Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

The sections shown on this interface are based on the templates [UG OBTL+](#) or [PG OBTL+](#)

If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to [Data Transformation Status](#) for more information.

Expected Implementation in Academic Year	AY2024-2025
Semester/Trimester/Others (specify approx. Start/End date)	Semester 2
Course Author * Faculty proposing/revising the course	Dr Subramanian Venkatraman
Course Author Email	msegraduate@ntu.edu.sg
Course Title	Innovation in Medical Devices & Nanomedicine
Course Code	MS6008
Academic Units	1
Contact Hours	13
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course introduces innovation in medical devices and nanomedicine, with a focus on student startups in these areas. Fundamentals of technologies for therapeutics and diagnostics will be presented, with case studies. Venture creation, patents and licensing aspects, as well as prototyping options will be covered with guest lecturers. The overall aim is to inspire students to start medical device and nanomedicine companies in Singapore, and to equip them with the basic tools for successful commercialization.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Understand the key medical technologies for therapeutics and diagnostics: unmet needs; Appreciate how some ideas succeed in the marketplace, using case studies of succesful companies in Nanomedicine/therapeutic devices/robotics/diagnostics.
ILO 2	Evaluate and assess the role of Patents in Medical Devices and Nanomedicine: how and what to patent where; the licensing options for startups.
ILO 3	Explore the possible funding options for startups, including venture financing.
ILO 4	Learn how to use prototyping options for medical devices and nanomedicine, including outsourcing and in vitro in vivo correlations.
ILO 5	Appreciate the complexities of clinical trials, and outcomes as well as the regulatory pathways for new devices.
ILO 6	Prepare a business pitch for a new venture.

Course Content

The content of the course includes case studies of medical devices and nanomedicine; an overview of medical needs; patenting basics; prototyping of devices; regulatory aspects; of diagnostics and therapeutics; fundamentals of financing new ventures; options available in Singapore; and the elements of a successful business pitch.

Reading and References (if applicable)

- Burgess, R. (2018). Understanding Nanomedicine: An Introductory Textbook. Pan Stanford Publishing, an imprint of Pan Stanford.
- Various review papers; patent examples; licensing examples (TBC).

NOTE: The above listing comprises the foundational readings for the course and more up-to-date relevant readings will be provided when they become available.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Technologies for medical devices; unmet needs	1	Review paper (TBC)	In-person	Lecture 1
2	Intro to Nanomedicine	1	Understanding Nanomedicine/R Burgess/Pan Stanford, 2018	In-person	Lecture 2
3	Basics of patenting	2	Review paper (TBC)	In-person	Lecture 3
4	Standard licensing terms	3	Review paper (TBC)	In-person	Lecture 4
5	Regulatory aspects of devices and nanomedicine	5	Review paper (TBC)	In-person	Lecture 5 / Guest Lecture 1 (Alfred Chia)
6	Financing a startup in Singapore	5,6	Review paper (TBC)	In-person	Lecture 6 / Guest Lecture 2 (Ng Xu Wen)
7	Case study 1: Robotics	1,2	N/A	In-person	Lecture 7 / Guest Lecture 3 (Domenico Campagnolo)
8	CA1: Group Written Proposal (review and feedback)	1,2,4	Review paper (TBC)	In-person	Submission of CA1: Group Written Proposal
9	Case study 2: Stents	1,2,4	Review paper (TBC)	In-person	Lecture 8
10	Case study 3: Covid-19 Vaccines	1,2,4	Review paper (TBC)	In-person	Lecture 9

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
11	Case study 4: Covid-19 diagnostic	1,2,4	Review paper (TBC)	In-person	Lecture 10 / Guest Lecture 4 (Prof Peter Preiser)
12	Case study 5: OTC Diagnostics	4	N/A	In-person	Lecture 11 / Guest Lecture 5 (Kate Qi)
13	CA2: Group Recorded Presentation (review and feedback)	1-6	N/A	In-person	Submission of CA2: Group Recorded Presentation (Business Pitch)

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Blended learning with active use of multi-media resources (TEL)	This will permit flexibility of access to learning materials, activities and assessments and can help you develop independent learning and critical thinking skills.
Showing real-world applications	Most of the concepts that are dealt in the course have real-world implications and applications. Therefore, they are used as examples while discussing the related concepts.
Weekly Consultation	Weekly consultation hours will be available to encourage discussions that will reinforce students' understanding on various concepts and applications. Instead of providing answers directly to students' queries, they will be guided to think and make intelligent guesses based on sound principles. This approach will cultivate critical thinking.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Assignment(Continuous Assessment (CA) 1: Individual In-Class Assignments)	1-6		25	Individual	Holistic	Multistructural
2	Continuous Assessment (CA): Report/Case study(Continuous Assessment (CA) 2: Group Written Proposal)	1-6		25	Team	Holistic	Multistructural
3	Continuous Assessment (CA): Presentation(Continuous Assessment (CA) 3: Group Recorded Presentation (Business Pitch))	1-6		50	Team	Holistic	Multistructural

Description of Assessment Components (if applicable)

Continuous Assessment (CA) 1: Individual In-Class Assignments
Students will be given an in-class assignment after all guest lectures. Students are required to submit a short essay (100-200 words) reflecting on the theories and skills they have learnt from the industry experts with analysis on how they can apply their new knowledge in their final group presentation.

Continuous Assessment (CA) 2: Group Written Proposal
Each group will submit a written proposal for their group presentation (business pitch) at the end of the semester.

Continuous Assessment (CA) 3: Group Recorded Presentation (Business Pitch)
Group presentation will be a business pitch based on any patent or technology listed on the NTUitive website. The presentation will be recorded. Submit recorded presentation in week 13.

Formative Feedback

- In-video tutorial classes and discussions / feedback during group presentations
- You are encouraged to drop by coordinator's office during the consultation hours to browse through your papers and discuss any issues, if needed.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
Adaptability	Intermediate
Collaboration	Intermediate
Communication	Advanced
Creative Thinking	Basic

Course Policy

Policy (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. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (General)

You are expected to complete all assigned readings, activities, assignments, attend all classes punctually and complete all scheduled assignments by due dates. You are expected to take responsibility to follow up with assignments and course related announcements. You are expected to participate in all project critiques, class discussions and activities.

Policy (Absenteeism)

In-class activities make up a significant portion of your course grade. Absence from class without a valid reason will affect your participation grade. 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. There will be no make-up opportunities for in-class activities.

Policy (Others, if applicable)

Last Updated Date: 11-11-2024 10:17:38

Last Updated By: Tan Yong Lay Hayden