

# NS3003: ETHICAL APPLICATION OF ARTIFICIAL INTELLIGENCE IN BIOLOGICAL SCIENCES AND HEALTHCARE

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**Effective Term**

Semester A 2025/26

## Part I Course Overview

**Course Title**

Ethical Application of Artificial Intelligence in Biological Sciences and Healthcare

**Subject Code**

NS - Neuroscience

**Course Number**

3003

**Course offered as BVM programme?****Course Description****Academic Unit**

Neuroscience (NS)

**College/School**

College of Biomedicine (BD)

**Co-offering Academic Unit(s)****Course Duration**

One Semester

**Other Course Duration****Credit Units**

3

**Level**

B1, B2, B3, B4 - Bachelor's Degree

**GE Area (Primary)****GE Area (Secondary)****Medium of Instruction**

English

**Other Languages for Medium of Instruction****Medium of Assessment**

English

**Other Languages for Medium of Assessment****Prerequisites**

Nil

**Precursors**

Nil

**Equivalent Courses**

Nil

**Exclusive Courses**

Nil

**Additional Information****Part II Course Details****Abstract**

The implementation of deep learning techniques developed in the field of artificial intelligence is expected to bring revolutionary advancement in biological research and healthcare. This course uses a project-based learning approach to introduce the students to AI techniques, including fundamental concepts such as supervised and unsupervised learning, practical workflows such as model training and benchmarking, and state-of-the-art neural network architectures such as convolutional neural networks and transformer learning. The students will gain practical knowledge when learning to apply AI tools to real-world problems in the field of biology and healthcare, spanning topics including (1) mining the biological big data such as biological sequences, structures, and images, (2) AI-guided clinical decision-making processes such as triage and diagnosis, and (3) AI-guided drug screening. For each project, the course will explain the logic behind the analytic workflow and provide hands-on instructions on optimizing and interpreting AI models. Ethical considerations and challenges, including data privacy, bias mitigation, and the societal impact of AI technologies, will also be discussed.

**Course Intended Learning Outcomes (CILOs)**

	<b>CILOs</b>	<b>Weighting (if app.)</b>	<b>DEC-A1</b>	<b>DEC-A2</b>	<b>DEC-A3</b>
1	To understand the basic principles of AI algorithms, including the basic theory, classification and assumptions.	25	x	x	
2	To understand a list of suitable problems in the biological sciences and healthcare that are suitable for AI applications: the advantages and caveats.	25	x	x	x
3	To gain practical experience in solving real world questions, with AI-inspired algorithms, including model optimization and interpretation.	30	x	x	x
4	Evaluate ethical implications and challenges of AI applications in healthcare	20	x	x	

**A1: Attitude**

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

**A2: Ability**

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lectures	Theoretical concepts of the AI algorithms, and introduction to each selected topic and project	1, 2, 3, 4	2
2	Tutorials	Review case studies of AI applications through paper discussions, or oral presentations in selected topics.	1, 2, 3, 4	0.5
3	Practical labs and assignments	Investigate curated datasets for each project, learn the pros and cons of different algorithms, learn the practical ways to optimize the performance, and learn how to interpretate the AI models.	1, 2, 3	0.5
4	Final projects	Collaborative work on designing and implementing AI solutions for biological or healthcare problems	1, 2, 3, 4	

### Additional Information for LTAs

### Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?	
1	Attendance	1, 2, 3, 4	10	Check attendance to the lectures	No
2	Practical Assignments	1, 2, 3, 4	40	Grades will be based on the four take home assignments. GenAI is only allowed to aid the coding.	Yes

3	Final projects and ethical discussion	1, 2, 3, 4	50	Grades will be based on the report of the final project. GenAI is only allowed for coding.	Yes
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**Continuous Assessment (%)**

100

**Examination (%)**

0

**Examination Duration (Hours)**

0

**Minimum Continuous Assessment Passing Requirement (%)****Minimum Examination Passing Requirement (%)****Additional Information for ATs****Assessment Rubrics (AR)****Grade Mode Type**

Letter Grade (for B level)

**Assessment Task**

Attendance, Bi-weekly assignment and final project

**Criterion**

Based on the submitted programming codes and reports to evaluate whether the students can apply neural network concepts and implement models to address problems in the relevant biological datasets.

**Excellent (A+, A, A-)**

The student attends all lectures and tutorials. They can solve the assignment with efficient codes and clear interpretation to demonstrate an excellent understanding of the critical steps in the standard workflow.

**Good (B+, B, B-)**

The student attends >90% of lectures and tutorials. They can solve the assignment with functional codes and good annotations to demonstrate an overall correct workflow.

**Fair (C+, C, C-)**

The student attends 75%-90% of lectures and tutorials. They can attempt to solve the assignment with codes with minor issues and some annotations.

**Marginal (D)**

The student attends 60%-75% of lectures and tutorials. The assignment report demonstrates a lack of understanding of the AI analysis workflow and did not seek assistance from the teaching groups.

**Pass (P)****Failure (F)**

The student attends <60% of lectures and tutorials. The assignment report demonstrates a significant lack of understanding of the AI analysis workflow and did not seek assistance from the teaching groups.

**Excellent**

**Good****Fair****Marginal****Failure****Additional Information for AR**

## Part III Other Information

### Keyword Syllabus

Artificial intelligence  
 Deep learning  
 Personalized Medicine  
 AI drug development  
 AI ethics  
 Health data security  
 Health disparity

### Reading List

#### Compulsory Readings

#### Additional Readings

	Title
1	Precision health and artificial intelligence : with privacy, ethics, bias, health equity, best practices, and case studies (2023) by Arjun Panesar (2023).
2	Artificial intelligence in medicine : applications, limitations and future directions Manda Raz, Tam C. Nguyen, Erwin Loh, editors (2022).
3	Artificial intelligence in medicine Niklas Lidstr#mer, Hutan Ashrafiian, editors (2022).

## Annex (for GE courses only)

**A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:**

Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)

**PILO 1: Demonstrate the capacity for self-directed learning**

**PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology**

**PILO 3: Demonstrate critical thinking skills**

**PILO 4: Interpret information and numerical data**

**PILO 5: Produce structured, well-organised and fluent text**

**PILO 6: Demonstrate effective oral communication skills**

**PILO 7: Demonstrate an ability to work effectively in a team**

**PILO 8: Recognise important characteristics of their own culture(s) and at least one other culture, and their impact on global issues**

**PILO 9: Value ethical and socially responsible actions**

**PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation**

**B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.**

**Selected Assessment Task**

**Attach Additional Documents, if necessary**

## **Administration Only**

**Short Title**

Eth' App of AI in Bi Sc n Hlth

**Schedule Types**

- Lecture (C)
- Tutorial (T)
- Laboratory (L)
- Seminar (S)
- Dissertation/Project/Thesis (D)
- Fieldwork (F)
- Co-op Education Scheme (CES)
- Blackboard (BB)
- First Room (Z1A)
- Second Room (Z1B)
- First Room (Z2A)
- Second Room (Z2B)
- First Room (Z3A)
- Second Room (Z3B)
- First Room (Z4A)
- Second Room (Z4B)
- First Room (Z5A)
- Second Room (Z5B)
- First Room (Z6A)
- Second Room (Z6B)
- First Room (Z7A)
- Second Room (Z7B)

**Default Grade Mode**

Letter grade (S)

**Alternate Grade Modes**

**Banner Prerequisites**

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

**Banner Equivalent Courses**

**Banner Mutually Exclusive Courses**

**Reviewer Comments**

Key: 11727