The Hong Kong University of Science and Technology (Guangzhou)

UG Course Syllabus

[Course Title] Deep Learning

[Course Code] DSAA 2012

[No. of Credits] 3

[Any pre-/co-requisites] DSAA 2011 Machine Learning or AIAA 3111 Introduction to Data Mining

Name: [Instructor(s) Name] Chen LIANG

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Office Hours: [Specify Office Hours and Location] Wednesday 3:00-5:00 PM, W1-402

Course Description

[Briefly describe the course content, key topics or themes, objectives, methods of instruction, e.g., lectures, discussions, projects].

This course provides students with an extensive exposure to deep learning. Topics include shallow and deep neural networks, activation functions and rectified linear unit, construction of deep neural networks and matrix representations including deep convolutional neural networks and deep recursive neural networks, computational issues including backpropagation, automatic differentiation, stochastic gradient descent, complexity analysis, approximation analysis including universality of approximation, design of deep neural network architectures and programming according to various applications.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Understand the foundation of deep learning: models and optimization.

2. Train deep learning models.

3. Create/design deep learning models with other researchers.

4. Explain/present their results to others.

Weekly Schedule and Weekly ILOs

Week	Topics	Weekly ILOs
1	Course Overview and Introduction	1, 4
2	Mathematical Background and Deep Learning Theory	1, 4
3	Deep Feedforward Neural Networks	1, 2, 4
4	Convolutional Neural Networks	1, 2, 4

5	Recurrent Neural Networks	1, 2, 4
6	Regularization and Generalization	1, 2, 3, 4
7	Transformer Models	1, 2, 3, 4
8	Representation Learning	1, 2, 3, 4
9	Vision Transformers and Vision-Language Models	1, 2, 3, 4
10	Variational Autoencoder	1, 2, 3, 4
11	Generative Adversarial Networks	1, 2, 3, 4
12	Diffusion Models	1, 2, 3, 4
13	Deep Reinforcement Learning	1, 2, 3, 4

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

[List specific assessed tasks, exams, quizzes, their weightage, and due dates; perhaps, add a summary table as below, to precede the details for each assessment.]

Assessment Task	Contribution to Overall Course grade (%)	Due date
Writing Assignments	20%	12/5/2026 *
Coding Assignments	30%	12/5/2026 *
Course Project	30%	12/5/2026 *
Final Examination	20%	12/5/2026 *

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

[add to/delete table as appropriate]

Assessed Task	Mapped ILOs	Explanation
Writing Assignments	ILO1, ILO4	This task assesses students' ability to master DL theories, mathematical proofs, and analytical calculations (ILO 1) related to the course content, and be able to communicate and present DL theories and solutions to others (ILO 4).
Coding Assignments	ILO1, ILO2, ILO3	This task assesses students' ability to understand fundamental DL theories (ILO 1) and be able to implement algorithms, models, or DL frameworks related to the course content (ILO2, ILO3)

Final Exam	ILO1, ILO4	This task assesses students' ability to master DL theories, mathematical proofs, and analytical calculations (ILO 1) related to the course content, and be able to communicate and present DL theories and solutions to others (ILO 4).
Course Project	ILO1, ILO2, ILO3, ILO4	This task assesses students' ability to understand fundamental DL theories (ILO 1), be able to use them to address real world problems (ILO2, ILO3), and be able to communicate and present DL theories and solutions to others (ILO 4).

Grading Rubrics

[Detailed rubrics for each assignment will be provided. These rubrics clearly outline the criteria used for evaluation. Students can refer to these rubrics to understand how their work will be assessed.]

Assessed Task	**Rubrics**
Writing Assignments	Consist of mathematical derivations, analytical calculations, or short proof-based questions drawn from lecture materials. Assignments are marked based on standard answers.
Coding Assignments	Implementing algorithms, models, or DL frameworks related to the course content. Codes are marked with a standard online judge (OJ) system with predefined test samples.
Final Exam	The final exam is a closed-book examination and primarily consists of mathematical problems. The question types and level of difficulty are aligned with the Writing Assignments, focusing on analytical reasoning, mathematical derivations, and conceptual understanding of the theories and methods covered in the lectures. The exam is marked based on standard answers.
Course Project	Course project is marked based on following dimensions: 1) model performance (10pts), codes (10pts), and project report (10pts).

Final Grade Descriptors:

[As appropriate to the course and aligned with university standards]

Grades	**Short Description**	**Elaboration on subject grading description**
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve

		learning goals.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.
F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

Course AI Policy

[State the course policy on the use of generative artificial intelligence tools to complete assessment tasks.]

Homework Assignments & Group Project: Generative AI tools are partially allowed with strict transparency and ethical guidelines. Students are allowed to use generative AI tools for: 1) Ideation & Debugging, e.g., brainstorming relevant concepts or troubleshooting code/design issues; 2) Documentation Assistance, e.g., refining technical reports or project descriptions after original content is drafted by the student. 3) Educational Support, e.g., explaining ML algorithms. When using generative AI tools, Students must: 1) Clearly cite AI usage in submissions (tool used + specific prompts/outputs applied) and 2) Retain all AI-generated drafts/intermediate outputs for review if requested. Students should not directly generate core deliverables (code, sensor data analysis, system designs) without substantive human input.

In-class Quizzes and Exams: Generative AI tools are strictly prohibited during quizzes and exams.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include [specific details, e.g., strengths, areas for improvement]. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

[If applicable, explain the policy for resubmitting work or reassessment opportunities, including conditions and deadlines.]

Required Texts and Materials

[List required textbooks, readings, and any other materials]

Deep Learning. Ian Goodfellow et al.

Understanding Deep Learning. Simon J.D. Prince

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST(GZ)'s Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Regulations for Academic Integrity and Student Conduct for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

[Optional] Additional Resources

[List any additional resources, such as online platforms, library resources, etc.]