NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

# COURSE CONTENT

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|---|---|---|---|
| **Academic Year** | 2023/2024 | **Semester** | 1 |
| **Course Coordinator** | TBC | | |
| **Course Code** | BG2119 | | |
| **Course Title** | Anatomy & Physiology | | |
| **Pre-requisites** | Nil | | |
| **No of AUs** | 3 | | |
| **Contact Hours** | *26 hours lecture, 13 hours team-based learning and project* | | |
| **Proposal Date** | *20 Nov 2019* | | |

## 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.

## Intended Learning Outcomes (ILO)

Students are expected to be able to:

1. Identify basic human anatomical parts and organ systems
2. Describe key physiological processes
3. Explain the interplay between structure and function, in health, disease and ageing
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. The course includes a session viewing real and plastinated specimens at the Anatomy Learning Centre at the Clinical Sciences Building, Novena.

Details of the Course Curriculum are available online:
https://sites.google.com/view/aandp3/contents/course-curriculum

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

| Component | Course LO Tested | Related Programme LO or Graduate Attributes | Weighting | Team /Individual | Assessment rubrics |
|---|---|---|---|---|---|
| 1. Mid-term Assessment | 1, 2, 3, 4 | a, b, f | 40% | Individual | Single Best Answer (MCQ) |
| 2. Final Exam [2hrs, Open Book] | 1, 2, 3, 4 | a, b, c, e, j, l | 60% | Individual | Single Best Answer (MCQ) and Short Questions |
| Total | | | 100% | | |

**Mapping of Course ILOs to EAB Graduate Attributes**

| Course Intended Learning Outcomes | Cat | EAB's 12 Graduate Attributes* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) | (l) |
| | Core | ● | ● | ● | | ◐ | ◐ | | | ◐ | ◐ | | ◐ |
| Identify basic human anatomical parts and organ systems | | | | | | | | | | a | | | |
| Describe key physiological processes | | | | | | | | | | a | | | |
| Explain the interplay between structure and function, in health, disease and ageing | | | | | | | | | | a, b, f | | | |
| Communicate the application of anatomy and physiology knowledge to bioengineering solutions | | | | | | | | | | a, b, c, e, j, l | | | |

Legend:
- ● Fully consistent (contributes to more than 75% of Intended Learning Outcomes)
- ◐ Partially consistent (contributes to about 50% of Intended Learning Outcomes)
- š Weakly consistent (contributes to about 25% of Intended Learning Outcomes)
- Blank Not related to Student Learning Outcomes

**Formative feedback**

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

**Learning and Teaching approach**

| Approach | How does this approach support students 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 with on-site demonstrations in anatomy learning center, allows group discussion, problem solving and interactive communication. |

**Reading and References**

The course is based on an online multi-media textbook, that is specially written for the course:

Anatomy and Physiology for Bioengineering
https://sites.google.com/view/aandp3

This resource is available free online in various formats, for PC, tablets and phones, allowing for mobile learning.

**Course Policies and Student Responsibilities**

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 TBL discussions and activities. Attending lectures in person is optional as lecture videos are available online.

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.

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

**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 |
|---|---|---|---|
| TBC | | | |

**Planned Weekly Schedule**

| Week | Topic | Course LO | Readings/ Activities |
|---|---|---|---|
| 1 | Introduction, Tissues | Understand Structural Organization of body, Homeostasis, Anatomical terms, Nervous, Muscle and Epithelial Tissues. ILO 1, 2, 3, 4 | Lecture 1, Video, Reading |
| | | | TBL |
| 2 | Connective Tissue & Integumentary system | Understand and describe Connective Tissue, Skin layers, Accessory Structures, Functions. ILO 1, 2, 3, 4 | Lecture 2, Video, Reading |
| | | | TBL |
| 3 | Musculo-Skeletal System 1 | Understand and describe Bone functions, structure, formation, Axial & Appendicular skeleton, Fractures, Joint Classification, Synovial joints. ILO 1, 2, 3, 4 | Lecture 3, Video, Reading |
| | | | TBL |
| 4 | Musculo-Skeletal System 2 | Understand and describe Muscle types, gross & histology, physiology, Major muscles. ILO 1, 2, 3, 4 | Lecture 4, Video, Reading |
| | | | TBL |
| 5 | Gastro-Intestinal & Endocrine Systems | Understand and describe Digestive system, endocrine glands and hormonal regulation. ILO 1, 2, 3, 4 | Lecture 5, Video, Reading |
| | | | TBL |
| 6 | Cardiovascular System and Blood | Understand and describe Blood, heart, circulatory system. ILO 1, 2, 3, 4 | Lecture 6, Video, Reading |
| | | | TBL |
| 7 | Respiratory System | | Lecture 7, Video, Reading |

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|---|---|---|---|
| | | Understand and describe Airways, Lungs, Breathing, Respiration, Gaseous transfer. ILO 1, 2, 3, 4 | TBL |
| 8 | Bio-Engineering Problems 1 | Pose and analyse health issues in body regions and system that need bio-engineering solutions. ILO 3, 4 | Assessment & Briefing |
| | | | |
| 9 | Nervous System 1: | Understand and describe Neuron structure and physiology of excitable cells, central and peripheral nervous system. ILO 1, 2, 3, 4 | Lecture 8, Video, Reading |
| | | | TBL |
| 10 | Nervous System 2 | Understand and describe Autonomic nerves, sensory organs, somatic nervous system. ILO 1, 2, 3, 4 | Lecture 9, Video, Reading |
| | | | TBL |
| 11 | Clinical and Engineering Applications* | Visualise and manipulate real anatomical and pathological specimens so as to develop understanding of realworld bioengineering, medical and ethical issues. ILO 1, 3, 4 | Visit to Anatomical Learning Centre, CSB* |
| | Demonstrations, Applications, Practicals | | |
| 12 | Urinary & Reproductive Systems | Understand and describe Urinary system, Fluid salt balance, male & female reproduction, Sex hormones. ILO 1, 2, 3, 4 | Lecture 10, Video, Reading |
| | | | TBL |
| 13 | Bioengineering Problems 2 | Analyse, Design, Solve and Communicate Problems and Solutions in Bioengineering. ILO 3, 4 | Student Seminar |
| | | | |

Detailed Learning Objectives are listed in the Course Website online:
https://sites.google.com/view/aandp3/1-introduction-to-the-human-body

**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