A. Instructional Staff

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**B. Course Information**

**Prerequisites:** Medicinal Chemistry 532, or permission of instructor

**Course Website:**

**Course E-mail Group:**

**C. Course Schedule**

**General Course Information**

**Class Meeting Days:** Tue and Thu
**Time:** 1-2 PM (1-3PM double lecture)
**Room:** 1567 Pharmacy
### D. Course Description and Objectives

**Course Description**

This course consists of a general survey of principal therapeutic agents in clinical use today with an emphasis on their origin, associated diseases, chemical structure, basic structure-activity relationships (SAR), molecular mechanism of action and pharmacology. The overall and therapeutic area (TA) objectives are delineated below.

**Learning Objectives:**

- Develop an appreciation of the *origin* of principal therapeutic agents for each TA.
- Associate disease phenotype with pharmacology and mechanism of action.

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<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Topic</th>
<th>Faculty</th>
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</thead>
<tbody>
<tr>
<td>Thu</td>
<td>Jan 10</td>
<td>Intro - Diabetes &amp; Obesity Drugs</td>
<td>White/Bridges</td>
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<tr>
<td>Tue</td>
<td>Jan 15</td>
<td>Diabetes &amp; Obesity Drugs</td>
<td>Bridges</td>
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<td>Thu</td>
<td>Jan 17</td>
<td>Central Nervous System Drugs</td>
<td>White</td>
</tr>
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<td>Tue</td>
<td>Jan 22</td>
<td>Diabetes &amp; Obesity Drugs</td>
<td>Bridges</td>
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<td>Jan 24</td>
<td>Central Nervous System Drugs</td>
<td>White</td>
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<tr>
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<td>Jan 29</td>
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<td>White</td>
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<td>Thu</td>
<td>Jan 31</td>
<td>Antiviral drugs</td>
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<tr>
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<tr>
<td>Tue</td>
<td>Feb 14</td>
<td>Oncology</td>
<td>Grembecka</td>
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<td>Feb 26</td>
<td>Oncology</td>
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<td>Thu</td>
<td>Feb 28</td>
<td>Exam 1</td>
<td>White</td>
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<td>Mar 2 – 10 Winter Break</td>
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<tr>
<td>Tue</td>
<td>Mar 12</td>
<td>Antibacterial Drugs 1-3PM</td>
<td>Showalter</td>
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<td>Antibacterial Drugs</td>
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<td>Tue</td>
<td>Mar 19</td>
<td>535 1-3</td>
<td>Larsen</td>
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<td>Thu</td>
<td>Mar 21</td>
<td>No class for MC533</td>
<td>White</td>
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<td>Tue</td>
<td>Mar 26</td>
<td>Antiparasitic Drugs</td>
<td>Carruthers</td>
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<tr>
<td>Thu</td>
<td>Mar 28</td>
<td>Antiparasitic Drugs</td>
<td>Carruthers</td>
</tr>
<tr>
<td>Tue</td>
<td>Apr 2</td>
<td>Cardiovascular Drugs</td>
<td>Sliskovic</td>
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<td>Sliskovic</td>
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<td>Sliskovic</td>
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<td>Thu</td>
<td>Apr 11</td>
<td>Anti-inflammatory Drugs</td>
<td>Visnick</td>
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<tr>
<td>Tue</td>
<td>Apr 16</td>
<td>Anti-inflammatory Drugs</td>
<td>Visnick</td>
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<td>Thu</td>
<td>Apr 18</td>
<td>Anti-inflammatory Drugs</td>
<td>Visnick</td>
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<td>Tue</td>
<td>Apr 23</td>
<td>Exam II</td>
<td>White</td>
</tr>
<tr>
<td>Thu</td>
<td>Apr 25</td>
<td>First day of Exams</td>
<td></td>
</tr>
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</table>
• Recognize common TA structural pharmacophores and have a basic structure activity relationship.
• Understand the strengths and weaknesses of different TAs in terms of disease/symptom treatment.
• Understand “state of the art” translation to man for the TAs from discovery to the clinic.
• Retrieve and interpret data from a critical reading of the academic and patent literature to define the development path and key hurdles overcome in the creation of a new marketed drug for a selected TA.
• Work as an interdisciplinary team to critically analyze translation to the clinic for a specified TA and suggest strengths and weaknesses of drug discovery approaches for areas of key medical need in a specified TA.

• **Nervous System Drugs** - This module will provide an overview of the major disease states of the central nervous system including neurodegenerative diseases, pain, substance dependence, anxiety, depression, and psychosis. CNS disease mechanisms and therapeutic protein targets will be discussed in the context of the historical discovery and evolution to the therapeutic agents in use today.

• **Antibiotics** - This module will cover structures, mechanisms of action and resistance, clinical indications, and prominent adverse effects for the major classes of antibacterial drugs in use today.

• **Antiviral Agents** - The lectures will give an overview of all antiviral drugs approved by the U.S. Food & Drug Administration and the diseases they treat. General principles of how antiviral drugs specifically target viral, not cellular, functions will be presented. Selected antiviral drugs that are used to treat infections caused by herpes, influenza, hepatitis, and human immunodeficiency viruses will be studied in detail.

• **Anticancer Agents** – This module will begin with a summary of the scope of the cancer problem, risk factors and how cancer is caused, and introduce the concepts of oncogenes and tumor suppressor genes as potential sources of cancer drug targets. Additional lectures will describe the predominant classes of anticancer drugs and structural and mechanistic details of the major cancer drugs available today. The last (class participation) session will discuss emerging, but still unproven, strategies for intervention that may play a major role in cancer treatment in the future.

• **Antiparasitic Drugs** – The lectures will give an overview of the principal antiparasitic drugs approved by the U.S. Food and Drug Administration and the diseases they treat. Current challenges including drug resistance, animal reservoirs, compliance and parasitic dormancy, along with the efforts to eradicate certain helminth parasitic infections will be discussed.

• **Cardiovascular System Drugs** - This module will cover physiology, structures, mechanisms of action, and prominent adverse effects of drugs for the diseases of hypertension, thrombosis and atherosclerosis.
• **Anti-Inflammatory Drugs** - Inflammation is a complex biological process, essential for the survival of an organism in responding to pathogens and cellular injury. However, systemic, chronic inflammation is the hallmark of many debilitating diseases including cancer, arthritis, asthma, Alzheimer’s and chronic kidney disease. This module will provide an overview of the inflammatory process, our current understanding of its role in the above diseases, and how modern medicines are used to modulate inflammation and improve patient quality of life. Finally, we will discuss the fascinating field of traditional medicines from herbal supplements to Ginseng and fish oils, how they control oxidative stress and inflammation at the cellular and molecular level, and where these exciting insights may lead to the discovery and development of the medicines of the future.

• **Diabetes/Obesity Drugs** - The lectures will start with a discussion as to why obesity is becoming such a serious health problem, and after a discussion of mechanisms of weight control will look at why there are so many pharmacological approaches, but very few approved drugs for obesity. Diabetes will then be discussed, along with its strong correlation with obesity. Mechanisms of insulin sensitivity will be explored, and both marketed and experimental drugs for diabetes will be surveyed.

E. **College of Pharmacy Ability Based Outcomes**

Not Applicable

F. **Class Expectations**

• **Academic integrity** - students are expected to abide by the College of Pharmacy Code of Conduct as it relates to all aspects of academic integrity. This includes, but is not limited to procedures expected of students while taking an in-class exam/quiz.

• **Special needs** - students with special needs are required to communicate with one of the course co-directors about special needs before classes begin.

• **Questions/concerns** - students should direct questions about a specific topic or exam/homework on that topic to the individual faculty teaching the subject. Questions or concerns such as absence from exams, illness, course logistics or other problems that the student may have in the course should be directed to one of the course co-directors.

• **Attendance** – class attendance is required, except for illness/emergency or prearranged absences.

• **Cell Phones/Pagers** – are allowed, but should be set on silent/vibrate mode. Cell phone use during an exam is only for emergencies and the instructor/proctor must be informed immediately.

• **Headphones** – are not allowed.
• **Laptop Policy** – are allowed for note taking, but not for other activities during class. Not allowed during exams.

### G. Examinations and Grading

#### Exams

<table>
<thead>
<tr>
<th>Date</th>
<th>Exam Type</th>
<th>Topics</th>
<th>Proctor</th>
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</thead>
<tbody>
<tr>
<td>Feb 28</td>
<td>Midterm Exam I</td>
<td>Antiviral, Diabetes/obesity, antivirals, Nervous system drugs, cancer</td>
<td>White, proctor</td>
</tr>
<tr>
<td>Apr 23</td>
<td>Exam II</td>
<td>Antibiotics, Antiparasitic, Cardiovascular, Inflammation</td>
<td>White, proctor</td>
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</tbody>
</table>

The grade for the course will be determined by three (3) independent exams of 100 points each. The final grade will be derived by weighting each exam (or take home) based on the total number of lectures given within each module. The chart below outlines the weighting process:

#### EXAM I

<table>
<thead>
<tr>
<th>Name</th>
<th>Lectures</th>
<th>Exam Questions</th>
<th>Total Lectures</th>
<th>Total Points</th>
<th>Weighting</th>
</tr>
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<tbody>
<tr>
<td>Andy White</td>
<td>3 lectures</td>
<td>23</td>
<td>13</td>
<td>100</td>
<td>(13/23)</td>
</tr>
<tr>
<td>Alex Bridges</td>
<td>3 lectures</td>
<td>23</td>
<td>13</td>
<td>100</td>
<td>(13/23)</td>
</tr>
<tr>
<td>Peter Toogood</td>
<td>3 lectures</td>
<td>23</td>
<td>13</td>
<td>100</td>
<td>(13/23)</td>
</tr>
<tr>
<td>Jolanta Grembecka</td>
<td>4 lectures</td>
<td>31</td>
<td>13</td>
<td>100</td>
<td>(13/23)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13 lectures</strong></td>
<td><strong>100 points</strong></td>
<td><strong>13</strong></td>
<td><strong>100 points</strong></td>
<td><strong>(13/23)</strong></td>
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</table>

#### EXAM II

<table>
<thead>
<tr>
<th>Name</th>
<th>Lectures</th>
<th>Exam Questions</th>
<th>Total Lectures</th>
<th>Total Points</th>
<th>Weighting</th>
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<tr>
<td>Hollis Showalter</td>
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<td>Vern Carruthers</td>
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<td>100</td>
<td>(10/23)</td>
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<tr>
<td>Bob Sliskovic</td>
<td>3 lectures</td>
<td>27</td>
<td>11</td>
<td>100</td>
<td>(10/23)</td>
</tr>
<tr>
<td>Mike Visnick</td>
<td>3 lectures</td>
<td>27</td>
<td>11</td>
<td>100</td>
<td>(10/23)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11 lectures</strong></td>
<td><strong>100 points</strong></td>
<td><strong>11</strong></td>
<td><strong>100 points</strong></td>
<td><strong>(10/23)</strong></td>
</tr>
</tbody>
</table>

**TOTAL POINTS USED TO DETERMINE FINAL GRADE**

<table>
<thead>
<tr>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
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</tbody>
</table>

#### Exam Grading

Exams will be graded as quickly as possible. Following the return of the graded exam, you will have one week to look over the exam and return it for regrading if needed. Exams will not be regraded if returned after the announced deadline. When returning exams for regrading, indicate which questions you want regraded and state clearly in writing why you feel the question was misgraded.

#### Final Course Grades

The letter grade for the course will be based on a curve, with the class average set to the border between B+ and A-.
H. **Recommended Resources**

The course will be taught from on-line and course pack materials. The following resources are recommended for the course, but not required:

**Shapiro Science Library – Online Reference Collection:**
- *Burger’s Medicinal Chemistry and Drug Discovery*, Donald J. Abraham, ed.; Wiley,
- Online ISBN: 9780471266945  DOI: 10.1002/0471266949