

Lingnan University
Course Syllabus

Course Title	:	Capstone 1 – Innovation, Technology and Design
Course Code	:	CDS4105
Recommended Study Year	:	Year 4
No. of Credits	:	3
Mode of Tuition	:	Sectional Approach
Class Contact Hours	:	3 hours per week
Category	:	Capstone Course
Discipline	:	Nil
Prerequisite(s)	:	(a) CDS2103 Machine Learning for Innovative Design, and (b) CDS3001 Databases and Data Warehouses, and (c) CDS3101 Intelligent Sensing and Control
Co-requisite(s)	:	Nil
Exclusion(s)	:	Nil
Exemption Requirement(s)	:	Nil

Brief Course Description:

Capstone projects constitute a critical component of undergraduate education, providing students with an opportunity to integrate and apply the knowledge and skills acquired throughout their programme of study. Capstone 1 – Innovation, Technology and Design is the first phase of a two-part capstone sequence, focusing on problem identification, background research, and conceptual system design.

In this course, students work in teams to address real world challenges that require innovative, technology driven solutions. Emphasis is placed on design thinking, user centred design, and the effective use of emerging technologies. Students engage in activities such as needs analysis, stakeholder and market research, ideation, feasibility assessment, and conceptual prototyping. By the end of the course, each team will produce a comprehensive project proposal and preliminary design documentation.

Aims:

The course aims to prepare students for independent, integrative project work by developing their ability to identify meaningful problems, formulate innovative solutions, and translate ideas into structured and feasible design proposals. It also aims to enhance students' collaboration, communication, and professional skills required for large scale technology projects.

Learning Outcomes (LOs)

Upon successful completion of this course, students will be able to:

1. Identify and critically analyse real world problems that can be addressed through innovative technological solutions. (PILO1)
2. Conduct background research, needs analysis, and stakeholder or market analysis to inform project direction. (PILO1, PILO3, PILO8)
3. Apply design thinking and user centred design principles to generate and evaluate solution concepts. (PILO3)

4. Develop a coherent conceptual system design integrating appropriate data, sensing, and intelligent technologies. (PILO1, PILO2)
5. Assess technical feasibility, constraints, and risks associated with proposed solutions. (PILO2, PILO7)
6. Communicate project ideas, design rationale, and plan effectively through professional documentation and presentations, and collaborate effectively in a team environment. (PILO6)

Indicative Contents:

Capstone Orientation and Problem Definition

Overview of capstone projects; problem identification; societal and industrial challenges; project scoping.

Design Thinking and User Centred Design

Empathising with users; needs analysis; stakeholder analysis; ideation and brainstorming techniques.

Technology and Innovation

Exploration of emerging technologies; integration of data analytics, AI, sensing, and systems concepts; feasibility considerations.

Conceptual Design and Planning

System architecture and conceptual modelling; requirement specification; risk analysis; project planning.

Test and Validation

Definition of validation objectives and success criteria; conceptual approaches to functional and usability evaluation; incorporation of feedback; and risk identification for design refinement.

Proposal Development and Presentation

Technical documentation; proposal writing; design justification; oral and visual presentation skills.

Teaching Methods:

Teaching and learning activities include lectures, workshops, tutorials, and supervised project work. Lectures and workshops introduce design methodologies and project management concepts, while tutorials and consultations provide guidance on team progress and project refinement. Students are expected to engage in substantial independent and team based work outside class.

Measurement of Learning Outcomes:

Assessment LOs	Class Attendance and Participation	Project Proposal & Documentation	Group Presentation & Demo	Final Submission
	(10%)	(30%)	(20%)	(40%)
LO1	✓	✓	✓	
LO2		✓		
LO3		✓		✓

LO4		✓		✓
LO5		✓		✓
LO6	✓		✓	✓

1. Class Attendance and Participation (10%): This component assesses students' engagement in workshops, discussions, consultations, and teamwork (LO1, LO6).
2. Project Proposal and Documentation (30%): Students submit a written proposal detailing problem analysis, background research, conceptual design, feasibility analysis, and project planning (LO1-LO5).
3. Group Presentation and Demo (20%): Teams present their project concept, design rationale, and implementation plan to demonstrate clarity of thinking, innovation, and effective communication (LO1, LO6).
4. Final Submission (40%): The final submission evaluates the completeness, coherence, and professionalism of the overall project proposal and design package (LO3-LO6).

Assessment:

Class Attendance and Participation	10%
Project Proposal and Documentation	30%
Group Presentation and Demo	20%
Final Submission	40%
Total	100%

Required/Essential Readings:

1. Brown, T. (2009). Change by Design. HarperBusiness.
2. Ulrich, K. T., & Eppinger, S. D. (2016). Product Design and Development (6th ed.). McGraw Hill.

Recommended/Supplementary Readings:

1. Norman, D. A. (2013). The Design of Everyday Things. Basic Books.
2. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation. Wiley.
3. IDEO.org. (2015). The Field Guide to Human-Centered Design.
4. Lewrick, M., Link, P., & Leifer, L. (2020). The design thinking toolbox: A guide to mastering the most popular and valuable innovation methods. Wiley.
5. Traum, M. J., Niemi, S. R., Collins, P., Jenkins, M. Q., Putnam, S. R., Pinkoson, C. M., & Gutierrez, R. (2020). An Open Educational Resource Engineering Capstone Design Textbook with Case Studies Relevant to Student Experience. In Proceedings of the 2020 Capstone Design Conference, Dallas, TX, USA.

Important Notes:

- (1) Students are expected to spend a total of 9 hours (i.e. 3 hours of class contact and 6 hours of personal study) per week to achieve the course learning outcomes.
- (2) Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examinations and Course Work. In particular, plagiarism, being a kind of dishonest practice, is “the presentation of another person’s work without proper acknowledgement of the source, including exact phrases, or summarised ideas, or even footnotes/citations, whether protected by copyright or not, as the student’s own work”. Students are required to strictly follow university regulations governing academic integrity and honesty.
- (3) Students are required to submit writing assignment(s) using Turnitin.
- (4) To enhance students’ understanding of plagiarism, a mini-course “Online Tutorial on Plagiarism Awareness” is available on <http://pla.ln.edu.hk/>.
- (5) Students must adhere to the University’s guidelines and practices when using Generative Artificial Intelligence (GAI) tools. The official documents “Guidelines for Using GAI Tools at Lingnan University” and “Best Practices for Ethical and Responsible Use of GAI Tools in Course Assessments” can be found here: <https://www.ln.edu.hk/tlc/generative-artificial-intelligence/gai-guidelines-best-practices>.

Lingnan University
Course Rubrics

Rubric for Class Attendance and Participation (10%)

Criterion	Excellent (90-100)	Good (70-89)	Pass (50-69)	Fail (0-49)
Attendance (50%)	Attends > 90% of classes punctually.	Attends $\geq$ 70% of classes; minimal lateness.	Attends $\geq$ 50% of classes; occasional lateness.	Attends < 50% of classes or frequent lateness.
Engagement (20%)	Actively contributes to discussions, workshops, and team activities; frequently offers ideas or feedback.	Participates occasionally in discussions and activities.	Limited participation; responds only when prompted.	Rarely participates; disengaged during class activities.
Professional Conduct (30%)	Demonstrates high professionalism: prepared, respectful, responsible, and collaborative.	Generally professional with minor lapses.	Acceptable conduct with noticeable gaps.	Exhibits unprofessional behaviour; disrupts team/class progress.

Rubric for Project Proposal and Documentation (30%)

Criterion	Excellent (90-100)	Good (70-89)	Pass (50-69)	Fail (0-49)
Problem Definition (20%)	Problem is clear, well justified, relevant, with strong context and motivation.	Problem is defined and relevant but justification is limited.	Problem is identifiable but vague or weakly supported.	Problem unclear, irrelevant, or poorly formulated.
Research & Needs Analysis (25%)	Research is comprehensive, well synthesised, and shows deep understanding of stakeholders and needs.	Adequate research with some analysis; minor gaps.	Basic research; limited analysis or stakeholder insight.	Minimal or incorrect research; lacks analysis.
Conceptual Design (25%)	Conceptual design is innovative, coherent, and well integrated with technologies and user needs..	Functional conceptual design with some creativity and clarity.	Basic concept; partially coherent; limited innovation.	Weak or incoherent design; lacks structure or relevance.
Feasibility & Constraints (15%)	Feasibility analysis is realistic, rigorous, and addresses technical, economic, and risk factors thoroughly.	Some feasibility considerations with minor omissions.	Basic feasibility discussion with superficial analysis.	Little to no feasibility analysis; unrealistic assumptions.
Documentation Quality (15%)	Document is clear, professional, well organized, visually coherent, and technically sound.	Mostly clear and structured; minor issues in clarity or formatting.	Understandable but with structural or writing flaws.	Poorly written, unclear, or inadequately formatted.

Rubric for Group Presentation and Demo (20%)

Criterion	Excellent (90-100)	Good (70-89)	Pass (50-69)	Fail (0-49)
Content & Organisation (40%)	Presentation is clear, logical, persuasive, and demonstrates deep understanding of problem, design, and rationale.	Information is clear and mostly organized; minor gaps.	Basic clarity but lacks structure or depth.	Disorganized, unclear, or incorrect content.
Communication Skills (35%)	Delivery is confident, engaging, well paced; excellent visual aids.	Delivery clear with minor lapses; acceptable visuals.	Basic delivery; reading from slides; weak visuals.	Poor communication; unclear speech; ineffective visuals.
Team Collaboration (25%)	All team members contribute effectively and professionally.	Most members contribute; small imbalance.	Noticeable imbalance; limited coordination.	Poor collaboration; major imbalance or missing members.

Rubric for Final Submission (40%)

Criterion	Excellent (90-100)	Good (70-89)	Pass (50-69)	Fail (0-49)
Completeness & Coherence (30%)	Submission is comprehensive, coherent, and integrates all required components with logical flow.	Mostly complete; minor structural or content gaps.	Basic submission; some missing elements; limited clarity.	Incomplete or incoherent submission.
Design Maturity (30%)	Concept demonstrates excellent refinement, strong justification, and clear system architecture.	Concept sufficiently refined with clear rationale.	Partially refined concept; weak justification.	Immature or poorly justified design.
Feasibility & Risk Assessment (20%)	Demonstrates rigorous feasibility analysis and realistic identification of constraints and risks.	Feasibility assessed with minor omissions.	Basic but shallow consideration of feasibility.	No meaningful feasibility or risk assessment.
Professional Quality (20%)	Submission is polished, professional, well edited, and visually well presented.	Generally professional; minor inconsistencies.	Acceptable quality with several issues.	Poorly formatted, unclear, or unprofessional work.