Title (Units): **GCAP3275 Transdisciplinary AI Innovation Workshop (3,3,0)**

Course Aims: This Capstone Workshop aims to engage students in transdisciplinary projects focused on designing and developing innovative AI solutions for real-world challenges, aligning with competitions such as Robocon Hong Kong, HKAE Pitch Competition, and IEEE MetaCom Student Challenge. Students will collaborate across disciplines to create solutions addressing global issues like sustainable waste management, autonomous systems, and social innovation. The workshop fosters innovation, creativity, problem-solving, and teamwork while promoting social awareness through community-relevant projects. Students will gain hands-on experience in designing robots, applying AI technologies, and pitching solutions, preparing them for international competitions. Outcomes will be showcased at recognized events, enhancing students' professional skills and contributing to Hong Kong's reputation in higher education and engineering innovation.

Prerequisite: Nil

Course Intended Learning Outcomes (CILOs):
Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Synthesize knowledge from computer science, applied science, and business to develop innovative AI-based solutions for real-world challenges.
2	Apply critical thinking and problem-solving skills to design and implement solutions for sustainable development or social good.
3	Collaborate effectively in transdisciplinary teams to achieve project goals and prepare for tech competitions.
4	Communicate and present project outcomes to diverse audiences, including external partners at recognized competitions or conferences

Calendar Description: This transdisciplinary workshop guides students in teams to develop innovative AI-driven solutions (e.g., robotic systems or AI applications) for real-world problems in areas such as autonomous robotics and social innovation. Students integrate knowledge from multiple disciplines, build prototypes, and prepare entries for recognized competitions (e.g., Robocon Hong Kong Contest, IEEE MetaCom Student Challenge, or HKAE Pitch Competition). Projects culminate in public showcasing and dissemination to external audiences, fostering entrepreneurship, scientific advancement, and commitment to community needs.

Teaching and Learning Activities (TLAs):

CILOs	Type of TLA
1,2	Supervisory meetings, workshops, and seminars on AI technologies, robotics design, reinforcement learning, computer vision, and transdisciplinary integration.
1,2,3	Team-based project work, including ideation, prototyping (e.g., robot building, AI model development), testing, and iteration
3,4	Group discussions, peer feedback sessions, pitch practice, and preparation for competition submissions
1,2,3,4	Hands-on experiential learning through competition participation and external showcasing events

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks

1	Progress Report	20%	1,2,3	A mid-term report detailing project progress, technical approach, and challenges faced, submitted by teams.
2	Project Deliverable	40%	1,2,3,4	A substantial learning product, such as a functional robot prototype, AI system, or competition entry (e.g., IEEE MetaCom 2-page paper or HKAE pitch deck), demonstrating transdisciplinary innovation.
3	Final Presentation	30%	3,4	A presentation of the project at a recognized event (e.g., Robocon HK, HKAE Pitch Competition, IEEE MetaCom, or equivalent), showcasing the solution to external partners and the community.
4	Project Management and Participation	10%	2,3,4	An individual evaluation of each student's contribution to project management and active participation in team activities, assessed through supervisor feedback and peer reviews.

Assessment Rubrics:

Excellent (A)
- Fully achieves all four CILOs with outstanding mastery.
- Demonstrates exceptional synthesis of knowledge from computer science, applied science, and business to create highly innovative, functional AI-based solutions (e.g., advanced robotic prototypes or competition entries) addressing real-world challenges like sustainable waste management or autonomous systems.
- Exhibits superior critical thinking, problem-solving, and creativity in designing, implementing, and iterating solutions, with significant innovations that advance existing approaches.
- Shows exemplary collaboration in transdisciplinary teams, effectively managing roles, resolving conflicts, and preparing competitive entries.
- Delivers professional, engaging communication and presentations that clearly convey project outcomes to diverse audiences, including strong performance at external events/competitions.

Good (B)
- Achieves all or most CILOs with strong competence.
- Synthesizes knowledge from multiple disciplines to develop effective and innovative AI-based solutions for real-world challenges.
- Applies solid critical thinking and problem-solving to design and implement solutions, with relevant improvements to existing methods.
- Collaborates well in transdisciplinary teams, contributing meaningfully to project goals and competition preparation.
- Communicates project outcomes clearly and professionally to audiences, with good performance in external presentations or events.

Satisfactory (C)
- Achieves core CILOs at a basic to adequate level.
- Demonstrates basic synthesis of disciplinary knowledge to create acceptable AI-based solutions for identified challenges.
- Uses fundamental critical thinking and problem-solving to develop simpler solutions with minor enhancements.
- Participates adequately in team collaboration, supporting project progress and basic competition readiness.
- Presents outcomes in a straightforward manner to audiences, with satisfactory delivery at external events.

Marginal Pass (D)
- Partially achieves CILOs with minimal proficiency.
- Shows limited synthesis of knowledge, resulting in basic or partially functional AI solutions for challenges.
- Applies rudimentary problem-solving to produce simple solutions with little innovation or improvement.
- Demonstrates basic teamwork and participation, with limited contribution to transdisciplinary goals or competition efforts.
- Provides basic communication of outcomes, with marginal effectiveness in presentations or external showcasing.

Fail (F)
- Fails to achieve sufficient CILOs.
- Lacks meaningful synthesis of knowledge or development of viable AI-based solutions.

- Shows little to no critical thinking, problem-solving, or innovation in addressing challenges.
- Insufficient collaboration or participation in team activities and competition preparation.
- Unable to effectively communicate or present project outcomes to any audience.

Course Content and CILOs Mapping:

Content		**CILO No.**
I	Introduction to transdisciplinary AI innovation, competition overviews and project ideation	1, 2, 3
II	Core AI and robotics technologies	1, 2
III	Prototype development, testing, and integration across disciplines	1, 2, 3
IV	Pitching, presentation skills, and competition preparation	3, 4
V	Reflection, portfolio compilation, and final showcasing	1, 2, 3, 4

References:

1. Russell, S., & Norvig, P. (2020). Artificial Intelligence: A Modern Approach (4th ed.). Pearson.
2. Siciliano, B., & Khatib, O. (Eds.). (2016). Springer Handbook of Robotics (2nd ed.). Springer.
3. Murphy, R. R. (2019). Introduction to AI Robotics (2nd ed.). MIT Press.
4. IEEE MetaCom 2025 Submission Guidelines: https://metasejong-competition.github.io/en/
5. Robocon Hong Kong 2025 Objectives: http://www.roboconhk.com/2025/objectives.html
6. HKAE Pitch Competition Details: https://pitchcomp.hkae.hk/en/index.asp
7. Sutton, R. S., & Barto, A. G. (2018). Reinforcement Learning: An Introduction (2nd ed.). MIT Press.
8. Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.
9. LaValle, S. M. (2006). Planning Algorithms. Cambridge University Press.
10. Thrun, S., Burgard, W., & Fox, D. (2005). Probabilistic Robotics. MIT Press.

Course Content:

Topic

I. Introduction to transdisciplinary AI innovation, competition overviews and project ideation
   - Team formation and initial brainstorming on real-world challenges (e.g., sustainable waste, autonomous basketball robots)

II. Core AI and robotics technologies
   - Hands-on sessions on tools and frameworks (e.g., computer vision, reinforcement learning, path planning, embodied AI)

III. Prototype development, testing, and integration across disciplines
   - Supervised team project work and progress reviews
   - Transdisciplinary integration such as computer science, engineering, business/social impact

IV. Pitching, presentation skills, and competition preparation
   - Practice sessions and feedback
   - Preparation for external dissemination/competitions

V. Reflection, portfolio compilation, and final showcasing
   - Final adjustments and event participation