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	AY2025-2026
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Ong Chi Wei
Course Author Email	chiwei.ong@ntu.edu.sg
Course Title	Machine Learning and Optimisation for Bioengineers
Course Code	BG4104
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	CB0494 Introduction to Data Science and Artificial Intelligence
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

The aims of this course are multifaceted and designed to provide students with a deep and practical understanding of AI in healthcare. Firstly, the course aims to offer a comprehensive understanding of AI applications within the healthcare sector, delving into its potential benefits, limitations, and the necessary ethical considerations. Additionally, students will be familiarized with the practical use and integration of AI tools and technologies within various healthcare systems and processes, ensuring they are well-equipped to apply these advancements in real-world scenarios. A significant focus will also be placed on developing critical thinking and problem-solving skills, particularly in the context of AI applications in healthcare, enabling students to tackle complex challenges effectively. Lastly, the course emphasizes instilling a strong sense of ethical responsibility and awareness, ensuring that students recognize and uphold the ethical standards required when implementing AI in healthcare settings.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Understanding Healthcare Systems: Gain an understanding of healthcare ecosystems, including stakeholders, data sources, and operational challenges.
ILO 2	Fundamentals of AI: Comprehend the basic principles of artificial intelligence, including machine learning, deep learning, and natural language processing, and their relevance in healthcare.
ILO 3	Data Acquisition and Management: Acquire skills in sourcing, preprocessing, and managing healthcare data while adhering to ethical and regulatory standards.
ILO 4	Application of Machine Learning in Healthcare: Apply supervised, unsupervised, and reinforcement learning techniques to healthcare datasets for predictive modeling and outcome prediction.
ILO 5	Deep Learning Applications: Explore the applications of neural networks and deep learning in medical imaging analysis and natural language processing for healthcare data.
ILO 6	AI-Assisted Diagnosis and Treatment: Understand the role of AI in clinical decision support, drug discovery, robotic surgery, and personalized medicine.
ILO 7	Healthcare Operations and AI Integration: Identify opportunities for AI integration in healthcare operations, management, and administration, considering potential challenges and benefits.
ILO 8	Ethical Considerations: Evaluate ethical implications, data privacy, security issues, and regulatory compliance when applying AI in healthcare.
ILO 9	Critical Analysis and Problem-Solving: Develop critical thinking skills to assess the suitability of AI solutions for healthcare problems and propose innovative solutions.
ILO 10	Capstone Project Proficiency: Apply acquired knowledge and skills to design, implement, and present a substantial project addressing a real-world healthcare challenge using AI techniques.

Course Content

Primary Aims of the Course:

Understanding AI in Healthcare: Providing students with a comprehensive understanding of AI applications in healthcare, including its potential, limitations, and ethical considerations.

Integration of AI Tools: Familiarizing students with the practical use and integration of AI tools and technologies within healthcare systems and processes.

Problem-Solving Skills: Developing critical thinking and problem-solving skills specific to AI applications in healthcare contexts.

Ethical Awareness: Instilling a strong sense of ethical responsibility and considerations when using AI in healthcare.

Reading and References (if applicable)

1. Mitchell, T. M. (1997). *Machine Learning*. McGraw-Hill.
2. Catania, L. J. (2020). Foundations of Artificial Intelligence in Healthcare and Bioscience: A User Friendly Guide for IT Professionals, Healthcare Providers, Researchers, and Clinicians. Academic Press.
3. LIM., C. P., Vaidya, A., Jain, K., Mahorkar, V. U., & Jain, L. C. (2022). Handbook of artificial intelligence in healthcare. Springer International Publishing.
4. Esteva, A., Robicquet, A., Ramsundar, B. *et al.* A guide to deep learning in healthcare. *Nat Med* **25**, 24–29 (2019).
5. Topol, E. J. "Machines and empathy in medicine." *Lancet (London, England)* 402, no. 10411 (2023): 1411-1411.
6. Meskó, Bertalan, and Eric J. Topol. "The imperative for regulatory oversight of large language models (or generative AI) in healthcare." *NPJ Digital Medicine* 6, no. 1 (2023).
7. Moor, M., Banerjee, O., Abad, Z.S.H. *et al.* Foundation models for generalist medical artificial intelligence. *Nature* 616, 259–265 (2023).

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Introduction to Healthcare Systems and AI Fundamentals	1-5	Reading list [1]-[3]	In-person	In-class problem-solving
2	Data Analytics for Biomedical Application	1-5	Reading list [1]-[3]	In-person	In class problem solving
3	Supervised learning Part 1	1-10	Reading list [1]-[3]	In-person	Assignment 1
4	Supervised learning Part 2	1-5	Reading list [1]-[3]	In-person	In-class problem-solving
5	Unsupervised learning Part 1	1-5	Reading list [1]-[3]	In-person	In-class problem-solving
6	Unsupervised learning Part 2	1-5	Reading list [1]-[3]	In-person	In-class problem-solving
7	Invited talk	1-10	Reading list [4]-[6]	In-person	Hands-on
8	Optimization Part 1	5-10	Reading list [4]-[6]	In-person	In-class problem-solving
9	Optimization Part 2	5-10	Reading list [4]-[6]	In-person	Hands-on
10	Reinforcement Learning Part 1	5-10	Reading list [4]-[6]	In-person	In-class problem-solving
11	Reinforcement Learning Part 2	5-10	Reading list [4]-[6]	In-person	In-class problem-solving
12	AI Start-ups & Prompt Engineering	5-10	Reading list [4]-[6]	In-person	

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
13	Final report and project presentation	1,2,3,4		In-person	Presentation

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Immersive Experiential Learning	This course adopts an immersive experiential learning approach, aiming to immerse students in real-world scenarios and practical applications of AI in healthcare. Through various activities and engagements, this approach aims to facilitate deeper learning and skill development among students.
Active Engagement	Interactive sessions, workshops, and discussions during the field trip encourage active participation
Collaborative Learning	Collaborative activities, group projects, and discussions during the trip facilitate teamwork, communication skills, and the ability to work effectively in diverse teams. These skills are vital in the interdisciplinary field of AI in healthcare, where collaboration across specialties is crucial.

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(Individual assessment)	1-10	a,b,c,d,e,f,g,h,i,j,k	10	Individual	Analytic	Extended Abstract
2	Continuous Assessment (CA): Project(Presentation)	1-10	a,b,c,d,e,f,g,h,i,j,k	10	Team	Analytic	Extended Abstract
3	Continuous Assessment (CA): Project(Project report)	1-10	a,b,c,d,e,f,g,h,i,j,k	20	Team	Analytic	Extended Abstract
4	Continuous Assessment (CA): Project(Peer review)	1-10	a,b,c,d,e,f,g,h,i,j,k	10	Individual	Analytic	Extended Abstract
5	Summative Assessment (EXAM): Final exam()	1-10	a,b,c,d,e,f,g,h,i,j,k	50	Individual	Analytic	Extended Abstract

Description of Assessment Components (if applicable)

In this AI in healthcare module, assessment is structured to gauge the depth of students' understanding and their ability to apply AI concepts and tools to healthcare problems. The assessment components and their corresponding weightage are designed to reflect both individual and team contributions.

Formative Feedback

During Project: As students engage with AI tools such as Google Colab, instructors will provide immediate feedback on their technical skills, problem-solving approaches, and collaborative practices. This real-time guidance helps students to adjust their methods and understanding as they work through healthcare-related AI problems.

Post-assignment Reviews: After submission of assignments like the lab report or project, instructors will offer in-depth feedback, highlighting strengths and suggesting improvements. This allows students to refine their learning strategies and knowledge application for future tasks.

Peer Evaluations: Students will participate in peer assessments, offering and receiving feedback among themselves. This peer-to-peer interaction encourages reflection on their own work and a deeper understanding of the subject matter through the perspective of their classmates.

Interactive Class Discussions: In-class participation provides an avenue for instant feedback. Through discussions and Q&A sessions, students can gain insights into their comprehension and application of AI in healthcare, fostering a dynamic learning environment.

Regular Check-Ins and Progress Updates: Instructors may also schedule periodic check-ins with students to discuss their progress, providing a more personalized feedback experience.

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
Collaboration	Advanced
Communication	Intermediate
Problem Solving	Advanced
Design Thinking	Intermediate
Embrace Challenge	Intermediate

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: 07-04-2025 11:35:16

Last Updated By: Lai Ru Ying

Appendix 1: Assessment Criteria for Assignment (10%)

Marks will be allocated based on the clarity and depth of the content, which should articulate the healthcare problem addressed and the relevance of AI

Criteria		Unsatisfactory (1-3)	Satisfactory (4-6)	Good (7-9)	Exemplary (10)	Score (1-10)
Individual Assignment	**Organisation & Content (35%)**	Illogical sequence and irrelevant content, making it difficult for reader to understand content; incomplete summary/abstract; evidence of plagiarism	Content is minimally organized; length requirement is not met; basic summary/abstract; some evidence of plagiarism	Content is adequately organized and comprehensive; length requirement is met with adequate content; adequate summary/abstract	In-depth and wellorganized content; meets length requirement with very high-quality content; excellent summary/abstract	
	Topic Focus & Relevance (25%)	Subject matter is irrelevant to the field; there is no focus in the article	Subject matter only slightly relevant to the field; article focus is unclear, without addressing current issues	Subject matter relevant to the field; article focus is appropriate, broadly addressing current issues without particular emphasis on the more pertinent points	Subject matter is highly relevant to the field; article focus is on-point, addressing the most pertinent and current issues; critical arguments are emphasized	
	Significance & Broadness of Readership (25%)	Article offers minimal to zero constructive contribution to the field; appeals to a narrow readership	Article offers satisfactory constructive contribution to the field; provides minimal insight; appeals to a rather narrow readership	Article offers good constructive contribution to the field; provides insight that are thoughtprovoking; appeals to a broad readership	Article offers excellent constructive contribution to the field; provides insight that can be game-changing; appeals to a broad readership	
	Outlook (15%)	Poor understanding on the progress of the field; unable to provide any future outlook for the subject matter and the field	Satisfactory understanding on the progress of the field; struggling to articulate the future outlook for the subject matter and the field	Good understanding on the progress of the field; able to articulate the future outlook for the subject matter and the field	Excellent understanding on the progress of the field; able to articulate the future outlook for the subject matter and the field confidently	

Appendix 2: Assessment Criteria for Project Presentation (10%)

Criteria	Excellent (3)	Good (2)	Satisfactory (1)	Needs Improvement (0)	Score
Content Knowledge	Demonstrates thorough understanding of machine learning and optimization techniques, effectively applying them to bioengineering.	Shows good understanding of the topic, with some detail on applications in bioengineering.	Basic understanding of machine learning and optimization, with limited application to bioengineering.	Limited or inaccurate understanding of the topic, with poor application to bioengineering.	
Clarity of Concepts	Concepts are explained clearly with relevant examples and are easy to understand.	Concepts are explained clearly but lack some detail or relevant examples.	Concepts are somewhat unclear or overly simplified. Some examples are missing or not fully relevant.	Concepts are poorly explained, hard to follow, and lack examples.	
Organization & Structure	Well-organized with a clear introduction, logical flow, and conclusion. Transitions are smooth.	Structure is clear but with some minor issues in flow or transitions.	Somewhat organized, but lacks smooth transitions between sections.	Disorganized or difficult to follow.	
Engagement & Delivery	Confident and engaging delivery with good eye contact, body language, and voice modulation.	Delivery is clear but somewhat lacking in engagement or confidence.	Delivery is monotonous or unclear at times; minimal engagement with the audience.	Delivery is hard to follow, with little engagement or clarity.	
Visual Aids (Slides/Graphics)	Slides are well-designed, clear, and enhance understanding with relevant, high-quality visuals.	Slides are clear but may have minor design issues or lack full relevance.	Slides contain excess text or unclear visuals that detract from the presentation.	Poorly designed slides that confuse or do not aid understanding.	
Time Management	Presentation is within time limits and covers all necessary points thoroughly.	Presentation is within time limits but may rush through some points.	Presentation is slightly over/under time; important points may be rushed.	Presentation is too short or long, with key points skipped or rushed.	
Q&A Handling	Excellent responses to questions, demonstrating deep knowledge and insight.	Good responses, but may lack some depth or detail.	Responses to questions are adequate but lack clarity or completeness.	Struggles to answer questions or provides incorrect or vague responses.	
Application to Bioengineering	Clearly demonstrates the real-world relevance of machine learning and optimization in bioengineering.	Shows how the topic applies to bioengineering, with some relevant examples.	Mentions bioengineering but lacks specific or detailed examples.	Fails to demonstrate relevance to bioengineering.	

Appendix 3: Assessment Criteria for Project report (20%)

The project report will be evaluated on its comprehensive documentation of the problem-solving process using AI within a healthcare context, leveraging Google Colab. Marks will be allocated based on the clarity and depth of the content, which should articulate the healthcare problem addressed, the relevance of AI, and the rationale behind choosing cloud computing for the project.

Criteria		Unsatisfactory (1-3)	Satisfactory (4-6)	Good (7-9)	Exemplary (10)	Score (1-10)
Project Report	**Organisation & Content** (35%)	Illogical sequence and irrelevant content, making it difficult for reader to understand content; incomplete summary/abstract; evidence of plagiarism	Content is minimally organized; length requirement is not met; basic summary/abstract; some evidence of plagiarism	Content is adequately organized and comprehensive; length requirement is met with adequate content; adequate summary/abstract	In-depth and wellorganized content; meets length requirement with very high-quality content; excellent summary/abstract	
	Topic Focus & Relevance (25%)	Subject matter is irrelevant to the field; there is no focus in the article	Subject matter only slightly relevant to the field; article focus is unclear, without addressing current issues	Subject matter relevant to the field; article focus is appropriate, broadly addressing current issues without particular emphasis on the more pertinent points	Subject matter is highly relevant to the field; article focus is on-point, addressing the most pertinent and current issues; critical arguments are emphasized	
	Significance & Broadness of Readership (25%)	Article offers minimal to zero constructive contribution to the field; appeals to a narrow readership	Article offers satisfactory constructive contribution to the field; provides minimal insight; appeals to a rather narrow readership	Article offers good constructive contribution to the field; provides insight that are thoughtprovoking; appeals to a broad readership	Article offers excellent constructive contribution to the field; provides insight that can be game-changing; appeals to a broad readership	
	Outlook (15%)	Poor understanding on the progress of the field; unable to provide any future outlook for the subject matter and the field	Satisfactory understanding on the progress of the field; struggling to articulate the future outlook for the subject matter and the field	Good understanding on the progress of the field; able to articulate the future outlook for the subject matter and the field	Excellent understanding on the progress of the field; able to articulate the future outlook for the subject matter and the field confidently	

Appendix 4: Project Peer review (10%)

Criteria (Weighs)	Score from 1 to 9* (**1**: Never; **3**: Rarely; **5**: Occasionally; **7**: Frequently; **9**: Always)				
(For 6-members team)	*Member A*	*Member B*	*Member C*	*Member D*	*Member E*
Member name					
a. Fulfilling one's responsibilities duly (15%)					
Behaved responsibly--such as attend meetings punctually and regularly; participate in discussion; complete assigned tasks/roles punctually.	*Score from 1 to 9*				
	Qualitative comments/reasons				
b. Fulfilling one's responsibilities effectively (25%)					
Behaved and contributed effectively--such as quality of work produced; creativity of ideas;	*Score from 1 to 9*				
extensiveness of research and thinking.	*Qualitative comments/reasons*				
c. Managing interpersonal relationships (30%)					
Listened attentively to and sought inputs from others; helped team resolve conflicts and achieved common understanding to function effectively; promoted respect for others and differences; fostered camaraderie.	*Score from 1 to 9*				
	Qualitative comments/reasons				
d. Providing support to others to achieve goals (30%)					
Behaved fairly and ethically—such as sharing responsibilities and giving credits. Exhibited group citizenship behavior--such as helping others to learn and complete their work through guidance and encouragement; standing up for others when needed.	*Score from 1 to 9*				
	Qualitative comments/reasons				

Mapping of Course ILOs to EAB Graduate Attributes

Course Code & Title	BG4104 Machine Learning and Optimisation for Bioengineers
Course Type	Core module

Overview											
(a)	●	(b)	●	(c)	●	(d)	●	(e)	●	(f)	●
(g)	●	(h)	●	(i)	●	(j)	●	(k)	●		

Legend:

●   Fully consistent (contributes to more than 75% of Student Learning Outcome)

◐   Partially consistent (contributes to about 50% of Student Learning Outcome)

○   Weakly consistent (contributes to about 25% of Student Learning Outcome)

Blank   Not related to Student Learning Outcome

Course ILOs		EAB Graduate Attributes
1)	Understanding Healthcare Systems: Gain an understanding of healthcare ecosystems, including stakeholders, data sources, and operational challenges.	a,b,c,d,e,f,g,h,i,j,k
2)	Fundamentals of AI: Comprehend the basic principles of artificial intelligence, including machine learning, deep learning, and natural language processing, and their relevance in healthcare.	a,b,c,d,e,f,g,h,i,j,k
3)	Data Acquisition and Management: Acquire skills in sourcing, preprocessing, and managing healthcare data while adhering to ethical and regulatory standards.	a,b,c,d,e,f,g,h,i,j,k
4)	Application of Machine Learning in Healthcare: Apply supervised, unsupervised, and reinforcement learning techniques to healthcare datasets for predictive modeling and outcome prediction.	a,b,c,d,e,f,g,h,i,j,k
5)	Deep Learning Applications: Explore the applications of neural networks and deep learning in medical imaging analysis and natural language processing for healthcare data.	a,b,c,d,e,f,g,h,i,j,k

6)	AI-Assisted Diagnosis and Treatment: Understand the role of AI in clinical decision support, drug discovery, robotic surgery, and personalized medicine.	a,b,c,d,e,f,g,h,i,j,k
7)	Healthcare Operations and AI Integration: Identify opportunities for AI integration in healthcare operations, management, and administration, considering potential challenges and benefits.	a,b,c,d,e,f,g,h,i,j,k
8)	Ethical Considerations: Evaluate ethical implications, data privacy, security issues, and regulatory compliance when applying AI in healthcare.	f,g,h,i,j
9)	Critical Analysis and Problem-Solving: Develop critical thinking skills to assess the suitability of AI solutions for healthcare problems and propose innovative solutions.	a,b,c,d,e,f,g,h,i,j,k
10)	Capstone Project Proficiency: Apply acquired knowledge and skills to design, implement, and present a substantial project addressing a real-world healthcare challenge using AI techniques.	a,b,c,d,e,f,g,h,i,j,k

EAB GRADUATE ATTRIBUTES	WK1	EDGE PROFILE
a) **Engineering Knowledge**: Apply the knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems.		A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
b) **Problem Analysis**: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences with holistic considerations for sustainable development. (WK1 to WK4)	WK2	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
c) **Design / Development of Solutions**: Design creative solutions for complex engineering problems and design systems, components or processes that meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required. (WK5)	WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
d) **Investigation**: Conduct investigations of complex problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
e) **Modern Tool Usage**: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering problems, with an understanding of the limitations. (WK2 and WK6)	WK5	Knowledge including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts that supports engineering design and operations in a practice area.
f) **The Engineer and the World**: When solving complex engineering problems, analyse and evaluate sustainable development impacts to: society, the economy, sustainability, health and safety, legal frameworks and the environment (WK1, WK5, and WK7).	WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
g) **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (WK9).	WK7	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline such as the professional responsibility of an engineer to public safety and sustainable development.
h) **Individual and Collaborative Team Work**: Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face-to-face, remote and distributed settings (WK9).	WK8	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
i) **Communication**: Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions, taking into account cultural, language, and learning differences.	WK9	Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc with mutual understanding and respect, and of inclusive attitudes.
j) **Project Management and Finance**: Demonstrate knowledge and understanding of engineering management principles and economic decisionmaking, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.		
k) **Life-long Learning**: Recognise the need for, and have the preparation and ability to (i) engage in independent and life-long learning, and (ii) adapt to new and emerging technologies, and (iii) think critically, in the broadest context of technological change (WK8).		

Reference: