NUS National University of Singapore | Yong Loo Lin School of Medicine

ONE-WEEK ENRICHMENT MODULES

List of online modules available for May – July 2021

NUS Medicine would be holding a series of one-week enrichment modules which would be made available for international students. These enrichment modules seek to allow medical students to gain knowledge in other fields outside of clinical medicine, such as health informatics, medical education, AI, etc.

Contents

NUS Medicine International Relations
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Updated as of 18 February 2021, subjected to changes.

1. *Salut* to the Everyday Microbes

24 - 28 May 2021 (excluding 26 May)

Instructor Information

Instructor	Appointments
Dr Jun Hong CH'NG	• Lecturer, Department of Microbiology and Immunology
Ms Chuu Ling CHAN	• Instructor, Department of Microbiology and Immunology
A/Prof Kevin TAN Shyong Wei	• Associate Professor and Head, Department of Microbiology and Immunology
Asst. Prof Volker PATZEL	• Assistant Professor, Department of Microbiology and Immunology
Dr Rajesh CHANDRAMOHANADAS	• Senior Lecturer, Department of Microbiology and Immunology

General Information

Description

In contrast to medical microbiology that focuses on pathogens, the microbes are essential for healthy development and have many applications. Conducted entirely online via zoom-based discussions and demonstrations, this course will explore the role of our microbiomes in health and development, fermentation in F&B, as well as the role of microbes in sustainability. Specific examples on the use of microbes in engineering and design will also be introduced.

Learning Outcomes

Appreciate the wide-ranging benefits and everyday functions of microbes.

Syllabus (Outline)

During this course we will journey together to discover more about the following:

1. **The Human Microbiome** (2hrs, Junhong & Chuuling): General concepts of microbiomes in relation to health and development, share insights about trending research topics and have a "mukbang" session about probiotic products and how they measure up in our laboratory.
2. **Fermentation Technologies & Products** (2hrs, Kevin & Volker): Fermentation, the oldest metabolic pathway employed by primeaval forms of life before there was plantlife and oxygen in the atmosphere, instrumental in the formation of civilisations, the oldest application of microbiology, and source of indispensable products in our today's life.
3. **Back to the Future** (2hrs, Volker & Junhong): Shaping the earth, harvesting its resources and reviving the planet - microbes can do it all! From geology, biomining, bioremediation and bioenergy, do our fates rest in their hands? Featuring some #seriousbling
4. **Microbes in design-thinking** (2hrs, Rajesh): Novel strategies involving micro-organisms for healthcare and industrial applications. Specific examples will be used to walk through the design and optimization processes in contrast to traditional approaches

Modes of Teaching and Learning

- Online (zoom-based)

Schedule **Kindly note the different class timing*

Day	Date	Time
Mon	24 May	2pm – 4pm
Tue	25 May	4pm – 6pm*
Wed	26 May	N.A. – No class on Public Holiday
Thu	27 May	2pm – 4pm
Fri	28 May	2pm – 4pm

2. Together We Can Achieve

7 - 11 Jun 2021

Instructor Information

Instructor

Dr Rosalind SIAH Chiew Jiat

Appointments

- Lecturer, Alice Lee Centre for Nursing Studies
- Nurse Clinician (Specialty Care), Singapore General Hospital

General Information

Description

This module aims to provide students the opportunity to engage in Interprofessional Education (IPE) as part of a good practice. Students will examine theories and concepts of IPE and come to appreciate the application of IPE with the ultimate aim of becoming future-ready healthcare professionals.

Learning Outcomes

Upon completion of the module, students will be able to:
Knowledge

1. discuss theories and better understand the relevance and importance of IPE;
2. communicate role expectations of various healthcare professionals within the context of interprofessional team functioning;

Skills

1. appraise the attributes of effective interprofessional team functioning and their impact on patient outcome;
2. adapt appropriate interventions to initiate and maintain collaborations across healthcare professionals;

Attitude

1. adopt a positive attitude towards IPE; and
2. develop a desire to promote IPE for themselves and within the healthcare community.

Syllabus (Outline)

1. First Date: Introduction of theories and concepts of IPE
2. Problem is Not Me: Understand role expectations of various healthcare professionals
3. Why is My Patient Outcome not Improving?: Appraise the attributes of effective interprofessional team functioning
4. Initiation of Collaboration Comes from Anyone: Understand and adapt appropriate interventions
5. Mirror, Mirror on the Wall: Reflection of self and affirmation of thoughts

Modes of Teaching and Learning

- Online interactive tutorials

Schedule

Day	Date	Time
Mon	7 Jun	9am – 12pm*
Tue	8 Jun	9am – 11am
Wed	9 Jun	9am – 11am
Thu	10 Jun	9am – 11am
Fri	11 Jun	9am – 12pm*

**Kindly note the different class timing*

3. How Deep is Your Learning?

14 - 18 Jun 2021

Instructor Information

Instructor	Appointments
Dr Andrew TAN Yong-Yi **Prof Dean HO**	• Assistant Professor, Department of Physiology • Head, Department of Biomedical Engineering • Director, The N.1 Institute for Health (N.1) • Provost's Chair Professor (Director, The Institute for Digital Medicine (WisDM))
Dr NGIAM Kee Yuan	• Associate Professor, Department of Surgery • Group Chief Technology Officer, NUHS Corporate Office • Chief Advisor, Center for Healthcare Innovation, Alexandra Integrated Hospital • Deputy Chief Medical Informatics Officer, National University Hospital

General Information

Description

Neuroscience helped inspire the deep learning and reinforcement learning advances that led to an AI renaissance. This online course introduces the links between cortical architecture and deep learning artificial neural networks, between dopamine neuron activity and reinforcement learning algorithms; the links between simple statistical models and deep learning, between control theory and reinforcement learning algorithms; and potential vulnerabilities of AI usage. Differences between biological and machine learning are explored. Basic coding for machine learning and computational neuroscience is introduced. We discuss potential medical applications of the algorithms to aiding diagnosis, decoding neural activity for brain-machine interfaces, and crafting patient-management plans.

Learning Outcomes

Students should be able to gain some appreciation of AI's links with neuroscience, statistics, and control theory; potential vulnerabilities of the technology's usage, and its potential applications in medicine.

Syllabus (Outline)

This is a completely online course. Lectures will be conducted via conferencing software (e.g. Zoom). For workshops, students will follow tutorial notes that will guide them to code on their own laptops via a web interface (e.g. Google Collab); live help will be available via conferencing software (e.g. Zoom).

- Day 1
  Lecture: Visual object recognition, cortical architecture, and deep learning; potential medical applications of deep learning: analysis of medical images, decoding speech for a brain-machine interface
  Workshop: Introductory coding of simple statistical models, and deep learning models with MNIST

- Day 2
  Lecture: Fooling and being fooled by AI; vulnerability to noise, distortion, and adversarial examples; interpretability, correlation and causation; generative adversarial networks
  Workshop: Adversarial deep learning with MNIST

- Day 3
  Lecture: Biological learning; potential medical application: stroke rehabilitation
  Workshop: Introductory coding of computational neuroscience models; Hodgkin-Huxley neuron, integrate-and-fire neuron, Morris water maze learning

- Day 4
  Lecture: Prediction-error-driven learning and reinforcement learning algorithms; control theory and reinforcement learning; potential medical application: q-learning for sepsis treatment
  Workshop: Introductory coding of reinforcement learning models; cartpole balancing with q-learning and DQN algorithms

- Day 5
  Lecture: Clinical Applications of Neural Networks Transforming the Practice of Medicine (Dr. Ngiam Kee Yuan)
  Lecture: AI for personalized medicine at The N.1 Institute for Health (Prof Dean Ho)

Modes of Teaching and Learning

- Lectures
- Online workshops

Schedule

Day	Date	Time
Mon - Fri	14 Jun – 18 Jun	9.30am – 4.30pm

4. Music, Health, and Well-being

21 - 25 Jun 2021

Instructor Information

Instructor

Asst. Prof Kathleen Agres

Appointments

- Assistant Professor, Yong Siew Toh Conservatory of Music
- Research Scientist and founder of the Music Cognition group at the Institute of High Performance Computing, Social & Cognitive Computing Department, Agency for Science, Technology and Research (A*STAR)

General Information

Description

This module examines the impact of music on health and wellness. In addition to considering how musical activities are particularly well-suited to support well-being in general, students will learn about the benefits of music-based interventions on health outcomes for various clinical populations. Emphasis will be placed on how music may support different functional domains, such as cognition, communication, movement and motor coordination, and mental health. In-class discussions will also feature the up-and-coming role of technology in music therapy. The module employs project-based learning to provide students with an opportunity for hands-on, student-driven learning and discovery.

Learning Outcomes

- Describe the fundamentals of music therapy and explain why music is well-suited to support health across different cultures and contexts
- Examine and discuss how music-based approaches can help different patient groups, supporting motor activity, cognition, communication, and mental health
- Demonstrate the ability to find, analyze, and evaluate relevant findings from Music & Health (e.g., interpret and critique a journal article)
- Think independently to synthesize concepts: apply what you've learned to a real-world setting, and create a new prototype or intervention idea

Why this module

There are currently no modules at NUS, to my knowledge, exploring the relationship between music and health. This new module will allow medical students to explore how music can serve as a low-cost, non-invasive alternative approach to traditional medicine to support healthcare and wellness. Given how many medical and science students are also musicians, it is anticipated that this module will be of interest to a considerable number of students.

Syllabus (Outline)

Day 1
Overview of Music, Health, and Well-being; affordances of music for healthcare (non-invasive, motivation & adherence, non-language based, cultural considerations, etc); introduction to Music Therapy.

Day 2
Music to Support Cognition and Communication; stroke, aphasia, and autism; Neurologic Music Therapy; Melodic Intonation Therapy.

Day 3
Music and Mental Health; emotion regulation; music recommendation and Automatic Music Generation; depression and anxiety; social interaction/cohesion.

Day 4
Music to Support Movement and Motor coordination; Parkinson's Disease; Serious Games for preventive medicine and tele-rehabilitation.

Day 5
Other topics: Music for pain management; chronic illness, cancer, and cardiac disease; clinical use of music in operating theatres.
Student presentations.

Modes of Teaching and Learning

The module will combine traditional approaches with project-based learning. Prof Agres will deliver interactive lectures every day, each focused on a main theme, and oversee a tutorial in which students discuss the material covered in the lectures. In addition, students will have 2.5-3 hours every day for hands-on, student-driven learning by working in small groups on a project of their choice. They will refine their project ideas throughout the week and present their final prototype or music intervention idea on the final afternoon.

Although the module is considered to be exploratory for medical students, and therefore has no formal final assessment, formative assessment throughout the week will be based on their participation and the progress of their projects. At the end of the week, each student group will present their project for the class and engage in peer feedback.

Schedule

Day	Date	Time
Mon - Fri	21 Jun – 25 Jun	10am – 3pm

5. Foundation of Medical Education

28 Jun - 2 Jul 2021

Instructor Information

Instructor	Appointments
Dr Dujeepa Samarasekera	• Director, Centre for Medical Education (CenMED) • Director, Centre for Development of Teaching & Learning (CDTL), NUS
Prof Hooi Shing Chuan	• Professor, Department of Physiology • Associate, CenMED
A/Prof Tan Chay Hoon	• Associate Professor, Department of Pharmacology • Associate, CenMED
Emeritus Prof Matthew Gwee	• Medical Educationalist and • Chairman, International and Education Programs, CenMED
Dr Derrick Lian	• Assistant Professor, NUSMed • Associate, CenMED
A/Koh Dow Rhoon	• Associate Professor, Department of Physiology • Associate, CenMED
Dr Lee Shuh Shing	• Director, International Relations, NUSMed • Medical Educationalist and • Assistant Director, CenMED
A/Goh Poh Sun	• Associate Professor, Department of Diagnostic Radiology • Associate, CenMED

General Information

Description

With students as the future educators, the Centre for Medical Education aims to provide our participants with the foundational knowledge in medical education, and principles of learning to apply them for their self-development.

Working closely with our Faculty mentors / content experts in the domain of their interest, participants will have the opportunity to learn the following:

- Curriculum Organisation,
- Delivery of Instruction and Evaluation,
- Assessment and Feedback,
- Supporting Learners, and
- Scholarship of Teaching and Learning (SoTL)
- Research in Medical Education

Participants will have to complete a series of online medical education modules and developing a study proposal, and/or a 1-page reflective report with focus on medical education.

Learning Outcomes

Students will be able to acquire foundational knowledge in the following areas of medical education and apply the principles for their self-development.

- Curriculum Organisation,
- Delivery of Instruction and Evaluation,
- Assessment and Feedback,
- Supporting Learners, and
- Scholarship of Teaching and Learning (SoTL)
- Research in Medical Education

Syllabus (Outline)

- Curriculum Organisation,
- Delivery of Instruction and Evaluation,
- Assessment and Feedback,
- Supporting Learners, and
- Scholarship of Teaching and Learning (SoTL)
- Research in Medical Education

Modes of Teaching and Learning

- Blended learning with online modules and Zoom tutorial sessions
- Experiential learning sessions
- Develop a study proposal and/or write a 1-page reflective report with focus on medical education

Schedule

Day	Date	Time
Mon	28 Jun	To be confirmed
Tue	29 Jun	To be confirmed
Wed	30 Jun	To be confirmed
Thu	1 Jul	To be confirmed
Fri	2 Jul	To be confirmed

6. Juggling Data and Coding

5 - 9 Jul 2021

Instructor Information

Instructor	Appointments
Dr Kenneth BAN Hon Kim	• Assistant Professor, Department of Biochemistry
Dr LIM Hong Shen	• Adjunct Assistant Professor, Department of Medicine
Dr LING Zheng Jye	• Academic Informatics Office, NUHS
Ms Shikha Kumari	• Academic Informatics Office, NUHS
Ms Pamela LIM	• Academic Informatics Office, NUHS

General Information

Description

Today, the practice of medicine is poised for a transformation, catalyzed by the increasing use of technology to digitalize and store healthcare information.

To prepare students for emerging competencies in this data-driven age of medical practice, this foundational workshop aims to equip students with core concepts and skills in the fundamentals of health informatics, so that they will be empowered to build on this foundation to learn more work about how data science can be applied to healthcare data to derive new insights that can improve health and patient outcomes.

Learning Outcomes

- Explain the principles of health informatics (data models, standards, and security)
- Explain the relational data model for organizing information
- Perform simple data queries using SQL and FHIR
- Perform basic data cleaning and transformation prior to analysis
- Perform basic descriptive analysis and visualization of datasets

Syllabus (Outline)

- Introduction to Health Informatics
- Data Standards, Interoperability, Security
- Introduction to Data Modeling
- Introduction to Data Querying
- Introduction to Data Cleaning & Transformation
- Introduction to Data Visualization

Modes of Teaching and Learning

- Lectures
- Guided tutorials (using students' own laptops)
- Project work (datathon)

Schedule

Day	Date	Time
Mon - Fri	5 Jul – 9 Jul	9am – 12pm