

<b>Academic Year</b>	2022/23	<b>Semester</b>	2
<b>Course Coordinator</b>	Xing Bengang		
<b>Course Code</b>	CM4053		
<b>Course Title</b>	Pharmaceutical Chemistry		
<b>Pre-requisites</b>	(CM1031 and CM1051 and CM2011 and CM2031 and CM3031) or (BS1003 and BS1005 and CM2011 and CM2031 and CM3031) or (BS1003 and CM1051 and CM2011 and CM2031 and CM3031) or (BS1005 and CM1031 and CM2011 and CM2031 and CM3031) or (CM1002 and CM2011 and CM2031 and CM3031) or by permission		
<b>Mutually Exclusive</b>	CM4016 <sup>1</sup>		
<b>No of AUs</b>	3		
<b>Contact Hours</b>	Lectures: 39 hours (13 weeks x 3 hours per week)		
<b>Proposal Date</b>	4 June 2022		

### Course Aims

Pharmaceutical Chemistry is one interdisciplinary course to train the chemistry students in pharmacology and the biomedical sciences. In this course, the students will learn how the drug molecules will sustain their activities, their basic metabolism process, the essential pharmacokinetics and pharmacodynamics of drugs, biomedical analysis assay, biomedical microbiology and the antibiotic bacterial inactivation, basic concepts in clinical antitumor treatment. Moreover, brand new techniques in biomedical molecular imaging, and functional nanotechnology in nano-medicine will be also extensively covered in this class.

### Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

1. Identify the basic concept of drug-bio-receptors interactions and explain their activity mechanism.
2. Explain and apply the concept of pharmacokinetics, pharmacodynamics to drug molecule in pharmaceutical industry.
3. Describe the metabolism of drug processing during the treatment.
4. Interpret and predict the biological pathways during the diseases therapy (For example, in the area of Antitumor and bacterial inactivation).
5. Illustrate and describe the principles of pharmacogenetics.
6. Describe and judge applicability of new modalities for biomedical sensing and imaging in a range of pharmaceutical chemistry situation.
7. Explain the future perspective of functional nanomaterials towards biomedical applications: Drug Delivery, diseases therapy and diagnostics (theranostics).

### Course Content

<sup>1</sup> Replaced course

1. Introduction of pharmaceutical chemistry
2. General Concept of Drug Metabolism
3. Pharmacokinetics and Pharmacodynamics
4. Principles of Pharmacogenetics I and II
5. Anticancer therapeutics
6. Antibiotics and Biomedical Microbiology
7. Biomedical Fluorescent Imaging
8. Nanomedicine

**Assessment (includes both continuous and summative assessment)**

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/Individual	Assessment Rubrics
1. Final Examination	1-7	Competence, written communication	60%	Individual	Point-based marking (not rubrics based)
2. Continuous Assessment 1 (CA1): Midterm Test	1-3	Competence, written communication	20%	Individual	Point-based marking (not rubrics based)
3. Continuous Assessment 2 (CA2): Quizzes	1-7	Competence, written communication creativity	20%	Individual	Point-based marking (not rubrics based)
Total			100%		

<http://www.ntu.edu.sg/tlpd/tlr/obt/4/Pages/41.aspx>

**Formative feedback**

Describe how you would be giving feedback to students on how they are learning in this course.

- Quiz questions will be frequently given during lectures to monitor the progression of the students, if concepts, are misunderstood will be immediately clarified in the class.
- Mass tutorial will also be given in class to ensure students have sufficient practice and clarifying possible queries that they may have.

**Learning and Teaching approach**

Approach	How does this approach support students in achieving the learning outcomes?
Quiz questions after lecture	Students will be required to answer quiz questions assigned during formal lectures. This approach will allow students to exercise their critical thinking skills and help them actively learn the new concept and information.
Video animations	Using animation, video, or movie to illustrate certain concepts in class. This will function as an effective tool to simplify complicated theory for

better understanding of the students.

<http://www.ntu.edu.sg/tlpd/tlr/obtl/4/Pages/41.aspx> - 44

### Reading and References

1. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry 12<sup>th</sup> ed. J. M. Beale Jr & J. H. Block ed. (on-line version only) By Lippincott Williams & Wilkins, 2010, ISBN-13: 978-0781779296
2. Foye's Principles of Medicinal Chemistry, Ed. by David Williams 2012. Edition 7<sup>th</sup>.) By Lippincott Williams & Wilkins, 2012 ISBN-13: 978-1609133450
3. Materials will also be chosen from the latest literatures.

### Course Policies and Student Responsibilities

#### (1) General

*Students are expected to attend all lectures punctually and take all scheduled quizzes and tests by due dates. Students are expected to participate in all lectures discussions and activities.*

#### (2) Absenteeism

*Students who are absent without a valid reason during the midterm will definitely affect his overall grades. A make up test is possible if valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.*

### Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

### Course Instructors

Instructor	Office Location	Phone	Email
XING Bengang	SPMS-CBC-04-020	(65) 6316 8758	<a href="mailto:bengang@ntu.edu.sg">bengang@ntu.edu.sg</a>

### Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
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1	Introduction to Pharmaceutical Chemistry	1,2	#
2	Pharmacodynamic and Pharmacokinetics	1,2	#
3	Pharmacodynamic and Pharmacokinetics	3	Quiz 1
4	General concept of Drug Metabolism	4	#
5	General concept of Drug Metabolism	4	Quiz 2
6	Anticancer Therapeutics	5	#
7	Anticancer Therapeutics	5	Quiz 3
	Recess		
8	Antibiotics and biomedical microbiology	5	MT1
9	Principles Pharmacogenetics I	6	#
10	Principles Pharmacogenetics II	6	Quiz 4
11	Biomedical fluorescent imaging	7	#
12	Biomedical fluorescent imaging	7	Quiz 5
13	Nanomedicine	7	#

# Pre/Post-lecture reading assignments.

MT1 Midterm- to be conducted during class

## CBC Programme Learning Outcome

The Division of Chemistry and Biological Chemistry (CBC) offers an undergraduate degree major in Chemistry that satisfies the American Chemical Society (ACS) curricular guidelines and equips students with knowledge relevant to the industry. Graduates of the Division of Chemistry and Biological Chemistry should have the following key attributes:

### **1. Competence**

Graduates should be well-versed in the foundational and advanced concepts of chemical science, be able to evaluate chemistry-related information critically and independently, and be able to use complex reasoning to solve emergent chemical problems.

### **2. Creativity**

Graduates should be able to synthesize and integrate multiple ideas across the curriculum, and propose innovative solutions to emergent chemistry-related problems based on their training in chemistry.

### **3. Communication**

Graduates should be able to demonstrate clarity of thought, independent thinking, and sound scientific analysis and reasoning through written and oral reports to audiences with varying technical backgrounds. They should also be able to effectively engage other professional chemists in collaborative endeavours.

### **4. Character**

Graduates should be able to act in responsible ways and uphold the high ethical standards that the society expects of professional chemists.

### **5. Civic-mindedness**

Graduates should be aware of the impact of chemistry on society, and how chemistry can be applied to benefit mankind. They should also be aware of and uphold the best chemical safety practices.