Subject Description Form

Subject Code	ABCT5102
Subject Title	Pharmacology and Toxicology in Biotherapeutics
Credit Value	3
Level	5
Pre-requisite	Nil
Co-requisite	Nil
Exclusion	Nil
Objectives	1. To provide students with a thorough understanding of the basic principles of pharmacology, including drug absorption, distribution, metabolism, and excretion (ADME), and pharmacodynamics. 2. To enable students to analyze the mechanisms of action and therapeutic applications of drugs acting on the autonomic nervous system, cardiovascular system, respiratory system, and central nervous system. Students will learn to correlate drug mechanisms with their clinical uses. 3. To educate students on the principles of drug safety, pharmacovigilance, and the identification and management of drug side effects and adverse reactions. This will prepare them to assess and mitigate risks associated with drug therapies. 4. To introduce students to chemotherapeutic agents and biologics, their mechanisms of action, therapeutic uses, and challenges in development and use. This includes understanding the role of these agents in treating various diseases. 5. To provide students with a comprehensive understanding of the drug development process, including preclinical studies, clinical trial phases, regulatory requirements, and ethical considerations. This knowledge is crucial for navigating the path from drug discovery to market approval.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) Understand the principles of pharmacology, including absorption, distribution, metabolism, and excretion (ADME) of drugs. b) Explain the fundamentals of pharmacodynamics, including drug receptors and dose-response relationships. c) Describe the mechanisms and effects of drugs acting on the autonomic nervous system, cardiovascular system, respiratory system, and central nervous system. d) Assess drug safety, side effects, and the role of chemotherapeutic agents and biologics in treatment. e) Understand the drug approval process, including an overview of clinical trial phases and the use of animals in research and alternative medicine.

Subject Synopsis/ Indicative Syllabus	**Introduction to Pharmacology: ADME** • Principles of absorption, distribution, metabolism, and excretion (ADME) of drugs. • Factors affecting drug bioavailability and pharmacokinetics. • Case studies illustrating ADME principles. **Fundamentals of Pharmacodynamics** • Drug-receptor interactions and signaling pathways. • Dose-response relationships and therapeutic index. • Concepts of agonists, antagonists, and drug efficacy. **Drugs Acting on the Autonomic Nervous System** • Pharmacology of autonomic drugs: cholinergic and adrenergic agents. • Mechanisms of action and therapeutic uses. • Side effects and contraindications of autonomic drugs. **Drugs Acting on the Cardiovascular System** • Pharmacological treatment of hypertension, angina, heart failure, and arrhythmias. • Mechanisms of action of cardiovascular drugs: beta-blockers, calcium channel blockers, diuretics, and ACE inhibitors. • Clinical case studies and treatment guidelines. **Drugs Acting on the Respiratory System** • Pharmacotherapy for asthma, COPD, and other respiratory conditions. • Mechanisms of action of bronchodilators, corticosteroids, and leukotriene modifiers. • Side effects and clinical considerations. **Drugs Acting on the Central Nervous System** • Pharmacological treatment of CNS disorders: depression, anxiety, schizophrenia, and epilepsy. • Mechanisms of action of CNS drugs: antidepressants, antipsychotics, anxiolytics, and anticonvulsants. • Case studies and patient management strategies. **Drug Safety and Side Effects** • Principles of drug safety and pharmacovigilance. • Common drug side effects and adverse drug reactions. • Risk assessment and management strategies. **Chemotherapeutic Agents and Biologics** • Overview of chemotherapeutic agents: anticancer drugs and antibiotics. • Mechanisms of action and resistance. • Introduction to biologics: monoclonal antibodies, vaccines, and gene therapy. **Animals in Research and Alternative Medicine** • Ethical considerations and regulations in the use of animals in research. • Alternatives to animal testing: in vitro and in silico methods. • Overview of alternative medicine and its integration with conventional therapies.
Teaching/Learning Methodology	Lectures, tutorial, written assignments presentations, examination 1. In-class participation – Students are expected to attend the classes and participate in the in-class activities including discussion and quizzes. 2. Written Assignments – Students will be asked to write an essay on a selected topic. They will be assessed on their understanding of the topic's content. In their essays, students must also express their own opinions to demonstrate their problem-solving skills and critical thinking abilities.

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<tr><td></td><td>3. Midterm and final Examination - Written exams assess how much students have learned about the concepts of modern pharmacology and drug development, as well as the challenges and successes in drug and biopharmaceutical development. Writing skills will be assessed in all the assessment methods.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% (weighting)</td><td colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>1. In-class participation</td><td>10</td><td>√</td><td></td><td>√</td><td>√</td><td></td></tr>
<tr><td>2. Midterm</td><td>25</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>3. Written Assignments</td><td>20</td><td>√</td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Final Examination</td><td>45</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="5"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:
Students are allowed to use GenAI tools to support their writing of and essays. If GenAI tools are used to support their essay writings, students must declare the use of such tools and how they have been used in the assessments. It should be noted that submitting a work generated by GenAI, in part or in whole, as your own (even in paraphrased form) constitutes an act of academic dishonesty; it is no different from asking another person to write your assignment or claiming others' ideas as yours.
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>26 Hrs.</td></tr>
<tr><td>▪ Tutorial</td><td>13 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Assignment and presentation</td><td>15 Hrs.</td></tr>
<tr><td>▪ Self study</td><td>63 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>117 Hrs</td></tr>
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<tr><td>Reading List and References</td><td>
1. Katzung, B. (2021). Basic & Clinical Pharmacology (15th ed.). McGraw-Hill. ISBN: 9781260452310.
2. Stine, K. E., & Brown, T. M. (2015). Principle of toxicology (3rd ed.). ISBN: 9781466503427.
3. Di, L. (2016). Drug-like properties: Concepts, structure design, and methods from ADME to toxicity optimization (2nd ed.). Elsevier. ISBN: 0128010762.
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