues of payment methodologies, cost-effectiveness, and access to care.

**INTD 4030. Serving Marginalized Communities: From local to global. 2 Credit Hours.**

This is a 2-week, in person course for 4th-year medical students who are planning future work in marginalized communities either locally or globally. This preparatory course uses a multidisciplinary, asset-based approach to provide a foundation of practical knowledge in community engagement to optimize the students' experiences, facilitate their adaptation to working in diverse settings, and maximize their impact in the communities where they serve. Topics include community partnerships and responsiveness to community needs, chronic and infectious illnesses of high burden in marginalized communities, prioritizing community resources, advocacy, health equity, ethical dilemmas, cultural humility, and professionalism. Course material is presented through a variety of approaches, including lectures, small-group case discussions, laboratory sessions, and online learning modules.

**INTD 4035. COVID-19 The Pathogenesis of a Pandemic. 2 Credit Hours.**

Students will be introduced to the novel coronavirus SARS-CoV-2 and the disease it causes, COVID-19. They will review emerging information pertaining to the virus and disease including virology, epidemiology and pathophysiology. They will also be engaged with material covering leadership principles, communication and social determinants of health. They will participate in online activities and discussions to further facilitate learning. This elective is completely online. Prerequisites: Completed MS1 and MS2 curriculum.

**INTD 4045. Patient Notes- Enrichment Elective. 0 Credit Hours.**

It is an interactive, inter-professional course that engages students in music listening sessions to teach students active listening skills. Through various forms of music, students will learn how to actively listen for specific details to gain insight on meaning, become comfortable with ambiguity and interpretation, and develop pattern recognition skills to quickly recognize deviation. Students will also develop stronger methodology for writing patients notes through conceptual practice of SOAP format notes for music pieces. Taught jointly by UTHSCSA faculty and professional musicians, this strategy of applying practical skills to an abstract concept such as music will refine these skills for students in clinical settings. Specifically, this course aims to improve interpersonal communication skills, and organizational note writing. This is also an opportunity for students to practice problems solving with other healthcare professionals.

**INTD 4048. Art Rounds. 2 Credit Hours.**

This is an interactive, interprofessional course that takes students to the McNay Art Museum to learn physical observation skills. Studies demonstrate that increased observational skills translate to improved physical examination skills. Using artwork as patients, students will have the opportunity to learn how to observe details and how to interpret images based on available evidence. Taught jointly by Health Science Center faculty and McNay museum educators, students will have the opportunity to develop and hone their observation, problem solving, and assessment skills. They will also observe, interpret, and give case reports on the original works of art to teach them the skill of verbalizing descriptions of what is seen, and not to accept assumptions made with a first impression. Open for Cross Enrollment on Space Available Basis.

**INTD 4058. Hospice and Palliative Medicine Elective. 4 Credit Hours.**

This rotation offers clinical experience in Hospice and Palliative Medicine (HPM). Palliative care provides treatment for seriously ill hospitalized and ambulatory patients and focuses on symptom management, enhancement of function, physical comfort, quality of life, psychosocial support, and communication about the goals of medical care for the patients as well as their families.

**INTD 4103. Communication Skills. 0.5 Credit Hours.**

To introduce fourth year medical students to the principles of conducting public interviews, presentations and effectively disseminating information to the communities they will serve.

**INTD 4104. Improving Patient Outcomes. 0.5 Credit Hours.**

This course is designed to increase a student's knowledge of and skills in identifying systemic problems with health care delivery and patient safety, collecting and analyzing data, generating solutions, presenting results and evaluating peers. The course objectives include facilitating systems thinking, exposing students to the ACGME general competencies (with emphasis on practice-based learning and improvement and systems-based practice), increasing understanding of health care economics and working in teams.

**INTD 4105. Medical Jurisprudence. 0.5 Credit Hours.**

The course will center on the Texas Medical Practice Act and applicable federal laws.

**INTD 4106. Practical Ethics For Healers. 0.5 Credit Hours.**

The course is the capstone of the four-year longitudinal curriculum in humanities and ethics. The goals are to reflect upon 1) physician's values, attitudes, and their intersection with cultural values and attitudes; 2) the historical and moral traditions of medicine in the context of society, politics, spirituality, and the health care system; and 3) the personal identity of a doctor. Open for Cross Enrollment on Space Available Basis.

**INTD 4107. The Skin Around Us: A View of Skin Disease from a Humanities Perspective. 4 Credit Hours.**

This elective is for fourth year medical students with a special interest in learning about skin diseases through a humanities perspective. Throughout the four week course, students will attend daily clinics, create a project and write an essay on activities encountered during the elective. The students will also complete brief writing assignments each week after watching videos, movies, and/or reading books.

**INTD 4108. Bridging the Gap: Transition from UME to GME. 4 Credit Hours.**

Medical education is changing with the introduction of a United States Licensure Medical Examination (USMLE) Step 1 scored on a pass/fail basis, increasing focus on the Undergraduate Medical Education to Graduate Medical Education transition, and changes to the residency application process. No longer can medical students wait until their senior academic year to prepare for USMLE Step 2 and discern their chosen specialty. In this course, which is to be delivered during the spring immediately prior to their senior year, medical students will be given instruction on specialty discernment and trained in test preparation techniques. Specialty discernment requires various forms of advising and mentoring. In this course, students will receive general instruction on the process of specialty discernment and will use online resources to prepare for residency applications in the context of academic metrics, specific program requirements, and specialty-based resources. The transition from undergraduate to graduate medical education is one of intense focus. While the transition seems as if it has a marked delineation, it exists on a continuum. In order to support the active process of creating goals, students need to reflect on their experiences as a clerkship student and create expectations of themselves in the context of their chosen specialty and career. Goal orientation in the context of mastery orientation defines success in terms of how well the knowledge, skills, and abilities have been demonstrated. (Cutrer, et al.) This type of goal orientation requires reframing and additional advising depending on the phase of the learner. Test preparation does not have to be separate and dedicated from the medical curriculum. In fact, directing learners to recognize opportunities to use exam preparation to build and apply more clinically-minded strategies, even when the content of the exam may not focus on clinical reasoning or diagnosis, might better prepare them to learn from their patients and to apply similar strategies later on. (Swan Sein, et al., 2021). By creating learning structures that facilitate this environment, medical students can use test preparation and test taking skills beyond the testing center. Prerequisites: at least 1 clerkship.

**INTD 4109. Non-Fiction Writing for Advocacy: A workshop and practicum. 2 Credit Hours.**

The non-fiction writing practicum is a longitudinal writing workshop designed to equip motivated students with the basic skills necessary to serve as effective advocates-in-writing for patients, the profession of medicine, and population health. Open for Cross Enrollment on Space Available Basis.

**INTD 4110. Getting Ready to Teach During Your Residency Program. 0.5 Credit Hours.**

The goal of this 8-hour course is to help senior medical students, who will be residents in a few months, develop teaching skills that will enhance the quality of their interactions with students. The course will be conducted in an interactive workshop format to allow participants to practice important teaching skills for residents. These include 1) orienting and priming students to their responsibilities and roles and accepting the personal role of teacher and role model, 2) giving feedback to improve student performance, 3) helping students to improve their patient presentations-the use of questioning, and 4) coaching procedural and technical skills. The participants will practice these skills and receive feedback from their course peers and instructors based on the guidelines for clinical teachers in action with students and provide critiques. Large and small group discussions and role plays will be used to reinforce teaching principles.

**INTD 4111. Fast Healthcare Interoperability Resources (FHIR) for Medical Students. 4 Credit Hours.**

FHIR for Medical Students delves into Fast Healthcare Interoperability resources (FHIR). This course is tailored for medical student with experience in C#, Java, and/or JavaScript, this will also be a prerequisite for the course, and those aiming to develop their skills with SMART on FHIR and CDS Hooks. The curriculum is hands-on with exercises, enabling participants to learn by both developing and reviewing practical software applications. Prerequisites: Some fluency in Java, C# or JavaScript/Node.js.

**INTD 4205. Veritas Mentors in Medicine Longitudinal Elective. 2 Credit Hours.**

This is longitudinal elective and the course work requirements will be for 2 week credit and must be complete by March 1st. Evaluation of MiM performance will include feedback from faculty mentors and students.

**INTD 4210. School of Medicine Research Elective Level 1. 4 Credit Hours.**

Medical research is multidisciplinary and broad in scope. Students will participate in basic, clinical research, quality improvement, or patient safety research projects under the supervision of faculty in the Health Science Center. The goal of this elective is to immerse students in a rich scholarly environment and provide an opportunity to work with research/faculty mentors to fully engage in a scholarly research process from writing the proposal to collecting the data to disseminating results. This elective is open to students who already have an established working relationship with a faculty member and who wish time to continue their work, students who wish to establish a new project, and for students who are in the MD-MPH degree program and MD with Distinction in Research Program. Interested students must submit a research elective application which includes the faculty mentor the student will work, to the office of UME, no later than 12 weeks before the research elective is to begin. Applications will be reviewed and confirmed or declined no later than 8 weeks prior to the proposed start date of the elective. Students will be able to 1) Formulate a research question and identify a research methodology to answer that question; 2) understand research ethics and apply an ethical approach to research design, implementation, and dissemination 3) design a research study and gather quality data; 4) apply and interpret basic biostatistics relevant to the individual research project; 5) write scientific reports. The supervising faculty member will evaluate the performance of the student using a standard, research specific, medical student evaluation form. Students will receive a Pass or Fail summative grade at the conclusion of the 4 week elective. Faculty will be expected to give the student formative feedback after two weeks to assist the student in meeting all expectations to pass the elective.

**INTD 4211. School of Medicine Research Elective Level 2. 4 Credit Hours.**

Medical research is multidisciplinary and broad in scope. Students will participate in basic, clinical research, quality improvement, or patient safety research projects under the supervision of faculty in the Health Science Center. The goal of this elective is to immerse students in a rich scholarly environment and provide an opportunity to work with research/faculty mentors to fully engage in a scholarly research process from writing the proposal to collecting the data to disseminating results. This elective is open to students who already have an established working relationship with a faculty member and reflects their increasing experience with the research process. INTD 4210 Level 1 elective or evidence of past experience knowledge and/or skills is a prerequisite. The expectation is that enrolled students will continue with research experiences begun in INTD 4210 Level 1 including students pursuing the MD-MPH degree and MD with Distinction in Research. Interested students must submit a research elective application which includes the faculty mentor the student will work, to the office of UME, no later than 12 weeks before the research elective is to begin. Applications will be reviewed and confirmed or declined no later than 8 weeks prior to the proposed start date of the elective.

**INTD 4212. School of Medicine Research Elective Level 3. 4 Credit Hours.**

Medical research is multidisciplinary and broad in scope. Students will participate in basic, clinical research, quality improvement, or patient safety research projects under the supervision of faculty in the Health Science Center. The goal of this elective is to immerse students in a rich scholarly environment and provide an opportunity to work with research/faculty mentors to fully engage in a scholarly research process from writing the proposal to collecting the data to disseminating results. Students enrolled in this course will have prior experience with research and ongoing research activities. As such, this elective is open to students who already have an established working relationship with a faculty member and reflects their increasing experience with the research process. INTD 4211 Level 2 electives is a prerequisite. As with INTD 4211 Level 2, the expectation is that enrolled students will continue with research experiences begun in INTD 4210 Level 1 and INTD 4211 Level 2 including students pursuing the MD-MPH degree and MD with Distinction in Research or produce evidence of past experience knowledge and/or skills which are deemed equivalent to these prerequisites. Interested students must submit a research elective application which includes the faculty mentor the student will work, to the office of UME, no later than 12 weeks before the research elective is to begin. Applications will be reviewed and confirmed or declined no later than 8 weeks prior to the proposed start date of the elective. Students will be able to formulate a research question and identify a research methodology to answer that question; understand research ethics and apply an ethical approach to research design, implementation, and dissemination; design a research study and gather quality data; apply and interpret basic biostatistics relevant to the individual research project; write scientific reports. The supervising faculty member will evaluate the performance of the student using a standard, research specific, medical student evaluation form. Students will receive a Pass or Fail summative grade at the conclusion of the 4 week elective. Faculty will be expected to give the student formative feedback after two weeks to assist the student in meeting all expectations to pass the elective.

**INTD 4300. Advanced Generative AI. 4 Credit Hours.**

This 4-week elective provides a comprehensive introduction to Generative AI technologies with a specific focus on applications in medicine. Through structured morning lectures, interactive demonstrations, hands-on exercises, and assignments, students will explore fundamental concepts and practical applications of Large Language Models (LLMs). Topics include data structures, vectorization, tokens, encoding/decoding, sentence transformers, fine-tuning techniques (PEFT/LORA), retrieval augmented generation, multimodal applications (visual/audio), and critical considerations regarding bias and legal implications in medicine. This course is exclusively for MS in AI students in good standing who have completed Capstone I. Students will complete daily homework assignments and a final project. The course is pass/fail, with grading based on attendance, participation, assignment completion, and the final project. Must be a MD/MSAI dual degree student. Prerequisites: INTD 4011.

**INTD 5005. Core Course 1: Biochemistry. 2 Credit Hours.**

Topics to be covered include: protein structure; properties of enzymes; structure, biosynthesis, and function of lipids; pathways and regulation of carbohydrate metabolism and biosynthesis and regulation of amino acids, nucleotides, and related compounds. Prerequisites: consent of instructor.

**INTD 5007. Advanced Cellular And Molecular Biology. 4 Credit Hours.**

This course provides an in-depth learning experience that instructs students on the fundamentals of molecular biology and cell biology as well as prepares the student to evaluate and design new research in the cutting-edge areas of modern molecular biology and cell biology. The course combines a didactic program of lectures along with a small group discussion format in which students interact closely with a group of faculty who have active research programs. The course focuses on active areas of research in molecular biology: Chromatin structure, DNA Transcription, DNA Replication and Repair, Recombination, RNA processing and regulation, Protein processing, targeting and degradation and in cell biology: Cell Signaling and Communication, Cell Growth, and Cell Death. Each week, the faculty provide students with didactic lectures on a current research area. Students and faculty will then jointly discuss key publications that serve to bridge the gap between the fundamental underpinnings of the field and the state of the art in that area.

**INTD 5013. Perio/Pros/Endo/Orth Interdisciplinary Course 1. 1 Credit Hour.**

A seminar that brings together the residents and graduate staff from the periodontic, prosthodontic, endodontic and orthodontic postdoctoral programs to share clinically relevant multidisciplinary information. Patient diagnostic evaluations and treatment plans are evaluated in an interactive environment. Selected topics involving new advancements are presented and discussed.

**INTD 5021. Dental Biomed Core 2. 1 Credit Hour.**

This course is a continuation of MSDS 5020 Dental Biomedical Core Course 1.

**INTD 5023. Research Ethics. 1 Credit Hour.**

The goal of this course is to provide the Master's student an opportunity to gain the essential standards necessary for training and education approved by the National Institute of Health. This course links to the web-based NIH Clinical Research Training On-Line Course <http://www.cc.nih.gov/training/training/crt/infor.html> for Principal Investigators that is required for all individuals conducting research. This course is open to current Health Science Center students. Open for Cross Enrollment on Space Available Basis.

**INTD 5031. Common Interprofessional Education Experience - LINC. 0 Credit Hours.**

This course is intended to introduce students to IPE at UT Health San Antonio using the shared IPE framework as defined in the QEP, facilitate interprofessional socialization, and prepare students for IPE activities they will experience as part of program-specific IPE plans.

**INTD 5032. TeamSTEPPS - Interprofessional Education Course. 0 Credit Hours.**

TeamSTEPPS is an evidence-based set of teamwork tools, aimed at optimizing patient outcomes by improving communication and teamwork skills among health care professionals.

**INTD 5035. UTeach. 2 Credit Hours.**

The course is designed for post-doctoral fellows, senior graduate students, faculty members, research staff and residents who are interested in a career in teaching and desire to acquire knowledge about learning processes and to develop educational planning, teaching and assessment skills to enhance their "teaching toolkit." UTeach (formerly University Teaching Excellence Course; UTEC) participants practice key skills needed for success in college-level teaching, working individually and in teams to accomplish course objectives. Classes will be supplemented by readings, worksheets and self-assessment inventories. Although the course will provide instruction in contemporary pedagogic techniques, it primarily emphasizes teaching science courses for undergraduates on campuses at predominantly undergraduate institutions (PUIs), rather than teaching graduate students and medical / dental students at the health science center (HSC) or other academic HSCs. Course instructors include faculty from the Schools of Medicine, Dentistry and Nursing at UTHSCSA as well as visiting faculty from local PUIs, St. Mary's University and Our Lady of the Lake University. UTeach has been offered for three consecutive fall semesters now (2015, 2016, 2017). It is sponsored by the San Antonio Biomedical Education and Research (SABER) Program that is supported by an Institutional Research and Academic Career Development Award (IRACDA) from the National Institute of General Medical Sciences of the NIH (PHS grant, K12 GM11726).

**INTD 5036. Simulation Interprofessional Education Experience -- LINC. 0 Credit Hours.**

The LINC Simulation IPE Experience builds on the fall common IPE experience and occurs in the spring semester. Conceived and supported by the LINC Academic Affairs Council and housed within the LINC Faculty Councils Didactic IPE Initiative, the purpose of this university-wide IPE activity is threefold: (1) introduce students to simulation at UT Health San Antonio; (2) facilitate interprofessional socialization; and, (3) prepare students for IPE activities they will experience as part of program-specific IPE plans. Students complete the LINC Simulation IPE Experience in interprofessional groups of 3-4. Interactivity is emphasized as student groups work through 5 hours of instruction, including interprofessional socialization activities, mini-lectures, illustrated case studies, video case studies, and interprofessional discussions rooted in problem-based learning. Prerequisites: INTD 5031.

**INTD 5037. Clinical Interprofessional Education Experience -- LINC. 0 Credit Hours.**

The LINC Clinical IPE Experience builds on the fall and spring first year common IPE experience and occurs in the spring semester of the second/third year. Conceived and supported by the LINC Academic Affairs Council and housed within the LINC Faculty Councils Didactic IPE Initiative, the purpose of this university-wide IPE activity is threefold: (1) introduce students to simulation at UT Health San Antonio; (2) facilitate interprofessional socialization; and, (3) prepare students for IPE activities they will experience as part of program-specific IPE plans. Students complete the LINC Clinical IPE Experience in interprofessional groups of 3-4. Interactivity is emphasized as student groups work through 5 hours of instruction, including interprofessional socialization activities, mini-lectures, illustrated case studies, video case studies, and interprofessional discussions rooted in problem-based learning.

**INTD 5040. Fundamentals Of Neuroscience1: Molecular, Cellular, & Developmental Neuroscience. 2 Credit Hours.**

This course is intended to introduce students to a broad survey of the basics of molecular, cellular and developmental neuroscience. The course is organized into a series of three modules: biochemical and cellular properties of nervous system cells, development of neuronal systems, and neurotransmission and neuromodulation, which covers the fundamentals of these three areas. Current topics and concepts are discussed in discussion sessions that include student participation. Two components; Neuroscience students register for both PHYL 5041 and INTD 5040.

**INTD 5043. Fundamentals Of Neuroscience 2: Systems Neuroscience. 3 Credit Hours.**

This course, the second component of our broad survey of the basics of neuroscience, begins at the level of the neural circuit, and guides the students through an understanding of increasingly complex levels of organization and function in the brain. Topics include neurotransmitter systems, sensory and motor function, motivated behavior, regulation and integration of autonomic, behavioral, and emotional responses in the limbic system, higher order cognitive processes, and the neurobiological basis underlying some important psychiatric disorders and their treatment.

**INTD 5046. Metanalysis In Cognitive Neuroimaging. 2.5 Credit Hours.**

The objective of this course is to familiarize students with human functional brain imaging methods, experimental designs, statistical analyses, inferential strategies, and content. Students are guided through a literature-based research project that culminates in a quantitative metanalysis of a set of studies using similar tasks.

**INTD 5047. Neuroanatomy. 2 Credit Hours.**

The purpose of this course is to provide students with a practical working knowledge of the structure of both the peripheral and central nervous system. The emphasis will be on the organization of the human brain, although the brains of other species may also be included if appropriate for a specific brain region. The course will look at each of the individual components of the central nervous system in some depth but will also emphasize the complex integration of these various components into a functional brain. The topics covered in the course are specifically designed to mesh in time with those covered in Fundamentals of Neuroscience 2 describing the function of these areas. For this reason, it would be best if these two courses were taken concomitantly. The course will be didactic with digital images, models, and wet specimens included in the course.



**INTD 5051. Research Methodology and Evidence-Based Practice. 2 Credit Hours.**

This course is designed to introduce dental residents and faculty to critical thinking, research methodology, and evidence-based practice skills.

**INTD 5064. Applied Statistics for Health Care Practitioners. 3 Credit Hours.**

This online course focuses on the application of descriptive and inferential statistics in research studies. Students are expected to gain knowledge and skills that will enable them to understand, interpret, and evaluate statistical results; work with a consultant statistician; and use software to enter, analyze, and summarize data. Course requirements include homework assignments, online discussions and/or chats, and periodic projects.

**INTD 5066. Laughter is the Best Medicine: An Interdisciplinary Elective about Humor, Healing, and Healthcare. 1 Credit Hour.**

This class is a serious look at humor! The physiological and psychological benefits of humor, as well as its therapeutic use with patient interactions, will be explored. Students will learn how to develop and improve their personal use of humor to combat burn out, through techniques to enhance coping skills and stress reduction. Student participation and interaction is integral to the content delivery.

**INTD 5067. Introduction to Programming for Biologists. 3 Credit Hours.**

This course covers fundamentals of computer programming. It is designed and tailored for biologists in three ways: 1) students can pass it with minimal mathematical background, 2) when possible, examples and exercises are based on biological data analyses, and 3) it prepares students for other courses that are focused on bioinformatics techniques and tools. The topics are similar to the first introductory course that a student would take in a computer science program including: An introduction to Unix operating systems (i.e., Linux and macOS), basic command line and terminal usage; The Emacs text editor; Using simple data structures including vectors, matrices, lists, and classes; Conditional statements; Loops; Functions; Debugging; Organizing computational biology experiments and Code repositories and version control systems including Git. While this course is based on R, students are expected to be able to self-teach other high-level programming languages including Python, Matlab, etc. after learning fundamentals of programming in this course. Students will learn skills that are essential for visualization, statistical analysis, machine learning, analyzing next generation sequencing data, and other bioinformatics analyses. Open for Cross Enrollment on Space Available Basis.

**INTD 5074. Topics In Translational Medical Product Development. 1 Credit Hour.**

It is crucial to understand the intricate process of translating basic research into market driven products, navigate the complex pathways of intellectual property management and the regulatory affairs of agencies such as the FDA. This course will offer students in biomedical sciences the opportunity to integrate industry-relevant training and experience with their basic science education. The course will explore the marketing and regulatory process by which a biomedical product is developed and brought to commercialization.

**INTD 5075. Complementary Healthcare for the Clinician. 0 Credit Hours.**

The goal of this elective is to introduce future doctors to practices outside of the classical medical school curriculum that promote an evidence-based approach to wellness. This is so that the medical students of the UTHSC School of Medicine are informed about the reality, evidence and rumor surrounding a variety of commonly used alternative and supplementary healthcare practices. The of this class is not to make the student an expert in areas such as acupuncture or yoga, but to be well informed of the role of such practices as it relates to patient treatment and wellness. To this end, all the classes will have a practical component which will allow the students to experience the alternative modalities in a structured setting.

**INTD 5081. Topics In Cardiovascular Research. 1 Credit Hour.**

This course is designed to familiarize students with the current literature related to cardiovascular disease. Each week a different research topic selected from the recent literature is presented and discussed. Students are expected to attend and participate in the discussions. In addition, students are required to prepare and present once during the semester. A list of previous and current course presentations will be available online.

**INTD 5082. Responsible Conduct of Research. 1.5 Credit Hour.**

This foundational course introduces students to core ethical content necessary for responsible research conduct. Through interactive seminars, students will learn about (1) scientists as responsible members of society (contemporary ethical issues in biomedical research and environmental/social impacts of research), (2) policies for research with human subjects and vertebrate animals, (3) collaborative research, (4) conflicts of interest (personal, professional, financial), (5) data acquisition and laboratory tools (management, sharing, ownership), (6) responsible authorship and publication, (7) mentor/trainee responsibilities and relationships, (8) peer review, and (9) research misconduct (forms of misconduct and management policies).

**INTD 5091. Special Topics. 1-4 Credit Hours.**

This is a placeholder course, for which graduate students may register, if they are unable to select a specific track core course at the time of registration. Tracks are: Biology of Aging, Cancer Biology; Cell and Molecular Biology; Genetics, Genomics, & Development; Membrane Biology & Cell Signaling; Metabolism & Metabolic Disorders; Microbiology & Immunology; Molecular Biophysics & Biochemistry; Molecular, Cellular, & Integrative Physiology; Neuroscience; and Pharmacology. The course may be repeated for credit.

**INTD 5094. Independent Study. 1-4 Credit Hours.**

This elective allows for detailed in-depth study in a specific area of study. The area and mode of study are to be agreed upon by the student and instructor. The course may be repeated for credit when the area of study varies. Clock hours are to be arranged. Prerequisites: Graduate standing and consent of instructor.

**INTD 5101. Health, Equity and the Environment. 1 Credit Hour.**

This course will introduce IPE to UT Health San Antonio (UTHSA) students through an elective course called, Health, Equity and the Environment that will focus on knowledge of environmental health disparities and skills that empower students to actively work to reduce disparities and promote wellbeing in their patients and communities. The purpose of this course is to determine the impact of the IPE course on developing IPE teams/teamwork and communication competencies relative to environmental health knowledge and its intersection with health equity. UTHSA students will complete IPE competencies pre-post surveys, a course evaluation and conduct a community service learning (CSL) activity to evaluate their understanding of IPE and environmental health and inequities. Open for Cross Enrollment on Space Available Basis.



**INTD 6002. Ethics In Research. 0.5 Credit Hours.**

This course covers topics relevant to ethics in scientific research. The course is taught on a case-study basis, dealing with real and hypothetical situations relevant to the conduct of scientific research. Topics discussed will include, but will not be limited to: data management, peer review, recognizing scientific misconduct, authorship, and The University of Texas regulations relevant to human and animal research. This course is required of all doctoral graduate students.

**INTD 6007. Advanced Cell Biology. 2 Credit Hours.**

This course provides an in-depth learning experience that instructs students on the fundamentals of cell biology as well as prepares the student to evaluate and design new research in the cutting-edge areas of modern cell biology. The course combines a didactic program of lectures along with a small-group discussion format in which students interact closely with a group of faculty who have active research programs. The course focuses on active areas of research in cell biology: Cell Signaling and Communication, Cell Growth, and Cell Death. Each week, the faculty jointly discuss key publications that serve to bridge the gap between the fundamental underpinnings of the field and the state of the art in that area. Students and faculty will then jointly discuss key publications that serve to bridge the gap between the fundamental underpinnings of the field and the state of the art in that area.

**INTD 6008. Mitochondria & Apoptosis. 1 Credit Hour.**

This course will focus in depth on Mitochondria and Apoptosis. Topics will include: Mitochondria and Respiration; Mitochondria and Reactive Oxygen Species; Mitochondria and Apoptosis. It will provide an opportunity for a unique learning experience where the student can prepare to evaluate and design new research in the cutting-edge areas of modern cell biology and molecular biology. Instead of a didactic program of lectures, the entire course comprises a small-group format in which students interact closely with a group of faculty who have active research programs. Each week, faculty will provide students with a brief overview of the research area. Students and faculty will then jointly discuss key publications that serve to bridge the gap between the student's prior understanding of the field and the state of the art in that area.

**INTD 6009. Advanced Molecular Biology. 2 Credit Hours.**

This course will provide an in-depth learning experience on the fundamentals of molecular biology as well as prepare the student to evaluate and design new research in the cutting-edge areas of modern molecular biology. The course combines a didactic program of lectures along with a small-group discussion format in which students interact closely with a group of faculty who have active research programs. The course focuses on active areas of research in molecular biology: Chromatin structure, Transcription, DNA Replication and Repair, Recombination, RNA processing and regulation, Protein processing, targeting and degradation. Each week, the faculty provide students with didactic lectures on a current research area. Students and faculty then jointly discuss Key publications that serve to bridge the gap between the fundamental underpinnings of the field and the state of the art in that area.

**INTD 6011. Introduction To Science Of Teaching. 1 Credit Hour.**

This course will provide insight into the basic skills of learning and teaching. Faculty from the Academic Center for Excellence in Teaching and the Graduate School will provide the opportunity to learn the skills, strategies, and experiences for a future in academia and teaching. Topics include lecture presentations on why scientists choose to teach, planning a student learning experience in addition to developing a lecture syllabus, curriculum and teaching portfolio and philosophy. The course is recommended for Supervised Teaching Course INTD 6071.

**INTD 6014. Perio/Pros/Endo/Orth Interdisciplinary Course 2. 1 Credit Hour.**

This seminar brings together the residents and graduate staff from the periodontic, prosthodontic, endodontic and orthodontic postdoctoral programs to share clinically relevant multidisciplinary information. Patient diagnostic evaluations and treatment plans are evaluated in an interactive environment. Selected topics involving new advancements are presented and discussed.

**INTD 6019. Pharmacotherapeutics. 1 Credit Hour.**

This course is designed to review general principles of pharmacology; current and accepted pharmacotherapy for the medical management of pain, infection, and selected systemic diseases; and associated adverse drug events. It is based on the top 200 drugs dispensed by U.S. community pharmacies for the prevention, diagnosis, and/or treatment of disease with special reference to dentistry.

**INTD 6035. Introduction to R and Unix/Linux. 0.5 Credit Hours.**

Computational biology is a rapidly emerging subfield of biomedical science. Acquiring basic computational skills will enable biologists to better understand and analyze "big data" and use novel approaches to answer biological questions. In addition, it will improve communication with computational scientists and bioinformaticians, thereby enhancing collaborations. The course consists of two modules. The first 5-week module is designed to gain familiarity with R coding. The second 3-week module covers working in the Unix/Linux environment and the use of shell scripts. This course will be taught in the form of interactive hands-on computer classes in combination with homework assignments. No prior knowledge of programming or coding is required. This course is designed to prepare students for more advanced computational biology course work, such as INTD 6062 and CSAT 6095. Open for Cross Enrollment on Space Available Basis.

**INTD 6037. Analytical Methods in Biomedical Research. 1 Credit Hour.**

This three-week interactive course introduces students to fundamental methodologies used to analyze cells and biomolecules including nucleic acids and proteins. Principles, procedures, advantages and limitations of routinely used methods will be discussed. By the end of this course, the student should be able to: Define the principles and procedures underlying cell culture, isolation of cell organelles, cell proliferation, tissue embedding, sectioning and staining, define the principles and procedures underlying methods to quantify and manipulate nucleic acids, define the principles and procedures underlying methods to quantify proteins and determine protein-protein interactions, list the common methodologies used to generate mouse models for biomedical research.

**INTD 6038. Biomedical Fundamentals. 3 Credit Hours.**

This course will cover diverse topics in molecular and cell biology, physiology, immunology and neuroscience including innate and adaptive immunity, cell signaling, protein trafficking, cell adaptation and cell death, stem cells, and membrane physiology. Interactive lectures based on a flipped classroom approach will be followed by small group presentations and discussions focusing on critically evaluating scientific publications relevant to the lecture. The course will also include student presentations of their ongoing research. By the end of this course, a student should be able to: explain in-depth the topics covered during the course, describe and discuss research publications in a wide variety of disciplines within the life sciences, critically analyze, interpret and evaluate scientific publications or presented research updates, identify and present emerging topics in their field of interest (as defined by the research of their mentor). The course is for PREP-UT Health Link students.

**INTD 6040. Resident Lecture Series in Psychiatric Disorders and Psychopharmacology. 1 Credit Hour.**

This is an interdisciplinary advanced elective in which students attend 17 lectures from the Psychiatry Year One Residents' lecture series. These lectures focus on the psychopathology, epidemiology, and pharmacological treatments for illnesses such as schizophrenia, anxiety disorders, trauma related disorders, eating disorders, and sleep disorders.

**INTD 6041. Basic Science Resident Lecture Series In Neurology. 1.5 Credit Hour.**

This is an interdisciplinary advanced elective in which students attend 20 lectures, selected from the full offering of daily one-hour lectures comprising the Neurology Residents' Basic Sciences lecture series. These lectures cover a range of topics, such as Epilepsy, Movement Disorders, the Thalamus, Parkinson's Disease, Alzheimer's Disease, Stroke, Sleep, etc., all given from a clinical perspective. In addition, graduate students will have the opportunity to observe or participate in at least two enrichment activities related topically to the lectures they attend, which may include such settings as case presentations, diagnostic training sessions, or clinical observations, again selected from the list of offerings included in the "Neurology Residents" series.

**INTD 6045. Clinical Practicum In Neuroscience. 1 Credit Hour.**

This course will provide students with a brief, but intense and very focused exposure to clinical practice in a relevant area of their choosing, designed and coordinated to best match their interests in close individual collaboration with a clinical mentor in one of the participating components: Neurosurgery, Neurology, Psychiatry, or Endodontics. Representative activities could include participation in case presentation and treatment planning, attending rounds with physicians and residents, direct observation of clinical procedures, patient interviews, follow-up care and outcome review. Potential venues may include inpatient psychiatric ward, sleep clinic, epilepsy clinic, stroke clinic, neurosurgical theater and surgical ICU. In consultation with the course director, students will first select one of the following sub-sections, then design their individually tailored clinical practicum experience with the coordinator for that section.

**INTD 6046. Resident Lecture Series in Psychiatric Disorders and Psychopharmacology II. 1 Credit Hour.**

This is an interdisciplinary advanced elective in which students attend lectures, selected from the full offering of weekly two-hour lectures comprising the Psychiatry Year One Residents' lecture series. These lectures cover a range of topics, such as Substance Abuse, Depression, Bipolar Disorder, etc., all given from a clinical perspective.

**INTD 6062. Next-Generation Sequencing Data Analysis. 2 Credit Hours.**

Next-generation sequencing (NGS) is becoming increasingly commonplace in biomedical research. For many labs, the main bottleneck to implementing NGS applications is data analysis. This course is designed to introduce students to bioinformatics analysis of NGS data. The course consists of two modules: the first module covers working in the Unix/Linux environment, mapping NGS data to a genome of interest, and performing downstream analysis of RNA-seq, ChIP-seq, and ATAC-seq data. The second module will be an introduction to the programming language Perl, which will enable students to perform custom bioinformatics analysis. This course will be taught in the form of interactive hands-on computer classes. No prior knowledge of programming or coding is required.

**INTD 6070. Teaching Excellence And Academic Skills (Texas). 1 Credit Hour.**

This course, designed to assist graduate students and faculty in acquiring teaching skills, is composed of four modules, each covering a range of topics from lecture and clinical teaching to instructional development to assessing student achievement.

**INTD 6075. Practical Machine Learning. 2 Credit Hours.**

This practical approach to machine learning in the biomedical sciences will be mostly problem set- and discussion-based. Background information will be delivered in short lectures on datasets and machine learning concepts. Our plan is to discuss encoding data, training models, and evaluating model performance, including dimensionality reduction, regularization to reduce overfitting, and optimization of method hyperparameters through grid and random searches, with models drawn from linear and logistic regression, random forest classifiers, multi-layer perceptrons, neural networks (feed-forward, recurrent, graph, convolutional, and adversarial), and variational auto-encoders. Each problem set will cover a different area, including chemical structures and properties, metabolite profiles and cancer diagnosis, DNA sequence and transcription factor binding sites, and intratumoral gene expression and patient survival. One problem set and one 2-hour discussion (30 minutes lecture, 30 minutes concept discussion, 1hr problem set progress discussion) every week. The final problem set will be a capstone project where the students implement methods of their own choosing and compete to achieve the best model performance. Open for Cross Enrollment on Space Available Basis.

**INTD 6076. Translational Biomedical Product Development. 1 Credit Hour.**

Translational Biomedical Product Development is a course that will provide students with an understanding of the overall process of translating basic research into innovative, market-driven biomedical products (therapeutics, biologics, diagnostics, and devices). It covers the complex pathways of intellectual property management and the regulatory processes by which a bioscience product is developed and brought to commercialization. Focused lectures will include pre-clinical development, patenting, FDA and regulatory requirements, clinical trials, marketing, funding, licensing, and commercialization strategies. Case studies of both successful and unsuccessful biomedical products will be presented to explore various business development opportunities. Upon successful completion of this course, students will have a comprehensive knowledge of the complex regulatory ecosystem of biomedical product development and management. Prerequisites include appropriate undergraduate courses in Biochemistry, Molecular Biology or Pharmacology, as assessed by the course director. Prerequisites: BIOC 6035 Open for Cross Enrollment on Space Available Basis.

**INTD 6085. Advanced Machine Learning. 2 Credit Hours.**

This advanced approach to machine learning in the biomedical sciences will be mostly problem set- and discussion-based. Background information will be delivered in short lectures on datasets and machine learning concepts. Our plan is to discuss advanced regularization techniques, convolutional and recurrent neural networks, generative adversarial networks, reinforcement learning and attention, transformer and NLP models, explainable AI, and ethical considerations. Each problem set will cover a different area of biomedical research. One problem set and one 2-hour discussion (30 minutes lecture, 30 minutes concept discussion, 1hr problem set progress discussion) every week. The final problem set will be a kaggle competition where the students implement methods of their own choosing and compete to achieve the best model performance. Prerequisites: INTD 6075 Open for Cross Enrollment on Space Available Basis.

**INTD 6097. Research. 0.5-12 Credit Hours.**

This course is intended for first-year IMGP students only. Students will be required to attend a minimum of 10 departmental (any) seminars during the semester and submit a 100-150 word synopsis of each seminar within two weeks of the seminar.

**INTD 6115. Perio/Pros/Endo/Ortho Interdisciplinary Course 3. 1 Credit Hour.**

This is a seminar that brings together the residents and graduate staff from the periodontic, prosthodontic, endodontic and orthodontics postdoctoral programs to share clinically relevant multidisciplinary information. Patient diagnostic evaluations and treatment plans are evaluated in an interactive environment. Selected topics involving new advancements are presented and discussed.

**INTD 7001. Flow Cytometry: Principles and Applications. 2 Credit Hours.**

This course will cover the principles of flow cytometry, the components of cell analyzers and cell sorters, the applications of different assays in flow cytometry and the interpretation of flow cytometry data. Flow cytometry plays an essential role in helping to elucidate cell phenotype characterization and function in both clinical and research settings. The purpose of this course is to bring students up-to-date on the technology of flow cytometry and to help them gain knowledge in how to apply this tool for patient diagnosis as well as basic and translational research.

**INTD 7002. Neurobiology Of Learning And Memory. 1 Credit Hour.**

This course will focus on recent findings and topics related to the underlying aspects of the neural basis of learning and memory. Students will have the opportunity to learn about: molecular basis of memory formation, consolidation and retrieval, memory and emotion, associative learning, memory and amnesia, and recognition memory and the medial temporal lobe. The lectures will be interactive and driven by discussions of key journal articles. Each week the first hour will be reserved for lecturing and the second hour will be reserved for a discussion of a journal article.

**INTD 7003. Elective in International Medicine. 4 Credit Hours.**

This elective serves as a vehicle for students to participate in international medicine rotations. Students will work with a faculty sponsor to identify a program, either a pre-established site or a site discovered by the student which requires faculty approval. This elective includes: 1) The Center for Medical Humanities and Ethics International Scholars Program in India, a competitive program requiring a separate application through the department of Medicine, 2) Shoulder to Shoulder program in Latin America, which requires a separate application process and some cost (airfare and small project fee), and is available October, January, and April, 3) Programs in Nicaragua, Mexico, Panama, and Guatemala, and 4) Other sites available through online directory: <http://www.globalhealth-cc.org/GHEC/Resources/GHonline.htm>. All rotations share a commitment to service learning - medical education and self-reflection that arises out of service to needy populations. Students spend up to 4 weeks (or possibly longer) living in an international site and participating in the care of patients, under the supervision of local and visiting health care providers. The clinical settings and caseload will vary based on the location. There may be opportunities for patient education and emphasis on efforts of local empowerment, aiming to build up the communities in a sustainable way. Students will be expected to integrate themselves into the health care delivery system, and when possible, to strive to make an impact through community education and home visits. For certain Latin American sites, fluency in Spanish is a prerequisite. Students are encouraged to seek similar service learning experiences with underprivileged populations in San Antonio and Border communities prior to or after the rotation. End of rotation "reflection essays" are required and will serve to process student experiences.

**INTD 7005. Indian Health Care Preceptorship. 4 Credit Hours.**

This elective offers the opportunity for an experience in the health care of Native Americans, coordinated through the Indian Health Service. Most experiences involve both inpatient and outpatient care under direct supervision of board certified family physicians or internists. Educational activities such as conferences, teaching rounds, etc., may vary from site to site. All clinical sites are located outside the state of Texas, including sites in New Mexico, Arizona and Alaska. Early application is recommended. Students completing appropriate application forms may be reimbursed for transportation costs and provided room and board by the Indian Health Service.

**INTD 7006. Biomarkers in Health Care Research and Delivery. 1 Credit Hour.**

This course provides a broad overview of the rapidly evolving use of biomarkers in health care research and health care delivery. Biomarkers are non-subjective (i.e., not symptom scores, disability scales, or diagnoses) physical or functional measurements that serve as quantitative indices of physiological processes, pathological processes, and responses to exposures or interventions (including therapeutic interventions) that are intended to enhance the rigor and reproducibility of health care research and care delivery. Federal agencies, including the Food and Drug Administration (FDA), the National Institutes of Health (NIH) and the Institute of Medicine (IOM) are deeply engaged in promoting the use of biomarkers, introducing multiple funding opportunities for biomarker development toward FDA qualification and/or regulatory approval for clinical use. Additionally, opportunities for commercial partnership during biomarker development will be discussed. Examples will be provided of fluid (serum, CSF, urine, etc.), tissue, imaging, and biometric biomarkers (including wearable devices). Course format will emphasize assigned readings/viewings from various sources (IOM white papers, FDA & NIH video and powerpoint presentations, recent biomarker validation publications, current biomarker qualification submissions, relevant regulatory guidance, funded-grant synopses, et cetera) followed by in-class review and discussion. Special topic lectures will be delivered by invited speakers ranging from established biomarker researchers to regulatory experts. Open for Cross Enrollment on Space Available Basis.

**INTD 7007. Medicine through Literature. 2 Credit Hours.**

In this course you are required to read short stories, poems, and a book of nonfiction. While many of the stories or poems directly address medical or ethical issues, the primary purpose is not to enhance your store of knowledge in these areas, but to promote your appreciation of these works through discussions with other students (online via Canvas discussions and in class) and with authors and lecturers. Your own contributions to the course - not just the insights you've gained as medical students but the wisdom you bring to the class as human beings - will be critical to its success. We hope that the readings will help you prepare for and process your clinical experiences, furthering your development as a person as well as physician. There will be no "right" or "wrong" answers in this course; rather, our goal is to encourage thoughtful and serious responses to the readings and a lively and fulfilling conversation about them and the issues they raise. MSIV students will receive two credits for completion of this longitudinal elective. All students are expected to participate in class discussions. Grades are earned by reading assignments, attendance at class meetings, and posting primary and secondary responses to posted discussion questions. Open for Cross Enrollment on Space Available Basis.

**INTD 7009. HIV Out Loud: Building the History of an Epidemic. 2 Credit Hours.**

This course acquaints students with oral history methods and specifically with the history and lived experience of HIV. Students will learn how to record oral history and will work closely with people living with HIV, advocates and family members to record a life history for the permanent "HIV Out Loud" archive in the Briscoe Library. Students will participate in 1 in-person orientation meeting and 3 required in-person sessions in which students will receive training on best practices and learn to record oral history. Subsequently, to receive credit for the course students will be required to attend 2 community events (such as tabling at World AIDS Day, attending HIV advocacy day, presenting on the project, etc), attend 3 virtual listening sessions, and either record an oral history for the archive or produce a paper or educational/analytical tool that uses the materials already archived. This course is a great fit for trainees interested in history, in HIV itself, and in advocacy.

**INTD 7020. Clinical Patient Management. 4 Credit Hours.**

This course is designed to help students develop skills in clinical behavioral dentistry through small group discussions, lectures, and routine patient treatment by application of the principles of coordinating patient care; communicating effectively with colleagues, staff, and faculty; and managing time, records, and environment. The students are required to manage their comprehensive care patients in the Junior Clinic following the principles presented in this course.

**INTD 7030. Tumor Immunology Working Group and Journal Club. 1 Credit Hour.**

The Tumor Immunology Working Group and Journal Club is an advanced, interactive course designed for graduate students, postdoctoral fellows, and faculty with a keen interest in the field of tumor immunology. This course aims to foster a deep understanding of the intricate interactions between the immune system and cancer, exploring both the fundamental concepts and the latest advancements in cancer immunotherapy through research updates and cancer immunology-related papers. Additionally, it seeks to promote collaboration among participants and establish a student peer group with research interests in tumor immunology.

**INTD 7040. Advancing Social Communication and Play. 1 Credit Hour.**

Advancing Social-Communication and Play (ASAP) is a classroom-based intervention program designed to help teachers, therapists and paraprofessionals foster the development of important communication and play skills in children with autism spectrum disorders (ASD). This course equips the Project ASPIRE Scholars with essential knowledge and skills necessary for effectively applying the ASAP intervention approach within a classroom environment. Prerequisites: OCCT 7029 and OCCT 7115.

**INTD 7050. Gross Anatomy. 6 Credit Hours.**

This course provides a complete and detailed study of the structure and function of the human body including the study of human cadavers through guided dissections and dissection. The course is designed for the Doctor of Occupational Therapy (DOT) and Doctorate of Physical Therapy (DPT) programs and will focus on material most pertinent to the practice of OT and PT. Students will apply their theoretical understanding of clinically relevant structures and common disorders to their therapeutic practice. Course fees: \$831.

**INTD 7074. Topics In Translational Medical Product Development. 1 Credit Hour.**

It is crucial to understand the intricate process of translating basic research into market driven products, navigate the complex pathways of intellectual property management and the regulatory affairs of agencies such as the FDA. This course will offer students in biomedical sciences the opportunity to integrate industry-relevant training and experience with their basic science education. The course will explore the marketing and regulatory process by which a biomedical product is developed and brought to commercialization.

**INTD 7091. Independent Studies. 1-9 Credit Hours.**

Students will have the opportunity to use this course to study for the National Board, Part II examination, according to their own need. This course also will serve as a framework for a student returning from a leave of absence or from other protracted time away from classes or clinic. At the conclusion of the course, the enrolled student must demonstrate knowledge and/or skills and/or values consistent with the expectations for entering the level of course study from which the student left. An individualized course of study will be developed once the student is enrolled.

**Courses****MEDI 3105. Medicine Clerkship. 8 Credit Hours.**

The objectives of this clinical experience are to provide opportunities for students to develop patient evaluation skills, productive self-learning techniques, a sound pathophysiological approach to medical disease, a concern and awareness for the patient's needs, and personal professional behavior. The student spends eight weeks, divided into two 4-week blocks, assigned to the inpatient General Medicine Service. An additional four weeks are spent in outpatient services. Bedside clinical teaching is emphasized by asking the student to perform patient evaluations, to contribute to the care of selected patients, and to participate in the clinical rounds of the services. During this clerkship the student receives intensive instruction from the Internal Medicine house staff and faculty. In addition, the student is expected to undertake independent patient-oriented reading and to systematically review pertinent information introduced during the preclinical years. Finally, students attend a series of clinical conferences including medical grand rounds, morbidity and mortality conferences, clinical subspecialty conferences, and organized courses in electrocardiography and nutrition. Successful completion of all required preclinical courses is prerequisite to enrollment in any of the clinical clerkships. The student spends eight weeks, divided into two 4-week blocks, assigned to the inpatient General Medicine Service. An additional four weeks are spent in outpatient services. Bedside clinical teaching is emphasized by asking the student to perform patient evaluations, to contribute to the care of selected patients, and to participate in the clinical rounds of the services. During this clerkship the student receives intensive instruction from the Internal Medicine house staff and faculty. In addition, the student is expected to undertake independent patient-oriented reading and to systematically review pertinent information introduced during the preclinical years. Finally, students attend a series of clinical conferences including medical grand rounds, morbidity and mortality conferences, clinical subspecialty conferences, and organized courses in electrocardiography and nutrition.

**MEDI 4000. Special Topic. 4 Credit Hours.**

This is a self-designed course created by both the student and the department to cover a specific topic. A Course Approval Form must be completed along with documentation of the designed course description.



**MEDI 4002. Clinical Cardiology. 4 Credit Hours.**

Students are required to participate in inpatient consultations and outpatient clinics evaluating patients with cardiovascular disease. Students are required to perform inpatient consultations at University Hospital and Audie L. Murphy V. A. Hospital. Students are required to perform appropriately focused history and physical exam, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plan on each assigned patient. Students are required to also have learning opportunities in ECG interpretation, the cardiac catheterization laboratory, and non-invasive test interpretation such as exercise treadmill testing and echocardiograms. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4006. Coronary Care Unit - Subinternship - VA. 4 Credit Hours.**

This subinternship is designed to prepare students for the intense and responsible role of the intern. The subintern is an integral member of the team and is required to participate in all team activities and participate in all medical care for his/her patients, under the supervision of the Internal Medicine resident, Cardiology fellow, and Cardiology attending. Students are required to care for patients in the CCU and Telemetry ward. The student will be involved in the inpatient care of patients with cardiac disease, including critically ill patients needing hemodynamic and respiratory monitoring and ventilation support. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4007. Cardiology Care Unit Sub-Internship-SAMMC. 4 Credit Hours.**

This subinternship is designed to prepare students for the intense and responsible role of the intern. The subintern is an integral member of the team and is required to participate in all team activities and participate in all medical care for his/her patients, under the supervision of the Internal Medicine resident, Cardiology fellow, and Cardiology attending. Students are required to care for patients in the CCU and Telemetry ward. The student's clinical performance will be evaluated by the supervising attending. Students are required to participate in the care of patients with a wide spectrum of acute and chronic cardiovascular problems. Emphasis is placed on mastering basic physical assessment through history and detailed cardiovascular physical examination and the interpretation of non-invasive and invasive cardiac testing. Students will have exposure to the catheterization laboratory, M-mode, 2-D, and Doppler echocardiography, color flow imaging, exercise testing, and 24-hour dynamic ECG rhythm monitoring and analysis. No late drops will be accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4008. Clinical Endocrinology. 4 Credit Hours.**

Students are required to participate in inpatient consultations and outpatient clinics evaluating patients with pituitary and hypothalamic disease, adrenal disease, diabetes mellitus, thyroid disorders, and lipid disorders. Students are required to perform inpatient consultations at Audie Murphy VA Hospital and University Hospital. Outpatients will be evaluated in weekly endocrine clinics at the VA Hospital and Texas Diabetes Institute. Students will be responsible for the initial evaluation of assigned patients, presentation of findings from the history and physical exam, interpretation of endocrine testing, and formation of differential diagnosis. If rotation is done as the Ambulatory selective, the student is required to prepare a written essay based upon specific course objectives concerning systems of care. Essays must be submitted on the last day of the rotation and are required to receive a passing grade in the course. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4010. Clinical Dermatology. 4 Credit Hours.**

This elective is recommended for students with a serious interest in Dermatology, and for those intent upon further training in Internal Medicine, Family Medicine, and Pediatrics. It offers considerable clinical experience in both outpatient clinics and supervised inpatient consultations. Students rotating at UTHSCSA are required to attend teaching conferences every Wednesday (all day) and Friday afternoons. This didactic time for students and residents includes lectures, journal reviews, text reviews, and clinical Kodachrome sessions. Didactic sessions will be held separately at WHMC and BAMC. Each student is required to do a 10-minute PowerPoint presentation on a topic of choice that is both dermatology related and fits in with choice of residency. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4012. Clinical Endocrinology - WHMC. 4 Credit Hours.**

Students will have exposure to a very active clinical endocrinology consultation service, outpatient endocrine clinic, and the performance and interpretation of diagnostic procedures in endocrinology. Students must perform appropriately focused history and physical exams, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plan on all assigned patients. Clinical performance will be evaluated by supervising attending. No late drops will be accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4015. Clinical Gastroenterology. 4 Credit Hours.**

Students are required to participate in inpatient consultations at Audie L. Murphy V. A. Hospital (ALMVAH) and University Hospital, outpatient clinics at ALMVAH and University Health System, and special gastrointestinal diagnostic testing under the supervision of Internal Medicine residents, GI fellows, and GI Faculty. Students are required to participate in the independent evaluation of patients with disorders of the gastrointestinal tract, pancreas, and liver. Students are required to become familiar with the application, indications, contraindications, and complications of gastroenterological procedures, as well as the proper preparation of the patient for the procedure. Students are required to perform appropriately focused history and physical exams, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plans on all assigned patients. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.



**MEDI 4017. Gastroenterology - SAMMC. 4 Credit Hours.**

Students will be exposed to clinical gastroenterology with didactic instruction, and will work in conjunction with house staff as part of the primary care team. Students are required to perform appropriately focused history and physical exams, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plan on all assigned patients. Students will have exposure to the full range of special diagnostic procedures including observation of upper endoscopy, endoscopic ultrasound, colonoscopy, flexible sigmoidoscopy, endoscopic retrograde cholangiopancreatography (ERCP), percutaneous liver biopsy, laparoscopy, and related techniques. No late drops will be accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4018. Clinical Hematology. 4 Credit Hours.**

The consultation service includes clinical exposure to inpatient consultations, conferences, and outpatient clinics. There is opportunity for training in blood and marrow morphology, observation, and performance of special clinical and laboratory procedures. Students are responsible for the following on all assigned patients: history and physical examination, admission/progress notes, doctor's orders, interpretation of laboratory data, formation of differential diagnosis, assessment, and management plan. Students on both services are required to attend conferences including Hematology Clinical Conference, Hematology/Pathology Conference, Bone Marrow Transplant Conference, and Coagulation Conference. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4023. Clinical Infectious Disease. 4 Credit Hours.**

Infectious diseases cross all subspecialty lines, especially because antibiotics and antifungal and antiviral agents are employed widely throughout medical practice. This elective will provide practical experience in the diagnosis and management of patients with infectious diseases. There will be particular emphasis upon the pharmacology and pharmacodynamics of antimicrobial agents, selection of appropriate diagnostic tests and therapeutic agents, and the appropriate orientation of the clinician to hospital microbiology laboratories. Students are required to participate in outpatient clinics and inpatient consultations at University Hospital and Audie L. Murphy V. A. Hospital and the associated clinics. Students will be responsible for the following in all assigned patients: history and physical examination, written and verbal patient presentations, interpretation of laboratory testing, participation in applicable procedures, development of differential diagnosis, assessment, and management plans. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4024. Infectious Disease - SAMMC. 4 Credit Hours.**

The course will provide students the opportunity to obtain a broad experience in the management of infectious diseases. The spectrum of illness ranges from HIV infection to chronic osteomyelitis. Students are required to care for patients with primary infectious disease problems, or patients with major illnesses in whom an infectious complication has arisen, under the direction of the consultation resident, with supervision from the fellow and staff on the Infectious Disease Service. Students are required to perform appropriately focused history and physical exams, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plans on all assigned patients. Basic bacteriological techniques and specific techniques of bacteriological identification and sensitivity testing are reviewed. No late drops will be accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4025. Clinical Nephrology. 4 Credit Hours.**

Students are required to participate in the consultation service, outpatient clinics, conferences, acute dialysis unit, and renal biopsy program. A variety of acid-base fluid and electrolyte disorders are seen in addition to the entire spectrum of renal diseases. Student exposure to chronic dialysis and renal transplantation programs is also possible. Students perform appropriately focused history and physical exam, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plans on all assigned patients. If rotation is done as the Ambulatory Selective, the student is required to prepare a written essay based upon specific course objectives concerning systems of care. Essays must be submitted on the last day of the rotation and are required to receive a passing grade in the course. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4026. Nephrology Service - SAMMC. 4 Credit Hours.**

The Nephrology Service offers students training and experience in the broad field of clinical nephrology. This consult rotation provides exposure to ambulatory and hospitalized patients with a variety of renal diseases including hypertension, glomerulonephritis, acute and chronic renal failure; exposure to problems of fluid, electrolyte, and acid-base disturbance. While on the service, students will be able to observe acute and chronic hemodialysis. Students are required to perform initial evaluations, including history and physicals, and will, under appropriate supervision, perform selected diagnostic procedures. A didactic lecture series, covering the broader topics of nephrology, is repeated on a monthly basis and the students are expected to attend. No late drops will be accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4034. Oncology Consultation Service. 4 Credit Hours.**

The students are required to participate in the clinical activities of the Medical Oncology Section of the Division of Hematology/Oncology, with experience on the consultation service at both University Hospital and the VA Hospital, plus intensive outpatient experience in the Oncology Clinics. The inpatient consultation experience provides exposure to management of complex oncology problems. The clinic experience provides exposure to a variety of clinical medical oncology problems and their management in the outpatient setting. The student is required to become familiar with all aspects of supportive care for the oncology patient. Students are required to perform appropriately focused history and physical exams, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plans on all assigned patients. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4042. Coronary Intensive Care Unit - Subinternship - UH. 4 Credit Hours.**

The objective of this subinternship is to prepare students for the intense and responsible role of the intern. The subintern is an integral member of the team and are required to participate in all team activities and participate in all medical care for his/her patients, under the supervision of the Internal Medicine resident, Cardiology fellow, and Cardiology attending. The student is required to become proficient in the work-up, diagnosis, and management of patients with acute myocardial infarction, acute respiratory failure, and other commonly encountered acute crises; develop expertise at arrhythmia recognition/ therapy, principles involved with airways management/mechanical ventilation. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4043. Clinical Chest Disease Consultation Service. 4 Credit Hours.**

Students are required to work in the inpatient and outpatient settings, participating in clinics, inpatient consultations, and division conferences. Students are required to perform appropriately focused history and physical exams, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plans on all assigned patients. Students are required to actively participate in the work-up and management of patients with acute and chronic lung diseases seen by the Consultation Service and attend Pulmonary clinics at the VA Hospital and UHC-D. Students will be exposed to various diagnostic methods including radiographic, radionucleotide, bronchoscopy, and pleural biopsy techniques. Through active participation, the student should become proficient in interpreting commonly used pulmonary function tests and chest x-rays. Principles and methods involving respiratory therapy, antimicrobial therapy, and evaluation of common pulmonary disorders will be emphasized. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4045. Pulmonary Medicine- SAMMC. 4 Credit Hours.**

Students are required to learn the recognition and treatment of acute and chronic pulmonary problems on a consult service with selection and implementation of appropriate treatment modalities. Students also are required to become familiar with pulmonary function testing to include interpretation and application of pulmonary physiology to a clinical setting. Principles of respiratory therapy will be emphasized to include the utilization of respirators and oxygen delivery systems. Clinical projects may be assigned to stress key teaching points. An active pulmonary clinic and complete pulmonary function laboratory will be available for students to gain clinical experience. No late drops will be accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4046. General Medicine Ward Subinternship-UH/VA. 4 Credit Hours.**

The goal of this subinternship is to prepare students for the intense and responsible role of the intern. The subintern is an integral member of the team and is required to participate in all team activities and participate in all medical care for his/her patients, under the supervision of the Internal Medicine resident and attending. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4047. General Medicine Ward Subinternship-SAMMC. 4 Credit Hours.**

This subinternship is designed to prepare students for the intense and responsible role of the intern. The subintern is an integral member of the team and is required to participate in all team activities and participate in all medical care for her/his patients, under the supervision of the Internal Medicine resident and attending. No late drops are accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4048. Medical ICU Subinternship - SAMMC. 4 Credit Hours.**

The goal of this subinternship is to prepare students for the intense and responsible role of the intern. The subintern is an integral member of the team and is required to participate in all team activities and participate in all medical care for his/her patients, under the supervision of the Internal Medicine resident, Critical care fellow and attending. Familiarization with pulmonary and hemodynamic physiology, as it applies to intensive care medicine, as well as the use and interpretation of data obtained from monitoring instruments, will be covered. No late drops will be accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4049. Clinical Rheumatology. 4 Credit Hours.**

The differential diagnosis and treatment of rheumatic and autoimmune diseases are taught through active student participation in outpatient clinics, consultation rounds, journal clubs, and division conferences. Students are required to evaluate patients at University Hospital, Audie Murphy VA Hospital, and UHC-D. Students are required to perform appropriately focused history and physical exams, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plans on all assigned patients. Students will also have exposure to community resources for the special problems encountered by the patients in this clinic and be able to identify different types of medical delivery systems. If rotation is done as the Ambulatory Selective, the student is required to prepare a written essay based upon specific course objectives concerning systems of care. Essays must be submitted on the last day of the rotation and are required to receive a passing grade in the course. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4058. Clinical Pharmacology. 4 Credit Hours.**

This selective is an essential course in Drug Prescribing and Therapeutics for future interns in any specialty. It is an excellent opportunity to brush up on drug therapy before entering residency and to avoid causing harm to the patients through mis-prescription of drugs. The drugs of the major therapeutic areas and how they are used are reviewed by specialists from the Departments of Medicine, Psychiatry, Surgery, Pharmacology, and Clinical Pharmacy. Particular emphasis is placed on the use of drugs in clinical scenarios and on developing therapeutic regimens.

**MEDI 4062. Allergy-Immunology - WHMC. 4 Credit Hours.**

The student will be a member of the Allergy-Immunology Ward Consult Team, along with a staff member, first-year fellow, and usually a resident. Students are required to assist in the evaluation of the inpatient consultations, and in addition see outpatients and attend all Allergy-Immunology Service educational activities. Students are required to perform appropriately focused history and physical exam, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plan on all assigned patients. No late drops will be accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4066. Medical ICU Subinternship - UH/VA. 4 Credit Hours.**

This subinternship is designed to prepare students for the intense and responsible role of the intern. The subintern is an integral member of the team and is required to participate in all team activities and participate in all medical care for his/her patients, under the supervision of the Internal Medicine resident, Pulmonary fellow, and Pulmonary/Critical care attending. Students are expected to participate in daily hospital rounds, morning report, Grand Rounds, Morbidity and Mortality conference, IM Housestaff conferences. The students are required to actively participate in the work-up and management of patients with critical illnesses under close supervision of the housestaff, fellows, and faculty. During this rotation, the student will be exposed to the fundamentals of ventilation support, airway management, respiratory and hemodynamic monitoring, stabilization and support of the critically ill patient. Emphasis is placed upon a system approach to patient evaluation and will include didactic sessions with critical care faculty in addition to daily rounds. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4068. Geriatric Medicine. 4 Credit Hours.**

This rotation offers clinical experience in geriatric internal medicine. The student is required to participate in the Section's outpatient clinic, academic nursing home, and didactic educational activities. The student also has the opportunity for exposure to other multidisciplinary programs in geriatric medicine, including hospital-based home care. Students are required to perform appropriately focused history and physical exams, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plans on all assigned patients. Students will also have exposure to community resources for the special problems encountered by geriatric patients and have the opportunity to learn to be able to identify different types of medical delivery systems. If the rotation is done as the Ambulatory selective, the student will be required to prepare a written essay based upon specific course objectives concerning systems of care. Essays must be submitted on the last day of the rotation and are required to receive a passing grade in the course. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4074. AHEC Clinic Experience. 4 Credit Hours.**

Under the auspices of the UT Health Science Center's South Texas Program, this experience exposes students to primary care of ambulatory patients at various clinical training sites in South, East, West, and the Coastal area of Texas. The goals are to expose you to 1) primary care, 2) community-based practice, and 3) delivery of medical care to underserved/rural populations and health disparities. Please reference the link <http://southtexas.uthscsa.edu> for more information. The student must spend time working in the office practice of a physician who is board certified in Internal Medicine and/or one of its specialties. In addition, the student can gain experience in preventive services applicable to infectious diseases, tuberculosis, diabetes, etc., and work with health professionals to gain a broader understanding of health care needs and services depending upon the area in which he/she is working. The student will be required to prepare a written essay based upon specific course objectives concerning systems of care. Essays must be submitted on the last day of the rotation and are required to receive a passing grade in the course. Student housing expenses may be covered by the AHEC, but there will be no reimbursement for travel costs. No late drops will be accepted. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4077. EKG Interpretation. 2 Credit Hours.**

This rotation is designed for students who have basic to intermediate expertise in reading ECG's and who are motivated to enhance this expertise through independent study. Students have the opportunity to become proficient in the interpretation of ECG's through daily self-study of electrocardiograms. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4078. HIV/AIDS Inpatient Service. 4 Credit Hours.**

This elective on the HIV/AIDS Medicine Team 6 at University Hospital offers the opportunity to assume direct patient responsibility under the supervision of a resident, Infectious Disease fellow, and attending faculty. This subinternship is for persons interested in obtaining extensive teaching in HIV disease. It provides practical experience in the diagnosis and treatment of HIV complications such as PCP, CMV, toxoplasmosis, invasive fungal infections, mycobacterial disease, and oncological and neurological complications of this disease. These objectives will be obtained through a team approach to patients with HIV infection involving nurses, physicians, and other staff, and also will include a formal didactic teaching series. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4079. Clinical Preceptorship in General Internal Medicine. 4 Credit Hours.**

The student will join the practice of a clinical faculty member practicing general internal medicine in an internal medicine subspecialty in the local community. Activities include hospital rounds, office visits, hospital committee meetings, and an introduction to practice management. Students are required to perform appropriately focused history and physical exams, prepare written and verbal presentations, interpret laboratory data, and develop differential diagnosis and management plans on all assigned patients. Students will also have exposure to community resources for the special problems encountered by patients in the ambulatory setting, and be able to identify different types of medical delivery systems. If rotation is done as the Ambulatory Selective, the student will be required to prepare a written essay based upon specific course objectives concerning systems of care. Essays must be submitted on the last day of the rotation and are required to receive a passing grade in the course. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4086. Mindfulness in Medicine. 0.5 Credit Hours.**

Mindfulness is important in one's personal life as well as professional work. It supports the physician in successfully caring for patients, connecting to colleagues and patients, and maintaining personal satisfaction. There is some evidence that mindfulness training in the professional development of physicians helps with effective decision making and reducing medical errors, increases sensitivity to feelings, improves attention and memory, decreases stress, and enhances reflective consideration in problem solving and decision making. Senior students are facing the formative transition to residency training, which is laden with new challenges and stressors such as work demands that conflict with emotional and physical availability for family and friends, an immense amount of new knowledge and skill to acquire, increased work hours in a complex health care system, and coping with death and the potential for errors in patient care. New interns are fearful of making mistakes that harm a patient and worry about their work-life balance. The goal of this course is to provide and apply skills in mindfulness for everyday practice so that learners are armed with the knowledge and techniques to improve their attention, renew their perspective during times of stress, build resiliency, and prevent errors and harm in their professional practice. Learning Objectives: By the end of this course, students should be able to: 1. Identify personal characteristics of leadership, bias, and resiliency and use this self-awareness to enhance professional relationships 2. Integrate techniques of mindfulness into daily life to improve attention to personal well-being, reduce stress, and avoid burnout during residency training 3. Use self-reflective writing to increase self-awareness, broaden perspectives, and cultivate empathy 4. Apply mindfulness to clinical practice to improve patient communication, recognition of error-prone situations, and quality of medical care. Course topics include: 1) Self-awareness and Resiliency; 2) Leadership, Bias, and Collaboration; 3) Mindfulness in Patient Care: Self-care and preventing medical errors; and 4) Narrative Medicine. Learning of course topics will be accomplished with a combination of self-study educational resources and assigned readings, didactic lecture, skills workshops, writing exercises, and small group discussion. Each student will be required to complete a portfolio of reflective writing and surveys, which will be used in small group discussions. To monitor the effectiveness of the course content and teaching methods, students will complete pre- and post-course surveys. Prerequisites: Completion of all core clerkships.

**MEDI 4087. Point of Care Ultrasound. 4 Credit Hours.**

This elective is designed to introduce students to the use of diagnostic bedside ultrasound in the care of hospitalized medicine patients, and is paired with the Internal Medicine Residency Point of Care Ultrasound Elective. In addition to review of ultrasound physics and machine controls/transducers, students will obtain knowledge and skills in image acquisition, image interpretation and pitfalls/limitations of various cardiac, pulmonary, abdominal and vascular diagnostic ultrasound applications. Other topics include clinical integration of ultrasound skills into patients with shock, cardiac arrest, respiratory failure, and volume status abnormalities. Training will be accomplished with a combination of didactic lectures, provided self-study educational resources, image acquisition skills workshops at the Center for Clinical Ultrasound Education, supervised bedside ultrasound exams of hospitalized medicine/ICU patients and independent ultrasound scanning sessions. Each student is required to complete a portfolio of ultrasound examinations covering the scope of the course material, which will be reviewed with expert faculty on a weekly basis for quality assessment, image interpretation practice and further teaching. The elective is primarily designed for students pursuing residency with an adult inpatient focus. Students must have successfully completed Internal Medicine, Family Medicine, Surgery and Emergency Medicine clerkships before taking this elective.

**MEDI 4103. Hematology for the Intern. 0.5 Credit Hours.**

The Advanced Hematology course will be taught using care-based discussion. The first session will be a review of red blood cell and white blood cell abnormalities. The remainder of the sessions will focus on two to three specific cases of red blood cell or white blood cell disorders. Discussion will cover differential diagnosis, appropriate laboratory studies, clinical findings, and prognosis. Discussions will include adult and pediatric cases of various types of anemia, leukemia, myeloproliferative disorders, myelodysplastic states, plasma cell disorders, and lymphoma. The pass/fail grade will be determined by attendance and participation in group discussions.

**MEDI 4105. Human Rights and Asylum Medicine. 4 Credit Hours.**

This elective is geared toward fourth-year medical students interested in working with underserved populations and patients whose health is greatly affected by their personal histories of torture or other abuse, social conditions, and/or legal circumstances. The course's aim is to teach medical students to identify and assist survivors of abuse and to integrate a human rights viewpoint into their practice of medicine. This course will offer instruction on the legal process of refugee placement and application for asylum and for special immigrant juvenile status. It will provide training in diagnosing and evaluating medical evidence of human rights violations. Emphasis will be given to conducting an appropriate trauma-informed interview and physical and psychological examination of a patient with a history of torture or other abuse to complete a forensic evaluation for asylum in the United States. Prerequisites: MEDI 3105.

**MEDI 4114. Combined Consultation Service In Geriatrics & Palliative Medicine. 0.5 Credit Hours.**

This elective didactic course will introduce the basic elements of assessing a geriatric patient or a patient in need of palliative care in the in-hospital setting.

**MEDI 4115. Palliative Care. 0.5 Credit Hours.**

This MS4 didactic elective will focus on the main beliefs of palliative care, which include symptom control and end-of-life care in general and in specific populations, fulfilling the following educational principles, applicable to many other areas in medicine: \* Communication skills instruction for medical students \* Exposure to interdisciplinary teams (IDT) \* Instruction in the multicultural practice of medicine.

**MEDI 4120. Interpretation of Electrocardiograms. 0.5 Credit Hours.**

This course consists of eight one-hour seminar sessions with active student verbal participation. Topics will include ECG basics, axis determination, analysis of rhythms, atrial arrhythmias, ventricular arrhythmias, conduction abnormalities, hypertrophy, ischemia, infarction, and vector analysis. The course will include examples of multiple ECG tracings for discussion, which will be moderated by the course director. Students will be called upon during the sessions to help interpret ECG tracings using the knowledge gained during the course didactics. The grade is based on student participation.

**MEDI 4121. Intermediate Bedside Cardio Exam. 0.5 Credit Hours.**

Course consists of 8 one hour sessions. Each session will include demonstrations of physical findings and their elucidation in patients with cardiovascular disease. Topics covered will include brief review of cardiac cycle, characteristics of innocent murmurs, systolic murmurs, diastolic murmurs, evaluation of arterial and venous pulsations, congestive heart failure, and self assessment. Grade based on class participation.

**MEDI 4150. Tropical Medicine & International Health. 0.5 Credit Hours.**

Course consists of 10 contact hours and will cover topics specifically related to health in the tropics and developing world. The course will consist of an introductory lecture and nine 1 hour small group case-based discussions. Students will prepare for the small group discussions through self-initiated study of the provided syllabus and faculty will lead the case-based discussion groups. Student grades will be determined by participation in the small group discussions (50%) and a final exam (50%).

**MEDI 4151. Poverty, Health, And Disease Elective. 0.5 Credit Hours.**

This elective course is offered to students who wish to gain insight into the complex interplay between poverty and health, both in the United States and in resource-limited settings around the world. The purpose of the course is to expose the students to several thought leaders and appropriate published literature, including books written to address these concepts. The course will explore the problems of inequality of access to health care and its impact on health delivery systems with examples from Guatemala, Haiti, and New Orleans. Open for Cross Enrollment on Space Available Basis.

**MEDI 4153. Informatics and Advanced Evidence-Based Medicine. 0.5 Credit Hours.**

The course is for students who want to master information and evidence. We will use the computer lab to learn advanced skills in: 1) retrieving information, 2) storing and filing information, 3) assessing information, and 4) keeping up with new advances. The skills will include both strategies and techniques. To pass the course, students must complete a small final project that previous students have enjoyed. In their project, they will publish on Wikipedia a short, structured summary of one article for a clinical topic. I will walk you through creating the edits. The edit can be done anonymously if the student prefers. By completing the project, the students learn the goals of the course. Credit for successful completion of the course requires active participation in class activities, a minimum of 100% attendance, and successful completion of final project.



**MEDI 4155. Clinical Epidemiology for the Intern. 0.5 Credit Hours.**

Clinical epidemiology – the basic science of clinical medicine that makes predictions about individual patients based on the occurrence of clinical events in groups of similar patients and using strong scientific methods to ensure that the predictions are accurate – is especially powerful in situations of medical uncertainty. Essential concepts and methods of clinical epidemiology are presented as they pertain to obtaining answers to clinical questions and guiding clinical decision-making with the best available evidence. A case-based approach is used to illustrate the relevance of clinical epidemiological approaches to decision-making about the care of individual patients. Learning activities incorporate both didactic, small-group problem solving approaches, and procedure skills (e.g., central venous line placement, incision and drainage of abscess, lumbar puncture, and thoracentesis). Credit for successful completion of the course will be based on attendance.

**MEDI 4170. Internal Medicine Internship Readiness Elective. 4 Credit Hours.**

This rotation (Internal Medicine Boot Camp) is a 4-week elective restricted to students who will begin a categorical internal medicine residency in July of that same academic year. The purpose of the course is to present the diagnosis and management of common medicine topics that an IM intern can expect to encounter during residency, enhance differential diagnosis skills of common chief complaints seen on a medicine service, and develop procedural skills and patient evaluation skills. Students are expected to attend all scheduled conferences and interactive laboratory and clinical sessions focused on procedural skills and clinical assessment of standardized patients. Clinical skills labs will include heart sounds using Harvey manikin, intubation, mechanical ventilation, PFT, joint aspiration and placement of central lines. Students will receive training in BLS and ACLS and can receive certification if all classes are attended and performance is satisfactory. Students are required to give an oral presentation on a medicine topic/clinical question. Students must meet expectations of clinical performance and professional behavior based on School of Medicine evaluation for fourth year students to "pass" course.

**MEDI 4450. Compassionate Care for the Seriously Ill Longitudinal Elective. 2 Credit Hours.**

This rotation offers exposure to the aging and seriously ill population through a longitudinal service-learning elective providing community service engagement through the "No one dies alone" volunteer program (NODA) at University Health System (UHS) and South Veterans Health Care System (STVHCS). Course participants will provide volunteer-role compassionate care to hospitalized aging and seriously ill patients in need through the NODA program; complete on-line learning modules to improve knowledge of the aging and seriously ill patient population; participate in debriefing sessions to integrate volunteer experience with course learning.

**MEDI 7000. Off Campus. 4 Credit Hours.**

All off campus rotations must be approved by the designated faculty member prior to the beginning of the rotation (at least one week before the course begins). Credit will not be given for any rotation that has not been approved in advance. Required paperwork includes: "Course Approval" form, a written letter or email for acceptance form the physician preceptor with the start and end dates of the course/rotation, and a course description of your learning objectives and responsibilities during the rotation. Forms must include a complete address and telephone number for the off campus location or residence address for the student while at the off campus site. Forms will not be approved after the rotation has already begun. Contact the department for assistance with enrolling in this course.

**Courses****PHYT 5009. Neuroscience. 4 Credit Hours.**

This course in neuroscience provides the foundation to understand the structure and functions of the developing, mature, and aging nervous system. It covers basic neuroanatomy, neurophysiology, and neuropharmacology. It also applies neuroscience to clinical applications regarding pathology and patient care. Since cultural organization is central to most functional concepts, neuroanatomy is emphasized to facilitate an overall understanding of the nervous system. Morphology is covered first at the cellular level, then regionally. Neurophysiology of cellular processes of nerve cell transmission as well as regional connectivity of pathways devoted to specific neural modalities is covered. Neuropharmacology encompasses the chemical aspects of synaptic transmission at the cellular level, and the regional differences of transmitter pharmacology. Special emphasis is given to the structures involved in motor control, neuroplasticity, normal neurological functions, and pathologies. Neuropathology is introduced when appropriate to the systems being discussed. The course offers laboratory time examining neurological structures of the central and peripheral nervous system cadaver specimens. Open for cross enrollment on space available basis.

**PHYT 5091. Special Topics. 0.5-4 Credit Hours.**

This course will be arranged through Department faculty. The course topics vary according to student interest. Semester hours are variable and credit hours will be assessed per topic. The course could be offered any time during the third year (MPT-III), fall or spring.

**PHYT 7001. Clinical Foundations 1. 4 Credit Hours.**

This course addresses the fundamental concepts of physical therapy practice including basic clinical screening for disease to include systems review, diagnostic procedures, and introductory physical therapy skills. Students are exposed to the components of documentation, basic examination, therapist-to-patient interaction, the disablement process, interdisciplinary management of the patient, and the use of the Guide to Physical Therapy as a management tool. Students also study functional screening techniques, body mechanics, surface anatomy, postural assessment, patient positioning and transfers, locomotion, and the use of assistive devices. The course adds to the foundation for clinical reasoning and clinical decision making. Students have the opportunity to practice fundamental skills involved in patient management.

**PHYT 7004. Human Physiology. 2 Credit Hours.**

This course is designed to provide students in health professions discipline with the fundamentals of normal human physiology. The course includes emphasizes concepts from a system level. Topics include cellular, respiratory, cardiovascular, digestive, renal, male and female reproductive, musculoskeletal, nervous, endocrine systems and other systems with integration of these physiologic concepts to pathologic disease processes. The course includes classroom lecture, discussion, and case studies.

**PHYT 7005. Exercise and Physiology of Rehabilitation. 3 Credit Hours.**

The goal of this course is to introduce the student to the application of exercise principles to different populations. This will be achieved by examining the physiology of exercise and applying the principles of therapeutic exercise to different populations. Emphasis is on the role of exercise to improve function, prevent dysfunction, and promote wellness. The role of complementary medicine and integration of interdisciplinary professionals in the presentation of content is intended to enhance understanding of holistic care for active populations. The effects of exercise on energy metabolism, nutrition, cardiopulmonary function, and the musculoskeletal systems are also emphasized in this course. At the end of this course, students will have had the opportunity to learn to be able to apply training principles to develop an appropriate exercise program.

**PHYT 7009. Neuroscience. 4 Credit Hours.**

This course in neuroscience provides the foundation to understand the structure and functions of the developing, mature, and aging nervous system. It covers basic neuroanatomy, neurophysiology, and neuropharmacology. It also applies neuroscience to clinical applications regarding pathology and patient care. Since cultural organization is central to most functional concepts, neuroanatomy is emphasized to facilitate an overall understanding of the nervous system. Morphology is covered first at the cellular level, then regionally. Neurophysiology of cellular processes of nerve cell transmission as well as regional connectivity of pathways devoted to specific neural modalities is covered. Neuropharmacology encompasses the chemical aspects of synaptic transmission at the cellular level, and the regional differences of transmitter pharmacology. Special emphasis is given to the structures involved in motor control, neuroplasticity, normal neurological functions, and pathologies. Neuropathology is introduced when appropriate to the systems being discussed. The course offers laboratory time examining neurological structures of the central and peripheral nervous system cadaver specimens. Open for cross enrollment on space available basis.

**PHYT 7011. Clinical Foundations 2. 4 Credit Hours.**

This course continues to introduce the fundamental concepts of physical therapy practice including basic clinical screening, systems review, and introductory physical therapy skills. The course takes a regional approach to surface anatomy and its radiologic correlates, detailed muscle function with specific muscle testing. Functional outcome measures, palpation, and principles of selected interventions to include soft tissue massage and proprioceptive neuromuscular facilitation (PNF). The course will continue to lay the foundation for clinical reasoning and clinical decision making. The student will be given the opportunity to practice fundamental skills involved in patient management.

**PHYT 7012. Movement Science 1. 4 Credit Hours.**

This course is a study of joint structure and function, and the mechanical principles underlying the kinematics and kinetics of human motion. Emphasis is placed on the interaction between biomechanical and physiological factors in musculoskeletal function and the implications of kinesiology principles in physical therapy practice.

**PHYT 7014. Research Methods I. 3 Credit Hours.**

This course is designed to develop critical thinking regarding interpretation of research literature. It provides a general introduction to research design, statistical reasoning, and interpretations of the literature. Topics include scientific method, research design, statistical reasoning, development of research questions, issues of measurement, and an overview of parametric and non-parametric statistical techniques. All topics are presented to facilitate understanding of research literature and utilizing evidence for clinical decision-making. The learner will have the opportunity to be able to critically analyze rehabilitation research and begin the process of formulating a critically relevant research question. Open for Cross Enrollment on Space Available Basis.

**PHYT 7017. Cells, Systems, and Disease. 3 Credit Hours.**

This course characterizes what happens to the human body during different disease processes. It begins at the cellular and tissue levels and advances to a progressive study of diseases and disorders within different organ systems. It examines the pathological changes of both histological and gross anatomical specimens, as well as the biochemical and physiological changes that occur during different diseases and disorders. It also discusses some aspects of diagnosis and treatment of these disorders. There is an extensive medical vocabulary associated with this course. Open for Cross Enrollment on Space Available Basis.

**PHYT 7018. Pharmacological Principles in Physical Therapy. 2 Credit Hours.**

This course provides the foundation for understanding the impact of drugs on patients with conditions encountered in the practice of physical therapy. Basic pharmacological principles are addressed, as well as important precautions and contraindications for physical therapy treatments. Open for Cross Enrollment on Space Available Basis.

**PHYT 7019. Scientific Basis of Neurological Disorders. 3 Credit Hours.**

This course in neuroscience provides further foundation to understand the structures and functions of the developing, mature, and aging nervous system. It covers basic neuroanatomy, neurophysiology, and neuropharmacology. It also applies neuroscience to clinical applications regarding pathology and patient care. Since structural organization is central to most functional concepts, neuroanatomy is emphasized to facilitate an overall understanding of the nervous system. Special emphasis is given to the structures involved in motor control, their functions, and pathologies. Open for Cross Enrollment on Space Available Basis.

**PHYT 7021. Clinical Experience 1. 5 Credit Hours.**

Clinical Experiences 1, 2, and 3 are designed for the student to apply knowledge gained in the basic and clinical sciences courses completed in the first 2 years to clinical practice. The student will become proficient in examination, evaluation, and intervention of patients in a variety of physical therapy settings. Students will complete 10 week rotations in each of 3 settings: acute, inpatient neurological, and outpatient orthopedic. However, they may complete these in any order depending on availability of clinical sites.

**PHYT 7091. Selected Topics in Physical Therapy. 1-9 Credit Hours.**

This course is an independent study of topics of current interest in the physical rehabilitation sciences. Includes study of current research and important new developments in specific areas of practice and research. Can be repeated for up to 9 credit hours.

**PHYT 7097. Research in Rehabilitation Sciences. 3-6 Credit Hours.**

This course is an independent research in a selected area of rehabilitation sciences directed by a faculty member. Can be repeated for up to 6 credit hours.

**PHYT 7801. Advanced Studies in Physical Therapy. 3 Credit Hours.**

This course is an independent study directed by a faculty member in a laboratory or clinical venue in which students study methods and tools of measure using advanced equipment or procedures to assess human performance.

**PHYT 7802. Practicum in Clinical Practice. 3 Credit Hours.**

This course is a mentored practicum in clinical practice in a specialty area under the guidance of a faculty mentor.

**PHYT 8002. Management of the Patient with Musculoskeletal Dysfunction 1. 5 Credit Hours.**

Students in this course integrate previously learned skills and knowledge and apply new skills in the examination, evaluation, and intervention of patients across the lifespan with musculoskeletal conditions of the upper quarter, which will include the cervical and thoracic spine and the upper extremity. The course reviews musculoskeletal tissues, the effects of systematic disease on musculoskeletal tissues, the physical therapy exam, and the principles of evidence-based practice. The course then follows a regional approach with attention to the examination and intervention of the cervical/thoracic spine and each joint area in the upper extremity. Students are expected to be knowledgeable and proficient in material from the first-year courses in the areas of patient care skills, anatomy, kinesiology, and therapeutic exercise. The course emphasizes 1) using the best available evidence to examine and treat patients with musculoskeletal complaints in the extremities, 2) critically analyzing the patient's history and tests and measures to formulate a physical therapy diagnosis and determine the need for further referral, 3) recognizing non-musculoskeletal causes of extremity pain and identifying patients needing further diagnostic studies and referral to a specialty physician, and 4) the interdisciplinary approach to patient management through guest speakers from different medical specialties.

**PHYT 8004. Introduction to Comprehensive Patient Management in Physical Therapy. 2 Credit Hours.**

This course continues and expands on the concepts of the Physical Therapy Patient-Client Management Model. This includes examination, evaluation, diagnosis, prognosis, plan of care, and interventions for the plan of care. Emphasis of this course is using the results of the examination as well as evidence to develop the plan of care. Coordination/communication with other health care professionals is discussed as well as the role of physical therapy in overall health and wellness and its role in global health.

**PHYT 8007. Orthotics in Rehabilitation. 1.5 Credit Hour.**

The goal of this course is for the student to become proficient in the basic principles and clinical application of orthotic interventions used in the interdisciplinary management of the patient with extremity or spinal disorders across the lifespan. The course addresses the examination of the patient in need of an orthotic device, analyzing the results of the exam, and use of the best available evidence to identify the most efficacious orthotic device to manage or prevent impairment, functional limitation, or disability. Students will have the opportunity to use their critical thinking skills to problem solve case situations and prescribe or fabricate an orthosis most efficacious according to the best available evidence and with consultation from other disciplines.

**PHYT 8011. Therapeutic Approaches to Pain and Movement Dysfunction. 3 Credit Hours.**

This course examines the management of pain and movement disorders with various interventions. Content includes both direct and indirect effects of interventions with a biopsychosocial approach to patient-centered care. Theory and application of modalities within this course include soft tissue massage/mobilization (STM); tissue integrity; inflammation and repair; and principles and application of electrophysical agents in clinical PT, including cryotherapy, heat and electrical stimulation. The course consists of lectures, labs, "passport" self-selected site visits to experience clinical application of modalities used in physical therapy.

**PHYT 8012. Prosthetics in Rehabilitation. 1.5 Credit Hour.**

This course is designed to enable the student to become proficient in the principles of examination and intervention for the patient who experiences limb amputation or has congenital limb absence. The course includes the management of wounds and co-morbidities that put one at risk for limb amputation and strategies to identify these patients and prevent limb loss. The student learns the care and prosthetic management of patients in the pre and post-operative stages with limb amputation at different levels. Instructors present strategies to problem solve when presented with patients with other conditions or factors that complicate the patient's course of rehabilitation. The interdisciplinary management of patients with limb amputation is emphasized through clinical experience with a prosthetist.

**PHYT 8013. Management of the Patient With Cardiopulmonary Dysfunction. 3 Credit Hours.**

This course provides instruction in the basic science and clinical foundation required for the examination and treatment of disorders of the cardiovascular and pulmonary systems. Emphasis is on interpretation of evaluative results involving cardiovascular and pulmonary pathology and application of specific treatment interventions in developing comprehensive PT management of these classes of pathology. This course includes interdisciplinary presentations and opportunities relevant to evidence-based wellness and fitness programs for the physical therapist functioning as part of the cardiovascular and pulmonary rehabilitation team.

**PHYT 8014. Seminar in Physical Therapy Patient Care. 1 Credit Hour.**

This course is designed to promote integration of knowledge from basic sciences, patient care, health promotion and scientific investigation to enhance patient outcomes. Emphasis will be placed upon facilitation of student review of patient cases/ profiles with selection of tests and measures and potential treatment interventions.

**PHYT 8021. Clinical Experience 2. 5 Credit Hours.**

Clinical Experiences 1, 2, and 3 are designed for the student to apply knowledge gained in the basic and clinical sciences courses completed in the first two years to clinical practice. The student will become proficient in examination, evaluation, and intervention of patients in a variety of physical therapy settings. Students will complete 10 week rotations in each of 3 settings: acute, inpatient neurological, and outpatient orthopedic. However, they may complete these in any order depending on availability of clinical sites.

**PHYT 8022. Professional Issues and Clinical Decision-Making 1. 1.5 Credit Hour.**

This course is designed for the student to assimilate major theories about learning across the lifespan, learning style, teaching techniques, communication in the clinical setting, and communication as a means to develop cultural competence. Emphasis will be on instruction related to clinical practice and critical thinking as well as application to motor learning. A major theme of this course is the development of communication skills to enhance therapist-patient interactions, promote an understanding of learning across the lifespan, and develop cultural competence. Open for Cross Enrollment on Space Available Basis.

**PHYT 8075. Human Development across the Lifespan. 3 Credit Hours.**

The purpose of this course is to provide the student with the opportunity to learn about typical human lifespan development with the emphasis on health and wellness with application to the practice of PT. The course focuses on the embryonic development, early infancy, childhood, adolescence, adulthood, older adults, and the oldest old. Opportunities for didactic, clinical, and community are integrated into the course to facilitate active learning opportunities. Topics may include interdisciplinary management, cultural sensitivity, psychological factors, socioeconomic concerns, community-based resources, and patient/family education regarding health and wellness/fitness. Open for Cross Enrollment on Space Available Basis.

**PHYT 8102. Research Methods II. 2 Credit Hours.**

The emphasis of this course is continued development of critical thinking skills to promote evidence-based practice in the clinical setting. This course is a continuation of Systematic Reasoning and Scientific Investigation 1, and gives the student the support to experience and complete an extensive Critically Appraised Topic or a written research investigation. The student will also practice in small group format the skill of research articles analysis and presentation for public health and education. Students will either submit one article to the APTA Hooked on Evidence website or practice applying for a speaking position for a TPTA conference. The student will also produce either a written research investigation relevant to the practice of PT or a written Critically Appraised Topic with an extensive review of literature. Students also generate an oral presentation of their project to complete the requirements for this course.

**PHYT 8106. Principles of Administration in Physical Therapy. 2 Credit Hours.**

This course examines current issues and trends in law, ethics and practical aspects of physical therapy clinical management. Specific topics include: (1) health care malpractice and business, contract, criminal, education, and workers' compensation legal concepts and cases; (2) informed consent; (3) organizational theory, behavior, and culture; (4) leadership and management principles; (5) human resource management issues, including recruitment, selection, and retention of staff and managerial human resources; leadership; supervision, and delegation of PTAs, aides, and other extenders; performance appraisal; training and development activities; compensation issues; management labor relations; grievance and discipline; work place safety; and employment law and regulations; (6) health care finance, including clinical budgeting, billing, and reimbursement issues; (7) starting and marketing a PT business; (8) quality, risk, and information management; and (9) comparing and contrasting business, organizational, and professional (ATPA) ethics.

**PHYT 8108. Management of the Patient with Neuromuscular Dysfunction 1. 5 Credit Hours.**

This course is designed to allow the student to develop the skills necessary to perform examination, evaluation, diagnosis, prognosis, and the development of comprehensive treatment plan of care for patients with neuromuscular dysfunction. Emphasis will be on differential diagnosis, screening, examination, and evaluation of function, and on development of intervention programs that lead to improvement in function. Movement dysfunction will be covered across the lifespan for acute and chronic conditions. The topics will be presented from a problem-solving approach that integrates case studies. Current evidence-based research related to the management of the patient with neuromuscular dysfunction will be critically assessed.

**PHYT 8112. Management of the Complex Patient. 3.5 Credit Hours.**

This course gives the student the opportunity to practice examination techniques with a systems approach. Screening for conditions requiring referral will be practiced with continued diagnosis, prognosis to include plan of care using the PT Guide to Physical Therapy Practice. The student will generate a case study that will incorporate specific anatomical correlations with images related to the patient case and will be presented to the class for integration of anatomical relationships to patient care. Faculty from the Department of Cell Systems & Anatomy will supervise the peer teaching in the anatomy laboratory.

**PHYT 8114. Management of the Patient with Musculoskeletal Dysfunction 2. 5 Credit Hours.**

Students in this course integrate previously learned skills and knowledge and apply new skills in the examination, evaluation, and intervention of patients across the lifespan with musculoskeletal conditions of the lumbosacral spine and the lower quarter. The course follows a regional approach with attention to the examination and intervention of the lumbosacral spine, the sacroiliac joint, and each joint of the lower extremity. Students are expected to be knowledgeable and proficient in material from the first-year courses of patient-care skills, kinesiology, and therapeutic exercise. This course emphasizes 1) using the best available evidence to examine and treat patients with spine complaints, and 2) recognizing non-musculoskeletal causes of spinal pain and identifying patients needing further diagnostic studies and referral to a specialty physician.

**PHYT 8116. Management of the Patient with Neuromuscular Dysfunction 2. 5 Credit Hours.**

This course is a continuation of Management of the Patient with Neuromuscular Dysfunction 1, and is designed to allow the student to continue to develop the skills necessary to perform examination, evaluation, diagnosis, prognosis, and the development of comprehensive intervention plans of care for patients with neuromuscular dysfunction. Emphasis is on differential diagnosis, screening, examination, and evaluation of function, and on development of intervention programs that lead to improvement in function. Movement dysfunction is covered across the lifespan for acute and chronic conditions. Current evidence-based research related to the management of the patient with neuromuscular dysfunction is critically assessed. Management strategies and skills are reinforced by encouraging the students to participate in hands-on pre-clinical experiences, work with area clinicians related to specific diagnoses, and design treatment plans based on case studies with a focus on interdisciplinary practice.



**PHYT 8121. Clinical Experience 3. 5 Credit Hours.**

Clinical Experiences 1, 2, and 3 are designed for the student to apply knowledge gained in the basic and clinical sciences courses completed in the first 2 years to clinical practice. The student is required to become proficient in examination, evaluation, and intervention of patients in a variety of physical therapy settings. Students are required to complete 10 week rotations in each of 3 settings: acute, inpatient neurological, and outpatient orthopedic. However, they may complete these in any order depending on availability of clinical sites.

**PHYT 8122. Professional Issues and Clinical Decision-Making 2. 2 Credit Hours.**

This course explores professional issues in physical therapy practice. Topics of emphasis include Vision 2020, professional behaviors, APTA Code of Ethics and Guide to Professional Conduct, and legal standards of behavior for physical therapists. Particular emphasis will be placed on communication and conflict resolution, personality and cultural diversity, stress management, and entry-level physical therapy skill performance. There will also be an interdisciplinary component to the course that will provide students with an overview of ethical issues facing allied health professionals. Topics to be discussed include responsibilities of the health care professional, life and death decisions, patient confidentiality, substance abuse, whistle-blowing, and informed consent. Ethics in research and other critical issues related to health care problems also will be addressed. Collaborative activities and simulated cases will be used to enhance discussion among students.

**PHYT 8130. Movement Science 2. 2 Credit Hours.**

The course will examine how humans learn and acquire skills, as well as the mechanisms that are used to control skillful movement utilizing integration of concepts from neuroscience and kinesiology. Content will include critical discussion of the various schools of thought on how movement is controlled and learned. Students will have the opportunity to apply the concepts of motor control and motor learning for patients with movement dysfunction. Emphasis will be placed on movement control and motor learning in normal and special populations.

**PHYT 8221. Clinical Experience 4. 2 Credit Hours.**

This course is a four-week clinical experience that allows the student to choose an area of interest and refine their physical therapy examination, evaluation, and intervention skills in that setting. Students may choose to gain more experience in one of the three required clinical areas (acute, inpatient neurological, outpatient orthopedic) or pursue a specialty area of interest. Alternatively, faculty may identify an area where the student may benefit from additional experience and assign a specific clinical setting.

**PHYT 8222. Professional Issues and Clinical Decision-Making 3. 1 Credit Hour.**

This course gives students the opportunity to prepare for their clinical experiences. Students are required to complete all required certifications and learn to use the clinical evaluation tool (PT MACS). Particular emphasis will be placed on satisfactory passing criteria for skills outlined in the PT MACS, and expected entry-level physical therapy skill performance.

## Courses

**RADI 4000. Special Topic. 4 Credit Hours.**

This course is intended for 4th year medical students interested in Radiology Residency and Radiology Research opportunities. Students must contact the coordinator prior to committing to this course. A designated faculty member will be assigned to the student prior to enrollment.

**RADI 4001. General Diagnostic Radiology. 4 Credit Hours.**

This course is designed as an introduction to diagnostic radiology. The primary goals of the course are directed toward introducing the student to the different diagnostic imaging modalities available and teaching the student to select the appropriate radiologic examinations for different clinical problems. Students will have the opportunity to receive a working knowledge of diagnostic radiology through lectures, individual projects, reading assignments, participation in subspecialty rotations, teaching conferences, and study of the American College of Radiology teaching file.

**RADI 4006. Pediatric Radiology. 4 Credit Hours.**

By being with the pediatric radiologist on a one-on-one basis through most of the working day, the student will have the opportunity to gain some insight as to the radiologist's role as a clinician, consultant, and teacher; and acquire some knowledge of general pediatrics, neonatology, urology, orthopaedics, and other specialties. The student may attend Diagnostic Radiology Lectures.

**RADI 4007. Review Of Radiology for the Intern. 0.5 Credit Hours.**

This is a refresher course in Clinical Diagnostic Radiology. In a large group format, a Radiology faculty member will review with the participants the basics of evaluating the chest X-ray, chest CT, abdominal CT, spinal, head, and pediatric cases. In addition, time will be spent on reviewing the appropriate studies to order for the work-up of various clinical scenarios.

**RADI 4020. Mammography- A Multidisciplinary Approach. 4 Credit Hours.**

This elective is intended to educate students in the subject of mammography with a multidisciplinary approach. Students will be allowed to spend 2 days each week in medical oncology, surgical oncology, or radiation therapy. Students will primarily be assigned to the mammography section of radiology, learning what criteria are used to detect breast cancer and participating in the work-up of lesions and witnessing biopsies. In addition, they will attend tumor board once a week that is multidisciplinary one day per week will set aside for library student and the students will be asked to research a topic or participate in a project regarding mammography. We intend that this elective will thoroughly educate those who are interested in mammography and help them understand how our specialty is integrated with many other disciplines.

**RADI 4202. General Diagnostic Radiology. 4 Credit Hours.**

By being with the pediatric radiologist on a one-on-one basis through most of the working day, the student will have the opportunity to gain some insight as to the radiologist's role as a clinician, consultant, and teacher; and acquire some knowledge of general pediatrics, neonatology, urology, orthopaedics, and other specialties. The student may attend Diagnostic Radiology Lectures.

**RADI 5001. Basic Radiation Safety. 1 Credit Hour.**

This course provides the student with the opportunity to gain a conceptual understanding of the radiation protection principles involved in the research, diagnostic, and therapeutic uses of radiation sources. This course will cover the safe receipt, use, storage, and disposal of radiation sources in the biomedical research setting. The contents of this course fulfill HSC training requirements in order to use radioactive materials on campus. Successful participants will earn three HSC safety certificates of completion: Basic Radiation Safety Training, Basic Laser Safety Training, and Basic Laboratory Safety Training.

**RADI 5005. Fundamentals Of Radiation Dosimetry. 3 Credit Hours.**

The aim of this course is to introduce the students to the fundamentals of radiation dosimetry, including dosimetry quantities, interactions with matter, cavity theory and calibration protocols. More specifically, the topics that will be covered during this course are the following: 1) Introduction/Ionizing Radiation, 2) Quantities for describing interactions, 3) Exponential attenuation, 4) Charged particle and radiation equilibria, 5) Absorbed dose in radioactive media, 6) Radioactive decay, 7) X-ray interactions with matter, 8) Charged particle interactions with matter, 9) Cavity theory, 10) Dosimetry Fundamentals, and 11) Calibration protocols.

**RADI 5007. Statistics in the Radiological Sciences. 2 Credit Hours.**

An overview of biomedical statistics methods and basic applications to experimental design with special emphasis given to those methods used in radiation detection, image analysis, and evaluations of diagnostic efficacy. Students will learn the theory behind these methods and apply them to actual and simulated problems in the Radiological Sciences using the R statistical programming environment.

**RADI 5010. Medical Biophysics. 3 Credit Hours.**

This course is an introduction to the basic principles of biophysics as applied to medicine and biology. Emphasis will be placed on non-imaging topics of medical biophysics such as mechanics, thermodynamics, diffusion, electrical conduction, biomagnetism, and light spectroscopy.

**RADI 5011. Radiation And Nuclear Physics. 3 Credit Hours.**

This course reviews nuclear structure, interactions of radiation with matter, and the statistical nature of radiation. The course covers gas, scintillation, and solid-state detector technologies and their applications, including spectroscopy.

**RADI 5015. Physics Of Diagnostic Imaging 1. 3 Credit Hours.**

This course introduces the student to the basic principles and radiological practice using noninvasive imaging systems. Topics include production of x-rays, interaction of radiation with matter, and the physics of imaging using computed tomography, ultrasound, and magnetic resonance. Prerequisites: consent of instructor.

**RADI 5018. Physics Measurements In Imaging Lab. 2 Credit Hours.**

This is a laboratory course focusing on performance of measurements used in quality assurance (QA), system characterization, and acceptance testing of medical imagers. Corequisites: RADI 5015.

**RADI 5020. Principles of Health Physics 1. 3 Credit Hours.**

This course covers the basic principles of protection dealing with the major forms of ionizing radiation.

**RADI 5025. Molecular Oncology & Radiobiology. 1.5-3 Credit Hours.**

This course is an overview of the physics and chemistry of radiation biology; the biological effects of ionizing and non-ionizing radiations and hyperthermia at the cellular and tissue levels and whole body and late effects.

**RADI 5030. Neuroscience Imaging Laboratory. 1 Credit Hour.**

Students are assigned to rotate in 6 laboratories at the RIC: MRI, PET, TMS, ERP, animal imaging, and optical imaging. In each lab, students will have the opportunity for hands-on experience on subject preparation, data acquisition, and processing.

**RADI 5050. Human Neuroelectrophysiology. 3 Credit Hours.**

A detailed study of the electrophysiological basis of human behavior, with an emphasis on event-related brain potentials associated with cognitive function, perception, and action. See instructor for prerequisite coursework.

**RADI 5090. Radiological Sciences Seminar. 1-9 Credit Hours.**

Enrolled students are required to attend a minimum of 9 faculty/outside speaker seminars per semester and complete an evaluation sheet on each seminar attended. To fulfill the number of seminars, students may include seminars offered by disciplines other than their own. A list of seminars of interest to the students will be supplied on the first class day. Students must also prepare a PowerPoint presentation on a Radiological Sciences topic and present their seminar for critique by program faculty and students. By the end of this course, each student should be able to: 1) Demonstrate competence in verbal communication. 2) Demonstrate competence in written communication. 3) Critically review research literature and analyze scientific data.

**RADI 6012. Phys Nuclear Medi Imaging. 3 Credit Hours.**

This course is a study of physical principles of planar, SPECT, and PET radionuclide imaging; instrument theory; dosimetry; computer uses; and safety considerations.

**RADI 6014. Physics Of Dental Imaging. 2 Credit Hours.**

This course is a survey of imaging procedures used in modern dentistry with an emphasis on the clinical objectives and physical principles underlying intraoral, panoramic, cephalometric, and digital dental radiography. Prerequisites: consent of instructor.

**RADI 6015. Physics Measurements in Imaging 2. 3 Credit Hours.**

Students will study and work with advanced methods for evaluating the performance of clinical imaging systems, including x-ray imaging, fluoroscopy, mammography, ultrasound, x-ray CT and MRI. Testing will follow procedures described in publications of the AAPM and ACR and used to achieve compliance with the regulations and recommendations the DSA, MQSA, ACR, NRC, MIPPA and State of Texas' Radiation Control Program. Students will study the procedures and then use "best practices" to perform the tests in a clinical setting. Methods for evaluating nuclear medicine equipment shall also be reviewed and carried out, but in a less intensive manner. Prerequisites: RADI 5015, RADI 6049, RADI 6012 and RADI 6016.

**RADI 6016. Physics of Diagnostic Imaging 2. 3 Credit Hours.**

This course includes theory and applications of various forms of electronic imaging systems; advanced diagnostic imaging principles involving mathematical image analysis, digital image processing, digital image display, and concepts of electronic imaging. Prerequisites: consent of instructor.

**RADI 6017. Neuroimaging Methods. 3 Credit Hours.**

This course will deal extensively with several noninvasive brain imaging techniques to study the functional organization of the human and animal brains. Methods covered include positron-emission tomography (PET), event-related potentials, magneto-encephalography, optical imaging, voltage and calcium imaging, autoradiography, as well as transcranial magnetic stimulation. The course will only touch upon anatomical and functional MRI as well as high field MRI, as students will receive exhaustive MRI training from other classes. Course format will include both lectures on the several methods and seminars in which recent technical advances in the field are discussed. Prerequisites: consent of instructor.

**RADI 6018. Foundations Of Neuroscience Imaging. 3 Credit Hours.**

This course will explore several advanced topics in cognitive neuroimaging techniques. Examples of such topics include strategies to study the functional and/or anatomical organization of the human brain and paradigms used for studying a variety of brain functions. Students interested in functional MRI as well as DTI will have an opportunity to gain extensive knowledge and experience.

**RADI 6020. Advanced Topics In Cognitive Neuroscience. 3 Credit Hours.**

This course will explore several advanced topics in cognitive neuroscience. It includes exhaustive study of a brain function in normal and in disease states. Brain functions include but are not limited to sensation, perception, action, language, motion, and cognition.

**RADI 6021. Prin/Health Physics 2. 3 Credit Hours.****RADI 6022. Programming for Medical Physics. 1 Credit Hour.**

The purpose of the course is to demonstrate to students the usefulness of programming for medical physics. The Matlab programming language is chosen because it enables rapid coding and data visualization. Students will first be taught basic programming techniques. Then, they will be shown specific examples of these techniques being applied to medical physics. Finally, they will create a final program, which performs a task of the student's choosing and utilizes several concepts from the course. Students will be graded based on their attendance and programming projects. Must have familiarity with the field of medical physics.

**RADI 6023. Introduction To Clinical Medical Physics Practice. 1-9 Credit Hours.**

This course allows students to observe professional medical physicists in a clinical setting and learn the roles of various other medical professionals in the Radiology and Radiation Oncology medical clinic. Students participate in simple tasks related to medical physics data and are shown how to evaluate data to provide reports and tables. Students are also trained in basic safety and ethical issues in clinical medicine and the professional conduct of the medical physicist, following the guidelines established in AAPM Report 109. This material is intended to cover ethical issues in clinical medicine and in the professional conduct of the medical physicist. The term ethics is used here in the sense of a permissible standard of conduct for members of profession. While different people may have different opinions of what is ethical professions always have certain ethical standards or codes of conduct that are compiled in written form and are generally by practitioners. In addition to becoming familiar with written codes of conduct, the student shall be introduced to commonly encountered situations in which a choice of actions is available, some of which would be considered unethical and some of which be considered ethical, according to current standards of care of practice. These would include more specific issues that arise with respect to recent patient privacy concerns and legislation specific to the Health Insurance Portability and Accountability Act (HIPAA) and compliance both in clinical practice and research. A case-based approach in a seminar setting with class participation is utilized. This allows the student to put him or herself in the place of an individual who faces an ethical dilemma and to explore variations of the case that is presented. Other faculty members are also encouraged to attend, to offer comments, and to relate situations that they encountered either first- or secondhand.

**RADI 6024. Radiological Anatomy & Physiology. 3 Credit Hours.**

This course will provide students with an opportunity to learn anatomy, physiology, and commonly used medical terminology as it relates to radiologic imaging. Anatomic and physiologic features will be illustrated with radiologic images in formats commonly encountered in clinical radiology. By the end of the course, students are expected to be familiar with basic medical terminology and have a good understanding of medical anatomy, physiology, and some basic pathology as related to specific organs for which radiologic images are commonly applied.

**RADI 6025. Therapy Clinical Rotation 1. 10-12 Credit Hours.**

The first clinical rotation is designed to give an introduction and an overview of all the clinical processes and the basic safety training. In detail the student will cover the following topics: employee orientation, radiation oncology orientation, HIPAA training, introduction to radiation protection, introduction to nursing and introduction to simulation, introduction to LINACs, LINAC QA and warm up, monitor unit calculations, electronic medical records orientation, regulations and professional recommendations.

**RADI 6026. Clinical Therapy Rotation 2. 10-12 Credit Hours.**

In the second semester of the clinical rotation, the students will cover the following topics: on board MV and kV imaging, ExacTrac design, function and daily, monthly QA, Linac Annual QA and the RPC process, TBI and TSE, IMRT planning, LDR planning and the COMS eye plaque process, patient safety, and learn shielding techniques for CT, kV imaging, LINAC and isotopes.

**RADI 6027. Imaging Physics Clinical Rotation 1. 10-12 Credit Hours.**

The first clinical rotation is designed to give an introduction and an overview of all the clinical processes and the basic safety training. In detail the student will cover the following topics: employee orientation, clinical radiology department orientation, HIPAA & MIPPA training, introduction to safety in the radiology clinic, introduction to general radiography, introduction to hard copy devices and image displays, electronic medical records orientation, introduction to ultrasounds imaging, introduction to mammography, regulations and professional recommendations.

**RADI 6030. Physics Of Radiotherapy. 3 Credit Hours.**

Theory, design, and operation of radiation-producing equipment used in radiation therapy are introduced. Exposure and absorbed dose calculations, patient dosimetry, treatment planning, and use of computers in radiation therapy are covered.

**RADI 6031. Physics Measurements In Radiotherapy I. 3 Credit Hours.**

Performance of measurements on radiation therapy equipment used to determine therapy treatment parameters is the opportunity for study in this course.

**RADI 6032. Therapy Clinical Rotation 3. 10-12 Credit Hours.**

In the third semester of the clinical rotation, the students will cover the following topics: treatment plan checks, weekly chart checks, brachytherapy planning and QA, LINAC design, SRS Treatment Planning (SRS) and daily, monthly and annual QA, participation in all aspects of SBRT treatment and treatment planning QA.

**RADI 6033. Advanced Radiotherapy Physics. 3 Credit Hours.**

This course includes the coverage of advanced radiation therapy special topics: intensity modulated radiation therapy, advanced brachytherapy, and radiation therapy shielding.

**RADI 6034. Therapy Clinical Rotation 4. 10-12 Credit Hours.**

In the fourth semester of the clinical rotation, the students will cover the following topics: medical dosimetry rotation, ultrasound, PET, MRI, SPECT imaging in radiotherapy and acceptance and commissioning of major equipment.

**RADI 6035. Physics Measurements In Radiotherapy 2. 3 Credit Hours.**

In this course students will have the opportunity to gain further didactic and hands-on familiarity with radiation therapy measurement equipment (ion chambers, films, TLDs, water tanks, profilers, etc.) and learn daily clinical practices. Students will have the opportunity to learn the roles of a radiation oncology team, the generation of radiation therapy treatment plans, patient quality assurance, and advanced, specialized radiation therapy techniques. Learning can be accomplished through attendance of didactic lectures, homework assignments, presentations of class projects, and a comprehensive oral exam. Prerequisites: RADI 5005, RADI 6030, and RADI 6031.

**RADI 6038. Methods in Dosimetry & Shielding Design. 2.5 Credit Hours.**

The goal of the course is to teach students the guidelines established by the American Association of Physicists in Medicine (AAPM) and the National Council of Radiation Protection (NCRP) relating to patient dosimetry and shielding design of radiological facilities. Students will be responsible to read, comprehend, and learn the selected Task Group reports. Students will be evaluated of their knowledge by weekly quizzes and a final oral evaluation held at the end of the course. Successful completion of the course will be accomplished when the student is knowledgeable and understands the recommendations for a practicing clinical physicist. Learning is accomplished through attendance of weekly lectures, assignments (presentation of assigned reports and guidelines), and class discussion.

**RADI 6039. Imaging Physics Clinical Rotation 2. 10-12 Credit Hours.**

In the second semester of the clinical rotation, topics covered include safety in the radiological clinic, nuclear medicine and MRI, introduction to fluoroscopy, computed tomography, magnetic resonance imaging, nuclear medicine and regulations, professionalism and ethics.

**RADI 6040. Imaging Physics Clinical Rotation 3. 10-12 Credit Hours.**

The third clinical rotation will include safety in radiology clinic, advanced general radiography, advanced breast imaging and image-guided stereotactic breast biopsy, dental radiography and cone beam CT, dual-energy x-ray absorptiometry (DEXA), advanced fluoroscopic imaging and special procedures, intermediate nuclear medicine and regulations, professionalism and ethics.

**RADI 6042. Non-Ionizing Radiation Biology. 1-9 Credit Hours.**

This course is an overview of the biological and known or potential health effects of non-ionizing radiation, with attention to radio frequency radiation in the microwave range, extremely low frequency (ELF) field exposures, LASER emissions, and ultraviolet (UV) light exposure.

**RADI 6043. Imaging Physics Clinical Rotation 4. 10-12 Credit Hours.**

The fourth clinical rotation will include safety in radiology clinic, imaging informatics, advanced imaging informatics, advanced magnetic resonance imaging, advanced nuclear medicine physics, regulations, professionalism and ethics.

**RADI 6049. Intro To Magnetic Resonance. 2 Credit Hours.**

This course presents the basics of the practice of magnetic resonance as the experimentalist or clinician first meets them. The approach begins with images, equipment, and scanning protocols. The student will have the opportunity to face issues pertinent to practice with theoretical background added as experience grows. Through this approach, key ideas are introduced in an intuitive style that is faithful to the underlying physics.

**RADI 6050. Magnetic Resonance Imaging. 2 Credit Hours.**

This course explores the physics of magnetic resonance image formation through discussion of imaging problems, reviews of current research topics with an emphasis on quantitative methods using MRI, and hands-on experience in MRI laboratories. Prerequisites: RADI 6049.

**RADI 6051. Statistical Parametric Mapping. 3 Credit Hours.**

Course content includes principles of NMR Spectroscopy as applied to the resolution of molecular structural problems in chemistry, biology, and medicine; and principles and methods for designing BOLD contrast MRI experiments and evaluating fMRI data.

**RADI 6054. Introduction to Statistical Learning. 2 Credit Hours.**

Machine learning and artificial intelligence (AI) are becoming increasingly common tools for image data analysis and image interpretation. AI methods are also being developed for treatment planning. This short, intensive course is designed to give the student an introduction to the principal methods of statistical learning that underlie artificial intelligence algorithms. Students will learn how to use the R statistical programming language to work through statistical learning exercises both in-class and in homework assignments. Course will be taught 2 hours per day for 3 days per week in July and August. Topics covered will include, Classification Schemes, Resampling Methods, Linear Model Selection and Regularization, Tree-Based Methods, Support Vector Machines, and Unsupervised Learning. Prerequisites: Completion of RADI 5007, Statistics in the Radiological Sciences; Familiarity with R statistical programming environment. Open for Cross Enrollment on Space Available Basis.

**RADI 6060. Biophotonics and Optical Imaging. 3 Credit Hours.**

Optical methodologies for imaging, diagnosis, and therapy are rapidly advancing in biology and medicine. This course will review basic elements of optics and optical sources, especially lasers and light-emitting solid state devices, in the context of biomedical applications. Dosimetry, tissue optics, and the principles of laser-tissue interaction will be considered in depth. Current medical uses of lasers will be surveyed, along with their scientific and technical foundations. The course will conclude with several case studies of research areas that are currently hot topics in biomedical optics.

**RADI 6062. Cognitive Neuroscience. 3 Credit Hours.**

Cognitive Neuroscience deals with the neural basis of cognition and behavior, including considerations of perception, attention, motor control, language, learning, memory, executive function, spatial cognition, emotion, and social cognition. It also presents discussions on neurocognitive development and the evolution of the human brain. Unlike courses in basic neuroscience, this course has a more human focus, presenting in-depth discussions of neuroimaging techniques and literature. In addition, it focuses on psychological models of cognitive function derived from psychological experimentation, human lesion studies, and computational modeling. Cognitive Neuroscience presents an integrated view of the psychology and neurobiology of human cognition and behavior. By the end of the semester, students will have had the opportunity to: (1) become highly familiar with the structure of the human nervous system; (2) become conversant about the physical basis and limitations of neuroimaging techniques; (3) become familiar with the principal brain areas thought to be involved in a host of human cognitive competencies and behaviors, including perception, action, emotion, and language; and (4) understand how psychological theory and neural theory come together to form the foundation of cognitive neuroscience.

**RADI 6071. Supervised Teaching. 1-12 Credit Hours.**

This course is a presentation of lectures and supervised teaching under the direction of faculty.

**RADI 6091. Special Topics. 1-12 Credit Hours.**

This course covers topics of special interest which may include emerging and new modalities in radiological sciences relating to x-ray, nuclear, or magnetic imaging.



**RADI 6097. Research. 1-12 Credit Hours.**

This course is supervised research under the guidance of a faculty member.

**RADI 6098. Thesis. 1-12 Credit Hours.**

Registration for at least two terms is required for M.S. candidates.

Prerequisites: admission to candidacy for the Master of Science degree.

**RADI 7000. Off Campus. 4 Credit Hours.**

All off campus rotations must be approved by the designated faculty member prior to the beginning of the rotation (at least one week before the course begins). Credit will not be given for any rotation that has not been approved in advance. Required paperwork includes: "Course Approval" form, a written letter or email for acceptance from the physician preceptor with the start and end dates of the course/rotation, and a course description of your learning objectives and responsibilities during the rotation. Forms must include a complete address and telephone number for the off campus location or residence address for the student while at the off campus site. Forms will not be approved after the rotation has already begun. Contact the department for assistance with enrolling in this course.

**RADI 7005. Treatment Planning Techniques In Radiation Therapy. 3 Credit Hours.**

The goal of the course is to provide an overview of the physics and clinical elements that contribute to the development of computerized treatment plans in radiation therapy. The commissioning and acceptance testing of a planning system will be discussed and demonstrated in several planning platforms. Anatomy specific treatment planning will be described, including imaging of the specific disease, as well as contouring and plan development. Multiple plans will be generated for each site using different planning modalities, such as 2D, 3D, and IMRT.

**RADI 7006. Treatment Planning Techniques in Radiotherapy 2. 3 Credit Hours.**

This course is a continuation of RADI 7005. It presents an in-depth study of multidisciplinary treatment of the cancer patient from the clinician's viewpoint. Students are required to master concepts specific to site-specific disease including: histopathology, etiologic and epidemiology factors, detection and diagnosis, tumor stage and grade, routes of metastases, dose fractionation and prognostic factors. This course is designed to approach each cancer type by anatomic system, addressing treatment factors with increasing degrees of complexity. Assigned exercises organized by treatment site and procedure type will be carried out under the direct supervision of an assigned advisor. These will be both simulated and real case assignments. The course is taught as a didactic course with applied planning. Didactic instruction will be provided by medical residents while practical planning instruction will be applied by a medical dosimetrist.

**RADI 7010. Motor Learning And Brain Imaging. 3 Credit Hours.**

This course is designed for the advanced student (doctoral or postdoctoral) to obtain a comprehensive overview of the field of motor learning from behavioral and brain imaging perspectives. Topic coverage will include general motor learning and speech motor learning (with reference to treatment of motor speech disorders). The course will be structured in a seminar format. The course will explore measurement methods and issues in motor learning and the neural substrates of learning in intact and disordered subject groups.

**RADI 7077. Ethics, Leadership and Vision. 2 Credit Hours.**

This foundational course introduces students to the core ethical content necessary for responsible research conduct. It will also provide basic knowledge on negotiations, professionalism, leadership, effective communication, etc. Open for Cross Enrollment on Space Available Basis.

**RADI 7099. Dissertation. 1-12 Credit Hours.**

Registration for at least one term is required for Ph.D. candidates.

Prerequisites: admission to candidacy for Doctor of Philosophy degree.