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 1
Course Author * Faculty proposing/revising the course	Ong Chi Wei
Course Author Email	chiwei.ong@ntu.edu.sg
Course Title	Anatomy & Physiology
Course Code	BG2119
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

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

Course Aims

This course will provide you with the basic knowledge of human anatomy and physiology in the context of macroscopy and microscopic structure, mechanics and function. The focus is on the healthy body, with reference to diseases and ageing. It provides basic biological knowledge in human systems for bioengineering applications.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Identify basic human anatomical parts and organ systems
ILO 2	Describe key physiological processes
ILO 3	Explain the interplay between structure and function, in health, disease and ageing
ILO 4	Communicate the application of anatomy and physiology knowledge to bioengineering solutions

Course Content

This is a one semester course on basic human anatomy and physiology. It is tailored for engineering students and does not require biology at GCE “A” level.

You will be introduced to key concepts in anatomy and physiology. A systems approach will be used covering: Skin, Musculo-skeletal, Cardio-respiratory, Nervous, Gastro-intestinal, Endocrine, Urinary and Reproductive systems. The emphasis is to understand how structure enables function and how these are perturbed in disease and ageing.

The course covers physiology, gross anatomy, tissue histology (microscopy) and basic pathology. It does not include molecular & cell biology and immunology (which are covered in other modules).

The course also covers broader aspects of how anatomical and physiological knowledge are applied for biomedical engineering and instrumentation, in real-world medical and research contexts, and in interaction with scientists and clinicians.

Reading and References (if applicable)

The course is based on an

Principles of anatomy and physiology
Tortora, Gerard J., author.; Derrickson, Bryan

This resource is available in the NTU library

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Introduction	1,2,3,4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture
2	Connective Tissue & Integumentary system	1, 2, 3, 4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture
3	Skeletal system	1, 2, 3, 4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture
4	Muscular System	1, 2, 3, 4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture
5	Cardiovascular System and Blood	1, 2, 3, 4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture
6	Respiratory System	1, 2, 3, 4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture
7	Mid Term test	1,2,3,4		In-person	exam
8	Gastrointestinal And Endocrine	1,2,3,4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture
9	Nervous System I	1,2,3,4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture
10	Nervous System II	1,2,3,4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture
11	Urinary And Reproductive System	1,2,3,4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Lecture

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
12	Group Project Presentation	1,2,3,4	Principles of anatomy and physiology Tortora, Gerard J., author.; Derrickson, Bryan	In-person	Presentation
13	Group Final Project Report	1,2,3,4			

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Blended format	The flipped classroom comprises overview videos, live and pre-recorded lectures, and readings. It allows students to follow lectures on e-textbook, with visual and auditory learning.
Team-based learning (TBL)	Individual and team readiness assessments, burning questions, application exercises , allows group discussion, problem solving and interactive communication.

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): Test/Quiz(Mid-term Assessment)	1, 2, 3, 4	a, b, f	10	Individual	Analytic	Multistructural
2	Continuous Assessment (CA): Class Participation(In class quiz)	1, 2, 3, 4	a, b, c, e, j, l	10	Individual	Analytic	Multistructural
3	Continuous Assessment (CA): Project(Group project)	1, 2, 3, 4	a, b, c, e, j, l	20	Team	Analytic	Multistructural
4	Summative Assessment (EXAM): Final exam(Final Exam [2hrs, Closed Book])	1, 2, 3, 4	a, b, c, e, j, l	60	Individual	Analytic	Multistructural

Description of Assessment Components (if applicable)

Formative Feedback

Individual Readiness Assessment (MCQ) answers will be discussed during class, and open for Burning Questions discussion.

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
Adaptability	Basic
Collaboration	Basic
Communication	Basic
Creative Thinking	Basic
Curiosity	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)

Students are expected to complete all online activities and take all scheduled assignments and tests. Students are expected to take responsibility to follow up with course notes, assignments and course related announcements. Students are expected to be prepared for and actively participate in all class discussions and activities. Attending lectures in person is optional as lecture videos are available online.

Policy (Absenteeism)

Weekly application exercise are an integral part of learning, discussion and application. Attendance without prior notice will be monitored.

Policy (Others, if applicable)

Continuous assessments: Students are required to complete the individual and team readiness assessments (quizzes). These will be marked but will not contribute to the final grade. There is a mid-term CA quiz that will be graded.

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Last Updated By: Lai Ru Ying

Appendix 1: Assessment Criteria

Criteria	Unsatisfactory: <40%	Borderline: 40% to 49%	Satisfactory: 50% to 69%	Very good: 70% to 89%	Exemplary: >90%
MCQ	Score <40%	Score 40-49%	Score 50-69%	Score 70-89%	Score >90%
MCQ and Short Questions	Score <40%	Score 40-49%	Score 50-69%	Score 70-89%	Score >90%

Appendix 2: The EAB (Engineering Accreditation Board) Accreditation SLOs (Student Learning Outcomes)

a) **Engineering knowledge:** Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems
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.
c) **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
d) **Investigation:** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
f) **The engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g) **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.
h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
j) **Communication:** Communicate effectively 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.
k) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l) **Life-long Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Mapping of Course ILOs to EAB Graduate Attributes

Course Code & Title	BG 2119 Anatomy & Physiology
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 Outcomes)
◐	Partially consistent (contributes to about 50% of Student Learning Outcomes)
O	Weakly consistent (contributes to about 25% of Student Learning Outcomes)
Blank	Not related to Student Learning Outcomes

Course ILOs		**EAB Graduate Attributes**
1)	Identify basic human anatomical parts and organ systems	a
2)	Describe key physiological processes	a
3)	Explain the interplay between structure and function, in health, disease and ageing	a, b, f
4)	Communicate the application of anatomy and physiology knowledge to bioengineering solutions	a, b, c, e, i, j

EAB Graduate Attributes[1]

a) **Engineering Knowledge**: Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

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.

c) **Design / Development of Solutions**: Design solutions for complex engineering problems and design systems, components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

d) **Investigation**: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[1] Reference: EAB Accreditation Manual

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.

f) **The Engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems.

g) **Environment and Sustainability**: Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts.

h) **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i) **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

j) **Communication**: Communicate effectively 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.

k) **Project Management and Finance**: Demonstrate knowledge and understanding of engineering management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

EAB Graduate Attributes

l) **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.

m) **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)

n) **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)

o) **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.

p) **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)

q) **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).

r) **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).

s) **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).

t) **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.

u) **Project Management and Finance**: Demonstrate knowledge and understanding of engineering management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

v) **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).

No	Knowledge Profile
WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences
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
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
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
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
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
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.
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
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

Reference: EAB Accreditation Manual