A1CE Curriculum Content

AiCE Program Team

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Contents

Chapter 1

Pillars

1.1 Artificial Intelligence Core

Subdomain	Code	Competency	Credits	Required?	Universities
Artificial Intelligence (AI)	AIC-301	Symbolic AI	4	No	CMKL
	AIC-302	Probability-based Models	4	No	CMKL
	AIC-303	Planning and Search Strategies	4	Yes	CMKL
	AIC-304	Neural Network and Deep Learning	4	Yes	CMKL
Machine Learning (ML)	AIC-501	Supervised Learning and Unsupervised Learning	4	Yes	CMKL
	AIC-502	Reinforcement Learning	4	No	CMKL
	AIC-503	Transformer Network	4	No	CMKL
Data Mining (DM)	AIC-401	Information Retrieval and Extraction — Search and Indexing	4	No	CMKL
	AIC-402	Proximity Measurement and Cluster Analysis	4	No	CMKL
	AIC-403	Classification and Regression	4	No	CMKL
AI Applications	AIC-601	Recommender System	4	No *	CMKL
	AIC-602	Natural Language Processing (NLP)	4	No *	CMKL
	AIC-603	Autonomous Agents	4	No *	CMKL
	AIC-604	Computer Vision	4	No *	CMKL
	AIC-605	Geographic Computing	4	No *	CMKL

***** *AI APPLICATIONS*: At least 0 of these competencies must be completed

Total credits for pillar AIC
All competencies: 60
Required competencies: 12
Required from option groups: 0

1.2 Communications and Presentation

Subdomain	Code	Competency	Credits	Required?	Universities
Communication and Presentation	COM-101	Research and Technical Writing	8	No	CMKL
	COM-102	Creative Writing	8	No	CMKL
	COM-103	Graphics and visual storytelling	8	No	CMKL
	COM-104	Analytical Thinking and Problem Solving	6	No	CMKL
	COM-105	Presentation and Storytelling	8	No	CMKL
	COM-106	Project Management	10	No	CMKL
	COM-201	Improvisational Acting	12	No	CMKL

Total credits for pillar COM
All competencies: 60
Required competencies: 0
Required from option groups: 0

1.3 Entrepreneurship and Innovation

Subdomain	Code	Competency	Credits	Required?	Universities
Soft Skills	URD-101	Undergraduate R&D Project (1)	9	Yes	CMKL
	URD-102	Undergraduate R&D Project (2)	9	Yes	CMKL
	URD-201	Undergraduate R&D project (3)	9	Yes	CMKL
	URD-202	Undergraduate R&D Project (4)	9	Yes	CMKL
Entrepreneurship and Innovation	ENI-101	Create Innovation-driven Enterprise (Path Selection)	4	Yes	CMKL
	ENI-102	Product Design and Development (Including Design Thinking)	8	No	CMKL
	ENI-103	Intellectual Property	2	No	CMKL
	ENI-104	Startup from Idea to Impact	12	No	CMKL
	ENI-105	Building Effective Teams to drive Innovation	2	No	CMKL
	ENI-106	Entrepreneurial finance	4	No	CMKL
Strategy and Innovation	ENI-201	Strategic Innovation Development	4	No	CMKL
	ENI-202	Business Strategy	2	No	CMKL
	ENI-203	Platform Strategy	4	No	CMKL
	ENI-304	AI for Business	12	No	CMKL
Leadership and Communication	ENI-301	Inclusive Leadership	2	No	CMKL
	ENI-302	Persuasive and Leadership Communication	4	No	CMKL
	ENI-303	Negotiation	4	No	CMKL
Business Application Domains	ENI-401	Retail and Services Applications	4	No	CMKL
	ENI-402	Logistics	4	No	CMKL
	ENI-403	Biomedical, Bioinformatics and Health	4	No	CMKL
	ENI-404	Gaming and Creative Industries	4	No	CMKL
	ENI-405	Fintech	4	No	CMKL
	ENI-406	Educational Technology	4	No	CMKL

Total credits for pillar ENI
All competencies: 124
Required competencies: 40
Required from option groups: 0

1.4 Arts, Humanities and Social Sciences

Subdomain	Code	Competency	Credits	Required?	Universities
People, Places and Cultures	HAS-101	Sociology and Cultural Anthropology	9	No	CMKL
	HAS-102	Social Psychology	9	No	CMKL
	HAS-103	Political Studies	9	No	CMKL
	HAS-104	Human Geography	9	No	CMKL
	HAS-105	Global Histories & Philosophy	9	No	CMKL
	HAS-109	Ethics and Policy Issues	2	No	CMKL
	HAS-110	Character Development I	4	No	CMKL
	HAS-111	Character Development II	3	No	CMKL
	HAS-112	Intellectual Property & Policy Management	9	No	CMKL
	HAS-113	AI and Computer Engineering for Community Impact	4	No	CMKL
Economics	HAS-108	Economics	8	No	CMKL
Arts and Music	HAS-106	History of visual arts	8	No	CMKL
	HAS-107	History of music	8	No	CMKL

Total credits for pillar HAS
All competencies: 91
Required competencies: 0
Required from option groups: 0

1.5 Human-Centered Design

Subdomain	Code	Competency	Credits	Required?	Universities
Designing for Human-Machine Teaming	HCD-203	Interaction Design and Experience Design	9	No	CMKL
	HCD-302	Creating Explainable AI	4	Yes	CMKL
	HCD-303	Human Psychology for User Interface Design	4	No	CMKL
	HCD-304	Design Thinking, Innovation, and Creative Confidence	12	No	CMKL
Analysis and Presentation (AP)	HCD-101	Visualization	4	No	CMKL
	HCD-103	User Interface Design and Evaluation	6	No	CMKL
	HCD-104	Immersive Environments	6	No	CMKL
Understanding Context of Use	HCD-201	Accessibility and Universal Design	2	No	CMKL
	HCD-202	User Research Methodologies, Data and Design Thinking	4	No	CMKL
Engaging in Critical Oversight	HCD-301	Ethics in computer engineering	2	Yes	CMKL
	HCD-401	Ethical Principles for AI (Fairness, Accountability, Transparency, Ethics)	4	No	CMKL
Game Engineering	HCD-501	Basic Game Design & Development	4	No	CMKL
	HCD-502	Advanced Game Design, Play & Mechanic	6	No	CMKL
	HCD-503	Story and Character Design & Development	6	No	CMKL
	HCD-504	Interactive Design, Arts & Concepts	6	No	CMKL
	HCD-505	Game Engine & Prototyping	12	No	CMKL
	HCD-506	Gaming Economy & Tokenomics Design	6	No	CMKL
	HCD-507	E-Sport & Ecosystem Development (IP)	6	No	CMKL
	HCD-508	AI for Gaming & Procedural Generation	12	No	CMKL
	HCD-509	Virtual Production	4	No	CMKL
	HCD-510	Motion Capture & Animation	4	No	CMKL
	HCD-511	VR Gaming & Augmented Reality	4	No	CMKL

Total credits for pillar HCD
All competencies: 127
Required competencies: 6
Required from option groups: 0

1.6 Mathematics

Subdomain	Code	Competency	Credits	Required?	Universities
Mathematics	MAT-101	Calculus - Differentiation	3	No	CMKL
	MAT-102	Calculus - Basic derivatives	2	No	CMKL
	MAT-103	Calculus - Integration	4	No	CMKL
	MAT-104	Calculus - Optimization	3	No	CMKL
	MAT-105	Vector Calculus	6	No	CMKL
	MAT-106	Analytical Geometry	6	No	CMKL
	MAT-107	Differential Equations and Approximation	12	No	CMKL
	MAT-201	Matrices and Linear Transformations (Linear algebra)	12	Yes	CMKL
	MAT-202	Data Domains — Time/Frequency Domain	4	No	CMKL
	MAT-203	Descriptive Statistics	2	Yes	CMKL
	MAT-204	Producing Data	3	Yes	CMKL
	MAT-205	Probability distribution	3	Yes	CMKL
	MAT-206	Inference Statistics	4	Yes	CMKL
	MAT-207	Discrete Mathematics	12	Yes	CMKL

Total credits for pillar MAT
All competencies: 76
Required competencies: 36
Required from option groups: 0

1.7 Science

Subdomain	Code	Competency	Credits	Required?	Universities
Science	SCI-101	Fundamentals of Biology	12	No	CMKL
	SCI-102	Fundamentals of Chemistry	12	No	CMKL
	SCI-103	Physics II	12	No	CMKL
	SCI-104	Quantum Physics	12	No	CMKL
	SCI-105	Kinematics describe motion	3	No	CMKL
	SCI-106	Dynamics explain motion	3	No	CMKL
	SCI-107	Energy and Momentum	3	No	CMKL
	SCI-108	Thermodynamics	3	No	CMKL
	SCI-109	Electricity	4	No	CMKL
	SCI-110	Magnetism	4	No	CMKL
	SCI-111	Light and Optics	4	No	CMKL

Total credits for pillar SCI
All competencies: 72
Required competencies: 0
Required from option groups: 0

1.8 Cybersecurity

Subdomain	Code	Competency	Credits	Required?	Universities
Data Acquisition, Management, and Governance	SEC-101	Data Acquisition, Preparation, Transformation and Cleaning	4	No	CMKL
	SEC-102	Data Reduction and Compression	4	No	CMKL
	SEC-103	Data Govermance	2	No	CMKL
Data Privacy, Security, Integrity, and Analysis for Security	SEC-201	Data Privacy, Security and Integrity	4	Yes	CMKL
	SEC-202	Creating Secure Software	4	No	CMKL
	SEC-203	Securing System Infrastructure	6	No	CMKL
	SEC-204	Security Policy and Processes	4	No	CMKL
	SEC-205	Distributed ledger and Blockchain	4	No	CMKL
	SEC-303	Vulnerability Assessment for Software Applications	4	No	CMKL
	SEC-401	Privacy Attacks	2	No	CMKL
	SEC-402	Differential Privacy (DP)	6	No	CMKL
AI System Security	SEC-301	Security Challenges in Modern AI Systems	4	Yes	CMKL
	SEC-302	Robustness of AI Components and Systems	6	Yes	CMKL

Total credits for pillar SEC
All competencies: 54
Required competencies: 14
Required from option groups: 0

1.9 Software Engineering

Subdomain	Code	Competency	Credits	Required?	Universities
Programming Fundamentals	SEN-099	Programming Essentials	4	No	CMKL
	SEN-101	Algorithmic Thinking & Problem Solving	2	Yes	CMKL
	SEN-102	Intro to Programming	6	Yes	CMKL
	SEN-103	Programming Multi-module Applications	4	No	CMKL
	SEN-107	Fundamental Data Structures	4	Yes	CMKL
	SEN-108	Basic Algorithms	2	Yes	CMKL
	SEN-208	Advanced Data Structures and Algorithms	4	No	CMKL
	SEN-209	Designing and implementing data bases	6	No	CMKL
Programming Paradigms	SEN-304	Object Oriented Design and Programming	6	No	CMKL
	SEN-305	Functional Programming	4	No	CMKL
	SEN-306	Dataflow Programming	4	No	CMKL
	SEN-307	Domain-specific programming languages	2	No	CMKL
Software Development and Maintenance (SDM)	SEN-201	Software Engineering Processes	6	Yes	CMKL
	SEN-202	Software Quality Assurance	4	No	CMKL
	SEN-203	Software Design	4	No	CMKL
	SEN-205	Requirements Analysis and Problem Definition	4	No	CMKL
	SEN-212	Software Configuration Management	2	No	CMKL
	SEN-213	Software Measurement	4	No	CMKL
	SEN-214	Software Maintenance and Evolution	2	No	CMKL
	SEN-301	Designing and Building Secure Software	4	No	CMKL
	SEN-302	Designing and Building Mission Critical Software	4	No	CMKL
Software Engineering Leadership	SEN-401	Agile Development Processes (including DevOps)	4	No	CMKL
	SEN-402	Software Project Management	4	No	CMKL
	SEN-403	Software Organization Maturity and Continuous Improvement	4	No	CMKL
	SEN-404	Legacy Software Strategies	2	No	CMKL
	SEN-405	Open Source Software	2	No	CMKL
Platform Specific Architectures	SEN-311	Web Architectures	4	No	CMKL
	SEN-312	Mobile Application Architectures	4	No	CMKL

Total credits for pillar SEN
All competencies: 106
Required competencies: 20
Required from option groups: 0

1.10 Scalable Systems

Subdomain	Code	Competency	Credits	Required?	Universities
Computer Organization	SYS-101	Operating Systems	4	Yes	CMKL
	SYS-102	Basic Computer Architecture	4	Yes	CMKL
	SYS-202	Real Time and Embedded Systems	4	No	CMKL
	SYS-205	Storage and File Systems Fundamentals	2	No	CMKL
	SYS-206	Computer Design Processor Architectures and Digital Design using HDLs	4	No	CMKL
	SYS-207	Networks	4	No	CMKL
	SYS-208	Digital and Analog Circuit Design	4	No	CMKL
Distributed Systems	SYS-301	Cyber Physical Systems	4	No	CMKL
	SYS-302	Cloud Computing	4	No	CMKL
	SYS-303	Scalable Management of Data and Models	4	No	CMKL
	SYS-304	Scalable Algorithms and Infrastructure	4	No	CMKL
	SYS-401	Parallel Computing	4	No	CMKL
	SYS-402	Distributed Data Storage	4	No	CMKL
	SYS-403	Big Data Computing	4	No	CMKL

Total credits for pillar SYS
All competencies: 54
Required competencies: 8
Required from option groups: 0

Chapter 2

Competency Details

2.1 AIC Pillar

2.1.1 Details for Competency AIC-301

AIC-301: Symbolic AI
Identity code: SYMBOLIC_AI_4
Required? No
Credits: 4 (Graded)
Description
This competency provides you with an understanding of the basic principles and techniques used in Symbolic AI, such as knowledge representation, logical reasoning, search and planning. You will learn how to develop intelligent systems that can search, reason, plan, and solve problems, using symbolic representations and logical reasoning.
Responsible Instructor: Hossein Miri
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-301:00010	Knowledge Representation	Hands-on problem	Applying knowledge representation techniques to store and manipulate information: Recall various methods of knowledge representation and choose a suitable one to model an agent's knowledge effectively	Apply	*None*	*None*
AIC-301:00020	Reasoning & Inference using Symbolic Logic	Hands-on problem	Applying reasoning and inference to problem-solving using symbolic logic: Recall key principles and rules of symbolic logic for reasoning and inference, and apply them to solve problems, e.g., a scheduling problem	Create	*None*	*None*
AIC-301:00030	Expert Systems	Hands-on problem	Understanding how rule-based expert systems work: Demonstrate comprehension of the principles underlying rule-based expert systems (e.g., forward & backward chaining) and use them to solve problems	Create	*None*	*None*
AIC-301:00040	Search & Problem Solving	Hands-on problem	Understanding various search algorithms and being able to select a suitable one for a specific problem: Demonstrate comprehension of the most fundamental search methods (complete/incomplete & heuristic/blind) to solve problems, e.g., by implementing breadth-first and depth-first using symbolic logic	Create	*None*	*None*
AIC-301:00050	Constraint Satisfaction	Hands-on problem	Analyzing constraint satisfaction to solve problems: Analyze and identify constraints in problems, e.g., by developing a solution for a Sudoku puzzle using a variation of the depth-first search	Create	*None*	*None*
AIC-301:00060	Planning	Hands-on problem	Understanding various planning techniques and being able to select a suitable one for a specific problem: Demonstrate comprehension of the most fundamental planning techniques (classical/non-classical) to solve problems, e.g., by designing a simple STRIPS planner for a robot in a warehouse to optimize its efficiency	Create	*None*	*None*
AIC-301:00070	Uncertainty	Hands-on problem	Understanding uncertainty and how to deal with it in symbolic AI systems: Demonstrate comprehension of the most fundamental rules of the probability framework for dealing with uncertainty, e.g., by developing a simple medical diagnosis system that deals with uncertainty	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.2 Details for Competency AIC-302

AIC-302: Probability-based Models
Identity code: PROB_AI_MODELS_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-302:00010	Probability Models	Imported assessment	Assessment: The concept of Probability-based Models: write an essay to describe the concept	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.3 Details for Competency AIC-303

AIC-303: Planning and Search Strategies
Identity code: PLANNING_SEARCH_4
Required? Yes
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-303:00010	Problem Spaces	Imported assessment	Assessment: Formulate a problem in terms of searching a solution space: Given a problem that involves optimizing multiple objectives, show how it can be represented in terms of search and propose a solution method.	Analyze	*None*	*None*
AIC-303:00020	Symbolic Planning and Problem Solving	Imported assessment	Assessment: Apply a symbolic technique to solve a problem: Install and experiment with modern implementation of Newell"s & Simon"s GPS (https //github.com/thundergolfer/the-general-problem-solver) Then create a set of rules to solve a simple specified problem using GPS.	Apply	*None*	*None*
AIC-303:00030	Bio-inspired Search Algorithms	Imported assessment	Assessment: Create a program that implements a well-known bio-inspired algorithm: Create a program that uses either Ant Colony Optimization or Genetic Algorithms to solve the problem of finding the ideal restaurant.	Create	*None*	*None*
AIC-303:00040	State space search	Imported assessment	Assessment: Create a program that can play board game using uninformed search (e.g. chess): Implement a simple chess AI using iterative deepening or other uninformed search algorithms to determine the next best move	Create	*None*	*None*
AIC-303:00050	Planning & search consideration for real-world app	Imported assessment	Assessment: Describe a sample plan and search consideration for real-world app: Compile a list of potential problems that can be solved by search	Understand	*None*	*None*
AIC-303:00060	State space search	Imported assessment	Assessment: Pathfinding using heuristic search: Implement a pathfinding algorithm (e.g. using A* or other heuristics search) to navigate a game character to a destination on a map with random obstacles	Create	*None*	*None*
AIC-303:00070	State space search	Imported assessment	Assessment: Implement a route planning algorithm for a map application: Formulating the turn-by-turn navigation problem using planning/search strategies and implement an algorithm to suggest a route given traffic condition and a map	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.4 Details for Competency AIC-304

AIC-304: Neural Network and Deep Learning
Identity code: DEEP_LEARNING_4
Required? Yes
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Kawisorn Kamtue
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-304:00010	Neural network history and core concepts	Imported assessment	Assessment: Explaining the core concept underlying neural networks and discuss why they work: Oral quiz answer the instructor's questions about the meaning and importance of core neural network concepts	Understand	*None*	*None*
AIC-304:00020	Convolutional layers	Imported assessment	Assessment: Understand the mathematics behind convolutional layer: Determine the output of convolution between an image and a filter	Understand	*None*	*None*
AIC-304:00030	Pooling layers	Imported assessment	Assessment: Applying pooling layer to an image/features: Determine the output of pooling layer to an image	Apply	*None*	*None*
AIC-304:00040	Back-propagation	Imported assessment	Assessment: Calculating the adjustment of weights in a neural network using back-propagation: Write a program that demonstrates back-propagation byl calculate new weights for a set of neurons in a neural network, given current weights plus measures of error.	Apply	*None*	*None*
AIC-304:00050	Deep learning overview	Imported assessment	Assessment: Describe, compare and contrast the important types of deep neural network used in modern ML: Write a paper at least three pages long that summarizes the main categories of deep neural networks currently used in ML, explaining their similarities and differences and mentioning their common areas of application.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.5 Details for Competency AIC-501

AIC-501: Supervised Learning and Unsupervised Learning
Identity code: SUP_UNSUP_ML_4
Required? Yes
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-501:00010	Core ML concepts	Imported assessment	Assessment: Understanding fundamental ML concepts: Find and explain an example of machine learning in the literature, discussing and evaluating the example in terms of concepts such as data dimensions, supervised versus unsupervised techniques, etc.	Analyze	*None*	*None*
AIC-501:00020	Unsupervised learning methods	Imported assessment	Assessment: Applying unsupervised learning methods: Given an unlabeled set of data, use a third party framework like sklearn or Weka to do K-Means clustering. Vary the number of clusters and repeat. Write one to two pages describing and interpreting the results.	Apply	*None*	*None*
AIC-501:00030	Supervised learning methods	Imported assessment	Assessment: Applying supervised learning methods: Given a labeled data set, use a framework like sklearn or Weka to train a decision tree, then test its accuracy. Vary several of the parameters and repeat. Write one to two pages describing and interpreting the results.	Apply	*None*	*None*
AIC-501:00040	Neural network fundamental concepts	Imported assessment	Assessment: Train and evaluate a simple neural network: Given a data set for a simple classification problem, train a neural network to perform the classification, then evaluate its performance.	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.6 Details for Competency AIC-502

AIC-502: Reinforcement Learning
Identity code: REINFORCEMENT_ML_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-502:00010	Core Reinforcement Learning Concepts	Imported assessment	Given a learning example, clearly define it in term of (1) supervised learning and (2) reinforcement learning. Able to identify all important terms and assumptions in RL. Analyzing and evaluating difference results between (1) and (2). Discussing appropriate situations when to use (1) or to use (2): Given a learning example, clearly define it in term of (1) supervised learning and (2) reinforcement learning. Able to identify all important terms and assumptions in RL. Analyzing and evaluating difference results between (1) and (2). Discussing appropriate situations when to use (1) or to use (2)	Analyze	*None*	*None*
AIC-502:00020	Standard Reinforcement Learning Tools	Imported assessment	Applying various RL algorithms with / on standard tools: Applying various RL algorithms with / on standard tools	Analyze	*None*	*None*
AIC-502:00030	Classic Reinforcement Learning Methods	Imported assessment	Given a problem and Gym environment, use a Q-learning framework to train a model to solve the problem efficiently . Evaluating the results and lesson learned: Given a problem and Gym environment, use a Q-learning framework to train a model to solve the problem efficiently . Evaluating the results and lesson learned	Analyze	*None*	*None*
AIC-502:00040	Deep Reinforcement Learning Concepts	Imported assessment	Given a problem and Gym environment, use a Deep Q-learning framework to train a model to solve the problem efficiently . Evaluating the results and lesson learned: Given a problem and Gym environment, use a Deep Q-learning framework to train a model to solve the problem efficiently . Evaluating the results and lesson learned	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.7 Details for Competency AIC-503

AIC-503: Transformer Network
Identity code: TRANSFORMER_ML_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Kawisorn Kamtue
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-503:00010	Encoder Decoder	Imported assessment	Assessment: Understanding the concept of encoder decoder: Explain pictorially how encoder and decoder works with specific examples	Understand	*None*	*None*
AIC-503:00020	Attention mechanism	Imported assessment	Assessment: Applying attention mechanism to a task: Write a simple function that demonstrate the attention mechanism	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.8 Details for Competency AIC-401

AIC-401: Information Retrieval and Extraction — Search and Indexing
Identity code: INFO_EXTRACTION_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-401:00010	Information retrieval	Imported assessment	Assessment: Information retrieval: write an essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.9 Details for Competency AIC-402

AIC-402: Proximity Measurement and Cluster Analysis
Identity code: CLUSTER_ANALYSIS_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-402:00010	Proximity Measurement and Cluster Analysis	Imported assessment	Assessment: Proximity Measurement and Cluster Analysis: write an essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.10 Details for Competency AIC-403

AIC-403: Classification and Regression
Identity code: CLASS_REGRESS_6
Required? No
Credits: 4 (Graded)
Description
In this class, students will learn about classification and regression which are the main pillars of data science. While this course covers well-known state-of-the-art algorithms and their concepts, it is heavily focused on the real-world applications of classification and regression. Some of the covered algorithms are XGBoost, Random Forest, ARIMA, and YOLO (but not limited to). There are short writing assignments and a final project at the end. Lab sessions will be conducted in Python, scikit-learn, and TensorFlow.
Responsible Instructor: Boonyarit Changaival
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-403:00010	Applied Machine Learning	Imported assessment	Assessment: the concept of machine learning: Understand and able to distinguish situations where machine learning is needed and when other approaches can be used. Writing assignment 1-2 pages of an example classification problem and methods to solve it.	Analyze	*None*	*None*
AIC-403:00020	Classification	Imported assessment	Assessment: analyze and implement classification algorithms: Able to analyze and implement classification algorithms to be used in given contexts and able to select suitable performance metrics along with the algorithms. Writing assignment 1-2 pages of an example classification problem and methods to solve it.	Apply	*None*	*None*
AIC-403:00030	Regression	Imported assessment	Assessment: Able to analyze and implement regression algorithms: Able to analyze and implement regression algorithms to be used in given contexts and able to select suitable performance metrics along with the algorithms. Writing assignment 1-2 pages of an example regression problem and methods to solve it.	Apply	*None*	*None*
AIC-403:00040	K-Nearest Neighbours	Imported assessment	Assessment: Use K-NN as a classifier: Given a labelled data and input queries, determine the classes of the output	Apply	*None*	*None*
AIC-403:00050	Decision Tree	Imported assessment	Assessment: Use a decision tree as a classifier: Given a labelled data, design a decision tree for classification	Apply	*None*	*None*
AIC-403:00060	SVM	Imported assessment	Assessment: Use SVM as a classifier: Given data points of two classes, draw a decision boundary by SVM that separates the two classes	Apply	*None*	*None*
AIC-403:00070	Classification and Regression	Imported assessment	Assessment: Evaluation the Classification and Regression concept: Project assigment A report of 5-10 pages on the results of the study and a presentation. Able to do further research and use foundation learning in this course to understand others state-of-the-art or novel algorithms.	Create	*None*	*None*
AIC-403:00080	Classification and Regression	Imported assessment	Assessment: Able to communicate reseach methodology and outcomes to audiences.: Project assigment A report of 5-10 pages on the results of the study and a presentation.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.11 Details for Competency AIC-601

AIC-601: Recommender System
Identity code: RECOMMENDER_4
Required? No
Credits: 4 (Graded)
Option Group: AI APPLICATIONS
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-601:00010	Basic concepts of recommendation systems	Imported assessment	Assessment: Identify type of inputs required for different recommender systems: Given different input matrices (Item-Content vs User-Rating), identify the appropriate algorithms or techniques suitable for the input.	Understand	*None*	*None*
AIC-601:00020	Evaluation of recommendation systems	Imported assessment	Assessment: Evaluate the quality of a given recommendation system: Given two distinct recommender systems, evaluate its quality and make recommendation regarding the system selection.	Understand	*None*	*None*
AIC-601:00030	Content-based filtering	Imported assessment	Assessment: Implement a recommender system using content-based filtering approach, given product descriptions: Given product descriptions (e.g. movie synopsis), implement a recommender system based on the similarity of product description	Create	*None*	*None*
AIC-601:00040	Collaborative filtering	Imported assessment	Assessment: Evaluate the effectiveness of a collaborative filtering-based recommender system using user preference: Given multiple user rankings of product preference (e.g book review), evaluate the effectiveness of a recommender system based on the product rating and similar user's profile or ratings.	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.12 Details for Competency AIC-602

AIC-602: Natural Language Processing (NLP)
Identity code: NLP_4
Required? No
Credits: 4 (Graded)
Option Group: AI APPLICATIONS
Description
No description provided
Responsible Instructor: Ekapol Chuangsuwanich
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-602:00010	NLP Pipepline & Tokenization	Quiz or exam	Text cleaning and tokenization: Assignment on text tokenization	Understand	*None*	*None*
AIC-602:00020	Language Modeling and word representation	Quiz or exam	Training a language model and be able to analyze the embedding properties: Assignment on language modeling	Understand	*None*	*None*
AIC-602:00030	Token classification	Quiz or exam	Able to perform token classification tasks.: Assignment on a token classification task	Understand	*None*	*None*
AIC-602:00040	Text classification	Quiz or exam	Able to perform text classification tasks.: Assignment on a text classification task	Understand	*None*	*None*
AIC-602:00050	Text generation	Quiz or exam	Able to perform text generation tasks: Assignment on a text generation task	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.13 Details for Competency AIC-603

AIC-603: Autonomous Agents
Identity code: AUTO_AGENTS_4
Required? No
Credits: 4 (Graded)
Option Group: AI APPLICATIONS
Description
No description provided
Responsible Instructor: Pitikhate Sooraksa
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-603:00010	Fundemental Concepts	Interview/oral exam	Define and explain the fundamental concepts of autonomous agents.: Write on a paper answers (each last no more than a normal-length paragraph) 1. Why did the Internet architects decide to divide TCP and IP into two separate protocols? 2. How do datagrams help the Internet achieve two of its goals: to connect existing networks and to survive transient failures? 3. If you could start from scratch, how would you redesign the Internet today? Would you keep the same principles but change their order? Would you use new principles? [Based on"The Design Philosophy of the DARPA Internet Protocols (PDF)" by David Clark. Skip Section 10.]	Understand	*None*	*None*
AIC-603:00020	Engineering Analysis and Design	Imported assessment	Summarize, analyze, design and implement the concepts of Autonomous Agents.: Write on a paper answers (each last no more than a normal-length paragraph): 1. Why is CSMA/CA used in 802.11? 2. Why is collision detection (CD) that is used in a wired Ethernet not used in 802.11? 3. Compared with the current 802.11 standard, what do you notice to be the same and very different? [Based on "IEEE 802.11 Wireless Local Area Network" by B. P. Cow et. al. Skip the physical layer subsection.]	Analyze	*None*	*None*
AIC-603:00030	Performance Evaluation	Imported assessment	Define and assess performance of Autonomous Agents.: Write on a paper answers (each last no more than a normal-length paragraph): 1.What problem(s) is the landmark hierarchy addressing? 2. How does it work? 3. Why do you think the landmark hierarchy wasn't used on the Internet? (There are many reasons, but it is not because the ideas presented in the paper are inherently bad)[Based on"The Landmark Hierarchy: An New Hierarchy for Routing Very Large Networks (PDF)" by Paul Tsuchiya.]	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.14 Details for Competency AIC-604

AIC-604: Computer Vision
Identity code: COMPUTER_VISION_4
Required? No
Credits: 4 (Graded)
Option Group: AI APPLICATIONS
Description
No description provided
Responsible Instructor: Kawisorn Kamtue
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-604:00010	Computer vision concepts and representation	Imported assessment	Assessment: Computer vision concepts and representation: write an essay	Understand	*None*	*None*
AIC-604:00020	Classification problem in computer vision	Imported assessment	Assessment: Classification problem in computer vision: write an essay	Understand	*None*	*None*
AIC-604:00030	Object detection and tracking with computer vision	Imported assessment	Assessment: Object detection and tracking with computer vision: write an essay	Understand	*None*	*None*
AIC-604:00040	Generative applications for computer vision	Imported assessment	Assessment: Generative applications for computer vision: write an essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.1.15 Details for Competency AIC-605

AIC-605: Geographic Computing
Identity code: GEO_COMP_4
Required? No
Credits: 4 (Graded)
Option Group: AI APPLICATIONS
Description
Introduces techniques for representing and manipulating spatial information in computer applications, focusing on vector and raster representations. Compares algorithmic and classical ML approaches in geocomputing with heuristic models and deep learning.
Responsible Instructor: Sally Goldin
Prerequisites

- SEN-107 - Fundamental Data Structures

Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
AIC-605:00010	Geographic Computing	Hands-on problem	Demonstrate the ability to use and reason about locations: Complete a hands-on exercise using lat/long, map scale and projections	Apply	*None*	*None*
AIC-605:00020	Geographic Computing	Hands-on problem	Apply the principles of vector representation to a problem: Complete a hands-on programming assignment that involves using vector entities and transforming them to raster entities.	Create	*None*	*None*
AIC-605:00030	Geographic Computing	Hands-on problem	Apply the principles of raster representation to a problem: Complete a program that demonstrates understanding of raster representation, including transforming a raster to a vector representation.	Create	*None*	*None*
AIC-605:00040	Geographic Computing	Hands-on problem	Analyze code that implements algorithmic geocomputing techniques: Given a set of code that does some geocomputing using either Dikjkstra's algorithm (vector) or maximum likelihood classification (raster) plus some guiding questions, analyze and explain the code	Analyze	*None*	*None*
AIC-605:00050	Geographic Computing	Hands-on problem	Create an AI-based geocomputing module: Create either a GA-based multi-criteria routing application (vector) or a deep-learning based image segmentation/classification application as a group project. Write a paper explaining how the code works, as an individual assignment.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.2 COM Pillar

2.2.1 Details for Competency COM-101

COM-101: Research and Technical Writing
Identity code: RESEARCH_WRITING_8
Required? No
Credits: 8 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
COM-101:00010	Audience and purpose	Imported assessment	Assessment: Recognize the audience: Given example texts, decide who is the intended audience and what is the purpose of the text	Analyze	*None*	*None*
COM-101:00020	Simple and compound sentences	Imported assessment	Assessment: Write correct and effective simple and compound sentences: Complete an exercise that requires composing sentences on various topics.	Create	*None*	*None*
COM-101:00030	Paragraphs	Imported assessment	Assessment: Use topic sentences and exposition patterns to write clear and informative paragraphs: For multiple cases given a topic and a suggested exposition pattern, write a paragraph that discusses that topic using that exposition pattern.	Create	*None*	*None*
COM-101:00040	Organizing your ideas	Imported assessment	Assessment: Create an organized outline for a document, then turn it into text: Given a subject, create an outline for a four page essay discussing that topic. Then write the essay according to the outline.	Create	*None*	*None*
COM-101:00050	Research paper overview	Imported assessment	Assessment: Recognize the standard sections of a research paper: Given example research papers with the headings removed, identify the abstract, problem statement, background/literature review, methodology, results, discussion, conclusions and references secions.	Analyze	*None*	*None*
COM-101:00060	Research paper stating the problem	Imported assessment	Assessment: Create a problem statement: Write an effective problem statement for a research paper	Create	*None*	*None*
COM-101:00070	Research paper literature review and technical background	Imported assessment	Assessment: Create a literature review: Write an effective and correct literature review	Create	*None*	*None*
COM-101:00080	Research paper methodology	Imported assessment	Assessment: Create a methodology section: Write a methodology section for a research paper	Create	*None*	*None*
COM-101:00090	Research paper results, discussion and conclusion	Imported assessment	Assessment: Write results, discussion and conclusion sections: Write effective results, discussion and conclusions sections for a research paper	Create	*None*	*None*
COM-101:00100	Research paper references and citations	Imported assessment	Assessment: Create a correct reference section and cite references correctly: Create a references section and use references in the text of a research paper	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.2.2 Details for Competency COM-102

COM-102: Creative Writing
Identity code: CREATIVE_WRITING_8
Required? No
Credits: 8 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
COM-102:00010	Why Creative Writing Matters	Imported assessment	Assessment: Understand how creative writing engages with the world around us while also learning some of the important techniques of writing creatively in various genres, including scriptwriting, fiction, nonfiction, and poetry: Given written assignment to examine how creative writing engages with the world around us while also learning some of the important techniques of writing creatively in various genres.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.2.3 Details for Competency COM-103

COM-103: Graphics and visual storytelling
Identity code: VISUAL_STORY_8
Required? No
Credits: 8 (Graded)
Description
No description provided
Responsible Instructor: Hossein Miri
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
COM-103:00010	Storytelling and Visual Media	Imported assessment	Assessment: Understand useful skills for becoming a creative technological storytelling and how to think visually and aurally along with the aspects of mine-en-scene, classical continuity-style coverage, trans media, as well as temporal and spatial montage theory.: Work as a team to write, produce, shoot, as well as edit several visual story assignments	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.2.4 Details for Competency COM-104

COM-104: Analytical Thinking and Problem Solving
Identity code: ANALYTICAL_THINKING_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
COM-104:00010	Thinking skills	Imported assessment	Assessment: Understand to Identifying Arguments, Analysing Simple Arguments, Finding More Detail in Arguments, Exploring Weaknesses, Finding Strengths, Assess the Credibility of Evidence, and Applying Skills. Finally, this course will help students have a deep understanding of their subjects, higher-order thinking skills – analysis, critical thinking, problem-solving, presenting ordered and coherent arguments, independent learning, and research: Given test and essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.2.5 Details for Competency COM-105

COM-105: Presentation and Storytelling
Identity code: PRESENT_STORY_8
Required? No
Credits: 8 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
COM-105:00010	The elements of a story	Imported assessment	Assessment: Create a story that uses characters, conflict, desire and resolution	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.2.6 Details for Competency COM-106

COM-106: Project Management
Identity code: PROJ_MGMT_10
Required? No
Credits: 10 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
COM-106:00010	Integration Management	Imported assessment	Assessment: Learn to develop the project charter, project management plan, acquisition of project knowledge, and understanding change control.: Create a simple project charter and project management plan	Create	*None*	*None*
COM-106:00020	Scope Management	Imported assessment	Assessment: Learning about scope management, requirements collection, scope definition (and scope creep), understanding a WBS (work breakdown structure), ways to validate and control scope: Create a work breakdown structure using project charter created previously	Create	*None*	*None*
COM-106:00030	Time Management	Imported assessment	Assessment: Plan schedule management (gantt chart), define activities, sequence activities, estimate activity resources, estimate activity durations and dependencies, develop schedule, control schedule: Create a schedule management (gantt chart) and estimate activity durations and dependencies, develop schedule, control schedule based on the project charter and work breakdown developed previously.	Create	*None*	*None*
COM-106:00040	Cost Management	Imported assessment	Assessment: Understanding budgets, cost control, cost aggregation: Based on the resources required as worked out in the Gantt Chart and WBS, add in budgeted resources for each activity	Analyze	*None*	*None*
COM-106:00050	Risk Management	Imported assessment	Assessment: Identify risks, performance of qualitative and quantitative risks, creation of risk responses and risk control plans.: Create a risk control plan for time, cost, and scope overruns. Add a qualitative risk control plan.	Evaluate	*None*	*None*
COM-106:00060	Communication Management	Imported assessment	Assessment: Understanding effective communication through different communication formats, documentation and how to visually represent data. Understanding how to read audiences.: Create a communications plan for internal resources (during project). Include cadence, method, and communication points.	Create	*None*	*None*
COM-106:00070	Human Resource Management	Imported assessment	Assessment: Understanding organizational theory, how to estimate resource requirements (bottom up, parametric, analogous), resource calendars, change requests and variation requirements, understanding teams and team management techniques. Understanding virtual teams vs. colocated teams, interpersonal skills.: Based on the resources required as worked out in the Gantt Chart and WBS, create at least two profiles of skills and knowledge required in human resources for the project	Create	*None*	*None*
COM-106:00080	Quality Management	Imported assessment	Assessment: Learn about quality control management and how to define standards through checksheets, pareto charts, and other tools.: Create a Quality Control worksheet, detailing standards, ranges and mitigation plans for anomalies.	Create	*None*	*None*
COM-106:00090	Procurement Management	Imported assessment	Assessment: Learn about enterprise procurement processes, strategies, bid documents, make	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.2.7 Details for Competency COM-201

COM-201: Improvisational Acting
Identity code: IMPROV_ACTING_12
Required? No
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
COM-201:00010	Improvisational Acting	Imported assessment	Assessment: Improvisational Acting: Improvisational Acting	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.3 URD Pillar

2.3.1 Details for Competency URD-101

URD-101: Undergraduate R&D Project (1)
Identity code: URD_PROJ_1_9
Required? Yes
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
URD-101:00020	Compliance	Imported assessment	Assessment: Compliance (1): Follows workplace policies and processes, unless the policy or process violates ethical standards or seems to have other issues. In this case, communicates concerns to the organization promptly.	Apply	*None*	*None*
URD-101:00025	Compliance	Imported assessment	Assessment: Compliance (2): Refrains from personal activities or communications during working periods. Avoids using organization resources (computers, supplies, etc.) for personal purposes.	Apply	*None*	*None*
URD-101:00035	Interpersonal relations	Imported assessment	Assessment: Interpersonal relations: Treats co-workers with respect and courtesy does not violate their privacy.	Apply	*None*	*None*
URD-101:00045	Professional awareness	Imported assessment	Assessment: Professional awareness (1): Knows and respects existing rules pertaining to professional work, including laws, standards, certifications, etc.	Apply	*None*	*None*
URD-101:00050	Professional awareness	Imported assessment	Assessment: Professional awareness (2): Shows and communicates to others an awareness and understanding of computing, related technologies and their consequences for individuals and society.	Apply	*None*	*None*
URD-101:00055	Compliance	Imported assessment	Assessment: Compliance (3): Accesses computing and communication resources only when authorized or when compelled by the public good.	Apply	*None*	*None*
URD-101:00070	Respect and courtesy	Imported assessment	Assessment: Respect and courtesy: Treats all team members with respect and courtesy values all team member contributions.	Apply	*None*	*None*
URD-101:00115	Fairness and respect for diversity	Imported assessment	Assessment: Fairness and respect for diversity: Acts fairly and does not discriminate among people based on race, gender, nationality, physical or cognitive capabilities, sexual orientation, etc. Embraces inclusive and accessible technologies and practices and avoids creating systems or technologies that disenfranchise or oppress people.	Apply	*None*	*None*
URD-101:00120	Privacy and confidentiality	Imported assessment	Assessment: Privacy and confidentiality (1): Respects the work required to produce new ideas, inventions, creative works, and computing artifacts. Honors copyright, patent and license restrictions on software and other artifacts.	Apply	*None*	*None*
URD-101:00125	Privacy and confidentiality	Imported assessment	Assessment: Privacy and confidentiality (2): Respects privacy. Uses personal information only for legitimate ends and without violating the rights of individuals and groups.	Apply	*None*	*None*
URD-101:00130	Privacy and confidentiality	Imported assessment	Assessment: Privacy and confidentiality (3): Honors confidentiality. Does not disclose confidential information such as trade secrets, client data, nonpublic business strategies, financial information, research data, pre-publication scholarly articles, or patent applications without appropriate permission.	Apply	*None*	*None*
URD-101:00135	Motivation to learn	Imported assessment	Assessment: Motivation to learn: Willing and eager to try new approaches, technologies or tools.	Apply	*None*	*None*
URD-101:00155	Fairness and respect for diversity	Imported assessment	Assessment: Respect for diversity: Listens attentively and respectfully to people who have different backgrounds, experiences or views.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.3.2 Details for Competency URD-102

URD-102: Undergraduate R&D Project (2)
Identity code: URD_PROJ_2_9
Required? Yes
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
URD-102:00005	Commitment	Imported assessment	Assessment: Commitment (1): Makes clear commitments to deliver work	Apply	*None*	*None*
URD-102:00010	Commitment	Imported assessment	Assessment: Commitment (2): Delivers committed work on time when this is not possible, notifies the organization promptly rather than waiting for the deadline.	Apply	*None*	*None*
URD-102:00030	Personal time management	Imported assessment	Assessment: Time management: Manages time effectively in order to make progress on concurrent work assignments. Avoids relying on last-minute heroic efforts to meet deadlines.	Apply	*None*	*None*
URD-102:00040	Quality focus	Imported assessment	Assessment: Quality focus (1): Strives to achieve high quality in both the products and processes of professional work.	Apply	*None*	*None*
URD-102:00060	Quality focus	Imported assessment	Assessment: Quality focus (2): Designs and implements systems that are robustly and usably secure.	Apply	*None*	*None*
URD-102:00065	Attention	Imported assessment	Assessment: Attention: Listens attentively to communications from team members	Apply	*None*	*None*
URD-102:00110	Honesty and integrity	Imported assessment	Assessment: Honesty: Is honest and trustworthy. Does not make false statements about system capabilities or personal competencies. Does not falsify data. Discloses conflicts of interest.	Apply	*None*	*None*
URD-102:00140	Active learning	Imported assessment	Assessment: Active learning (1): Regularly reads technical journals, watches videos, listens to podcasts, subscribes to curated newsletters or pursues other activities to learn about new developments, issues and technologies.	Apply	*None*	*None*
URD-102:00145	Active learning	Imported assessment	Assessment: Active learning (1): Independently seeks out educational resources, including other people, when assigned a task that requires new skills or knowledge.	Apply	*None*	*None*
URD-102:00180	Working flexibility	Imported assessment	Assessment: Working flexibility (1): Willing to take over work originally assigned to someone else if circumstances require this.	Apply	*None*	*None*
URD-102:00185	Working flexibility	Imported assessment	Assessment: Working flexibility (2): Recognizes the existence of trade-offs in making technical decisions, and shows flexibility in exploring the impacts of different conflicting solution dimensions.	Apply	*None*	*None*
URD-102:00195	Continuous improvement focus	Imported assessment	Assessment: Continuous improvement focus (1): Considers risks and suggests ways to reduce their impact.	Apply	*None*	*None*
URD-102:00200	Continuous improvement focus	Imported assessment	Assessment: Continuous improvement focus (2): Considers and is willing to suggest improvements to current plans and processes.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.3.3 Details for Competency URD-201

URD-201: Undergraduate R&D project (3)
Identity code: URD_PROJ_3_9
Required? Yes
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
URD-201:00015	Responsibility	Imported assessment	Assessment: Responsibility: Takes responsibility for one's own work, including for mistakes.	Apply	*None*	*None*
URD-201:00075	Openness	Imported assessment	Assessment: Openness (1): Freely shares ideas and suggestions with team members	Apply	*None*	*None*
URD-201:00080	Openness	Imported assessment	Assessment: Openness (2): Deals honestly with all team members does not withhold information that is appropriate to share.	Apply	*None*	*None*
URD-201:00085	Openness	Imported assessment	Assessment: Openness (3): Answers questions and provides help when a team member asks.	Apply	*None*	*None*
URD-201:00090	Openness	Imported assessment	Assessment: Openness (4): Asks for help from team members when necessary or appropriate.	Apply	*None*	*None*
URD-201:00095	Team spirit	Imported assessment	Assessment: Team spirit: Shares a sense of common commitment to accomplishing the team's goals.	Apply	*None*	*None*
URD-201:00100	Social consciousness	Imported assessment	Assessment: Social consciousness (1): Contributes to society and to human well-being, acknowledging that all people are stakeholders in computing.	Apply	*None*	*None*
URD-201:00105	Social consciousness	Imported assessment	Assessment: Social consciousness (2): Avoids doing harm. This includes not only harm to sentient creatures but also to the natural environment.	Apply	*None*	*None*
URD-201:00150	Human-centered focus	Imported assessment	Assessment: Human-centered focus: Actively identifies the stakeholders or users for any system under development and tries to objectively describe their characteristics as well as their goals.	Apply	*None*	*None*
URD-201:00160	Human-centered focus	Imported assessment	Assessment: Human-centered focus: Works to provide positive, satisfying and useful experience for users of a system under design, based on an understanding of their goals, abilities, limitations and emotions.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.3.4 Details for Competency URD-202

URD-202: Undergraduate R&D Project (4)
Identity code: URD_PROJ_4_9
Required? Yes
Credits: 9 (Graded)
Description
Second year R&D project - second semester
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
URD-202:00010	Teamwork	Observational assessment	Apply team efforts to solve stakeholder problems: Team works together to solve problems	Apply	*None*	*None*
URD-202:00020	Professionalism	Observational assessment	Act in the role of engineers in addressing real world issues: Team takes an organized, mature approach to the solution process	Apply	*None*	*None*
URD-202:00030	Adaptability	Observational assessment	Modify plans and implementations as necessary to deal with emerging issues and changing requirements: Team demonstrates the ability to revise plans and implementations	Apply	*None*	*None*
URD-202:00040	Ethics	Observational assessment	Applying ethical principles in design and development: Team demonstrates awareness of ethical considerations associated with their solution, especially risks and vulnerabilities associated with the stakeholders' roles and activities.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4 ENI Pillar

2.4.1 Details for Competency ENI-101

ENI-101: Create Innovation-driven Enterprise (Path Selection)
Identity code: INNOV_PATH_SELECT_4
Required? Yes
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-101:00010	Innovation-driven Advantage	Imported assessment	Assessment: Contexting Innovation-driven Enterprise: Understand innovation models, sustaining innovation vs. disruptive innovation and how to strategize what to do and not to do so firms can focus on the resource allocation properly.	Analyze	*None*	*None*
ENI-101:00030	Innovation-driven Advantage	Imported assessment	Assessment: Componentize Innovation-driven Enterprise: Articulating why innovation is successful or failed while being able to understand how to reduce the odds of failure by adopting systematic innovation approach for their entrepreneurial path.	Analyze	*None*	*None*
ENI-101:00040	Entrepreneurial mindset	Imported assessment	Assessment: Choose Entreprenuerial Path: Choose Entreprenuerial Path and Team formation	Analyze	*None*	*None*
ENI-101:00050	Innovation-driven Advantage	Imported assessment	Assessment: Innovation-driven Enterprise Strategy: Understand Innovation Strategy for Startup and Established Firms that student can put into their entrepreneurial path by using tools and framework providing in the class.	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.2 Details for Competency ENI-102

ENI-102: Product Design and Development (Including Design Thinking)
Identity code: DESIGN_THINKING_8
Required? No
Credits: 8 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-102:00010	Empathy	Imported assessment	Assessment: Develop Target Persona Profile: Students will develop at least 2 - 3 target personas of the target customer of their product or services. In this assessment, we will provide a personal profile template in powerpoint so students will have to develop the personas based on the template provided. This will help students focus on designing the product/service for the target persona profile.	Analyze	*None*	*None*
ENI-102:00020	Empathy	Imported assessment	Assessment: Develop User Journey Map, Customer Profile Canvas and Empathy Map: Students will have to develop user journeys of the target personas to deeply understand how they got started in the journey and how he/she experiences their product/service. Develop empathy map canvas according to job-to-be-done for the user journey. Then, Create the Customer Profile Canvas consists of job-to-be-done, pains, gains for each persona and What-if Statements based on the developed empathy map canvas.	Evaluate	*None*	*None*
ENI-102:00030	Ideate	Imported assessment	Assessment: Develop Value Proposition Canvas to address Product-Market-Fit: Students will have to develop Value Proposition Canvas for each target persona by brainstorming and ideating the ideas of their product/service to solve the pains and create gains for the job-to-be-done from the developed Customer Profile Canvas.	Create	*None*	*None*
ENI-102:00040	Product Specification	Imported assessment	Assessment: Develop product specification consisting of functional requirements and basic non-functional requirements: Students will have to develop functional requirements and quality attributes in user story format based on the MVP version.	Evaluate	*None*	*None*
ENI-102:00060	Prototype and Test	Imported assessment	Assessment: Develop High-fidelity Prototype to test the assumption (the defined What-if Statements): With the feedback from the high fidelity prototype, student will have to submit the revised prototype and take this as an MVP (Minimum Viable Product)	Evaluate	*None*	*None*
ENI-102:00070	Product Development Plan	Imported assessment	Assessment: Develop project plans in agile methodology.: Students will have to develop the requirements backlogs according to the product specification and plan the backlog on the sprint basis	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.3 Details for Competency ENI-103

ENI-103: Intellectual Property
Identity code: INTELLECTUAL_PROP_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-103:00010	Fundamental understanding of intellectual property	Imported assessment	Assessment: Understand the fundamental knowledge of intellectual property and the crucial role of having them in protecting the firm asset. Ultimately, the firm can use IP build on top of its core capability for a competitive advantage.: Take a quiz that evaluates key distinctions and concepts on these topics.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.4 Details for Competency ENI-104

ENI-104: Startup from Idea to Impact
Identity code: IDEA_TO_IMPACT_12
Required? No
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-104:00010	How do you scale your business?	Imported assessment	Assessment: Estimate the Total Addressable Market (TAM) Size for Follow-on Markets: This will help team see the magnitude of the revenue potential, which will motivate team to focus on winning the Beachhead Market quickly and effectively so you can branch out into these other markets. Also it forces team to realize that they are doing business not just for the beachhead market but for broader impact.	Analyze	*None*	*None*
ENI-104:00020	How do you design and build your product?	Imported assessment	Assessment: Identify key assumptions: While you have tested many key assumptions throughout the 24 Steps, now you have all the elements of the marketing analysis plan, so now it is time to survey the full landscape and identify those key assumptions that are crucial to the overall plan before you begin to make the heavy investments in product development and the supporting infrastructure.	Analyze	*None*	*None*
ENI-104:00030	How do you make money of your product?	Imported assessment	Assessment: Design a Business Model: The selection of a value extraction business model can dramatically reduce Cost of Customer Acquisition (COCA), increase Lifetime Value of an Acquired Customer (LTV), and provide team with a competitive advantage. All the information team analyzed will be used for making an informed decision.	Analyze	*None*	*None*
ENI-104:00040	What can you do for your customer?	Imported assessment	Assessment: Define your core: Determine the single thing that team will do better than anyone else and very difficult to copy.	Analyze	*None*	*None*
ENI-104:00050	Who is your customer?	Imported assessment	Assessment: Market Segmentation and Select Beachhead Market: Understand and apply how to do develop market segmentation and select beachhead market for products/services	Apply	*None*	*None*
ENI-104:00060	How does your customers acquire your product?	Imported assessment	Assessment: Determine the Customer's Decision-Making Unit (DMU) and map the Process to Acquire a Paying Customers: Analyze all stakeholders who are involved in making the decision to purchase your product - including influencers. Also, determine how the members of DMU make a decision to buy your product.	Analyze	*None*	*None*
ENI-104:00070	What can you do for your customer?	Imported assessment	Assessment: Chart your competitive position: Analyze your product vs customer's alternative options, through the lens of customer's top 2 priorities.	Analyze	*None*	*None*
ENI-104:00080	Who is your customer?	Imported assessment	Assessment: Build End-user Profile and Persona: Understand and apply how to build end-user profile and various personas to focus who the product and service will be served	Apply	*None*	*None*
ENI-104:00090	How do you design and build your product?	Imported assessment	Assessment: Test key assumptions: This scientific approach will allow you to understand which assumptions are valid, which ones are not, and which ones you can"t know for sure yet. As a result, you"ll have time to make adjustments to your planning while the cost and time to do so is much less than it will be in the very near future when you launch the product development process.	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.5 Details for Competency ENI-105

ENI-105: Building Effective Teams to drive Innovation
Identity code: EFFECTIVE_TEAMS_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-105:00010	Why do the Good Teams fail and then the Great Firms?	Imported assessment	Assessment: Understand and articulate from case studies and why the good teams fail and so impact the great firms.: Take a quiz, written assignment, presentation that evaluates key distinctions and concepts on these topics.	Understand	*None*	*None*
ENI-105:00020	The innovator DNA	Imported assessment	Assessment: Understand the DNA of the innovator. Students will start to think further on how to make a good composition of all these DNA in the team: Take a quiz, writtent assignnment, presentation that evaluates key distinctions and concepts on these topics.	Understand	*None*	*None*
ENI-105:00030	Distributed Leadership	Imported assessment	Assessment: Understand what is essential to having interdisciplinary, distributed leadership in the age of innovation-driven.: Take a quiz, writtent assignnment, presentation that evaluates key distinctions and concepts on these topics.	Understand	*None*	*None*
ENI-105:00040	Structure the team and make it work.	Imported assessment	Assessment: Understand the practical components that fundamentally begin from the strategic objectives, structure, process, incentive, and culture to achieve the ultimate goals.: Take a quiz, written assignment, presentation that evaluates key distinctions and concepts on these topics.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.6 Details for Competency ENI-106

ENI-106: Entrepreneurial finance
Identity code: ENTREPRENEUR_FINANCE4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-106:00010	Basic foundation of managing finance for entreprenuer	Imported assessment	Assessment: Understand the basics of financial management from sales projection and create project valuation using FCF and NPV. We will also discuss how startups get investment funding and the different stages of raising funds. Learn from the case study from start to IPO.: Discussion assignment on how startups get investment funding and the different stages of raising funds. Learn from the case study from start to IPO.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.7 Details for Competency ENI-201

ENI-201: Strategic Innovation Development
Identity code: INNOV_DEVEL_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-201:00010	Strategic development of firm innovation.	Imported assessment	Assessment: Understand different types of innovations and examples of how the firm builds and foster the Innovation portfolio. Learn from examples by articulating how innovative firms create a source of differentiation while diversifying the sum of all its parts.: Take a quiz, written assignment, presentation that evaluates key distinctions and concepts on these topics.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.8 Details for Competency ENI-202

ENI-202: Business Strategy
Identity code: BUS_STRATEGY_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-202:00010	Strategy to develop sustaining a business while continuously finding the new growth strategy.	Imported assessment	Assessment: Understand how to develop sustainable business and growth strategies for the firm portfolio.: Take a quiz, written assignment, presentation that evaluates key distinctions and concepts on these topics.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.9 Details for Competency ENI-203

ENI-203: Platform Strategy
Identity code: PLATFORM_STRATEGY_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-203:00010	How building the platform business could be the invincible advantage.	Imported assessment	Assessment: Understand Disruptive Innovation, Platform Thinking (Analysis). How we can develop Platform Strategy and Business Model that can build the competitive advantage of network effect and complementary of others. What are the steping stones of building the successful platform strategy and examples how some have already built them.: Take a quiz, written assignment, presentation that evaluates key distinctions and concepts on these topics.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.10 Details for Competency ENI-304

ENI-304: AI for Business
Identity code: AI_FOR_BUS_12
Required? No
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-304:00010	Ai for Business	Imported assessment	Assessment: Ai for Business: Create Ai for Business plan	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.11 Details for Competency ENI-301

ENI-301: Inclusive Leadership
Identity code: LEADERSHIP_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-301:00010	Introduction to Strategic Leadership Communication and Negotiation	Imported assessment	Assessment: Understand why Negotiation is an important matter for their career either within the corporates or their own startup ventures.: Given short role play	Understand	*None*	*None*
ENI-301:00020	Introduction to Inclusive Leadership	Imported assessment	Assessment: Students will finish this class with the fundamentals of how to lead, and communicate with diverse teams more effectively.: Given leadership test	Understand	*None*	*None*
ENI-301:00030	Putting it all together	Imported assessment	Assessment: Understand being the future leader who can communicate strategically and effectively while being able to deliver persuasive and systematic negotiation.: Given communication strategical and deliver persuasive negotiation test	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.12 Details for Competency ENI-302

ENI-302: Persuasive and Leadership Communication
Identity code: PERSUASIVE_COM_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-302:00010	Persuasive Communication	Imported assessment	Assessment: Understand how to communicate strategically, building persuasive message structure and increase ability to motivate, influece audience to action.: Given speech test	Understand	*None*	*None*
ENI-302:00020	Communicating with Data	Imported assessment	Assessment: Understand how to convey the message and communicate to others.: Given data and convey the message test	Understand	*None*	*None*
ENI-302:00030	Communicating Persuasively by Listening, and through giving and receiving feedback	Imported assessment	Assessment: Understand how to be an active and reflective listener.: Given listening and reflecting message test	Understand	*None*	*None*
ENI-302:00040	Communicating Pursuasvily with Presentations	Imported assessment	Assessment: be able to give an effective and persuasive presentation.: give a presentation test	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.13 Details for Competency ENI-303

ENI-303: Negotiation
Identity code: NEGOTIATION_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-303:00010	Core Negotiation Strategy	Imported assessment	Assessment: Understand the principles of influence and bargaining practice.: Given bargaining test practice.	Understand	*None*	*None*
ENI-303:00020	Psychology of Negotiation	Imported assessment	Assessment: Understand the psychology of Negotiation practical tools, try to avoid the mistakes, and recognize and leverage mistakes.: Given psychology of Negotiation test	Understand	*None*	*None*
ENI-303:00030	Investigative Negotiation	Imported assessment	Assessment: Understand the approach to "investigative negotiation.": Given Investigative Negotiation test	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.14 Details for Competency ENI-401

ENI-401: Retail and Services Applications
Identity code: RETAIL_APPL_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-401:00010	AI in the Retail Industry	Imported assessment	Assessment: Understand and apply the concept of AI in retail. AI Applications in the Retail Sector. Cashier Free Stores, Chatbot Based Solutions, Price Regulation Strategies, Virtual Trial Rooms , Product Categorization and Inventory Management, Feedbacks and Prediction: Allow students to choose what medium they would like to display their information of project report & progress in. Infographics Brochures Presentations Mind maps Flyers Newsletters Posters Resumes Reports\{}	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.15 Details for Competency ENI-402

ENI-402: Logistics
Identity code: LOGISTICS_APPL_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-402:00010	AI in Logistics	Imported assessment	Assessment: Understand and apply the concept of AI in logistics. AI offers logistics companies the ability to optimise network orchestration to degrees of efficiency that cannot be achieved with human thinking alone. AI can help the logistics industry to redefine today"s behaviors and practices, taking operations from reactive to proactive, planning from forecast to prediction, processes from manual to autonomous, and services from standardised to personalised.: Allow students to choose what medium they would like to display their information of project report & progress in. Infographics Brochures Presentations Mind maps Flyers Newsletters Posters Resumes Reports\{}	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.16 Details for Competency ENI-403

ENI-403: Biomedical, Bioinformatics and Health
Identity code: BIOMED_APPL_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-403:00010	AI in Medical & Bioscience	Imported assessment	Assessment: Understand and apply an introduction to artificial intelligence and machine learning concept to solve problems in biology and medicine. Applications will focus on problems from bioinformatics, genomics, medicine and healthcare. Students will acquire data science and analytic skills, learn how to implement AI solutions and participate in creating an AI solution.: Allow students to choose what medium they would like to display their information of project report & progress in. Infographics Brochures Presentations Mind maps Flyers Newsletters Posters Resumes Reports	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.17 Details for Competency ENI-404

ENI-404: Gaming and Creative Industries
Identity code: GAMING_APPL_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-404:00010	AI in Gaming & Creative Industry	Imported assessment	Assessment: Understand and apply the ways AI is changing the creative industries, and how they can build their own career in creative AI.: Allow students to choose what medium they would like to display their information of project report & progress in. Infographics Brochures Presentations Mind maps Flyers Newsletters Posters Resumes Reports	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.18 Details for Competency ENI-405

ENI-405: Fintech
Identity code: FINTECH_APPL_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-405:00010	AI in Business & Finance	Imported assessment	Assessment: Understand and apply the business value of AI and how to gain an understanding of the fundamentals of AI and machine learning and how aspects such as big data to financial functions.: Allow students to choose what medium they would like to display their information of project report & progress in. Infographics Brochures Presentations Mind maps Flyers Newsletters Posters Resumes Reports	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.4.19 Details for Competency ENI-406

ENI-406: Educational Technology
Identity code: ED_TECH_APPL_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical
- R&D

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
ENI-406:00010	AI in Education	Imported assessment	Assessment: Understand and apply the concept of teaching and learning through Artificial Intelligence and machine learning realm.: Allow students to choose what medium they would like to display their information of project report & progress in. Infographics Brochures Presentations Mind maps Flyers Newsletters Posters Resumes Reports\{}	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5 HAS Pillar

2.5.1 Details for Competency HAS-101

HAS-101: Sociology and Cultural Anthropology
Identity code: ANTHROPOLOGY_9
Required? No
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-101:00010	Sociology & Cultural Anthropology	Imported assessment	Assessment: Understand and examine societies past and present, how they are constructed and how they influence each other: Take a quiz and write essay that evaluate the key concepts of anthropological approaches to society, culture, history, and current events.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.2 Details for Competency HAS-102

HAS-102: Social Psychology
Identity code: SOCIAL_PSYCH_9
Required? No
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-102:00010	Social Psychology	Imported assessment	Assessment: Understand behavior at both the individual level as well as the group level of analyses. A cross-cultural perspective will also be utilized in the understanding of variations in Social psychology issues.: Given test and essays are designed to acquaint the student with both classic and contemporary research trends utilized in social psychological research.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.3 Details for Competency HAS-103

HAS-103: Political Studies
Identity code: POLITICS_9
Required? No
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-103:00010	Political studies	Imported assessment	Assessment: Understand cases drawn from antitrust and intellectual property rights health and environmental policy defense procurement and strategy strategic trade and industrial policy and R&D funding. Structured around theories of political economy, modified to take into account integration of uncertain technical information into public and private decision-making.: Given test and essays to examine the relationships among cases drawn from antitrust and intellectual property rights health and environmental policy defense procurement and strategy strategic trade and industrial policy and R&D funding. Structured around theories of political economy, modified to take into account integration of uncertain technical information into public and private decision-making.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.4 Details for Competency HAS-104

HAS-104: Human Geography
Identity code: HUM_GEOGRAPHY_9
Required? No
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-104:00010	Introduction to Human Geography	Imported assessment	Assessment: Describe, analyzing and comparing the ways in which human attributes, cultural characteristics and structures, including population, demographics, migration, language, religion, popular and folk cultures, race, ethnicity, gender roles, political and economic systems, levels of development, resource management, and land use and urbanization, remain constant or vary around the world.: Given test and essays to examine the relationships among cultural and human patterns, economic activities, and the physical environment, analyze and interpret information from primary sources, and develop skills in writing appropriate for geography and the social sciences.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.5 Details for Competency HAS-105

HAS-105: Global Histories & Philosophy
Identity code: GLOBAL_HISTORIES_9
Required? No
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-105:00010	Global Histories	Imported assessment	Assessment: Master knowledge through interaction with the instructors, reading material, and other students, think critically about the context and purpose of any given information, craft effective verbal and written arguments by combining evidence, logic, and creativity, and appreciate the relevance of the past in the present and future.: written assignments as the central medium of assessment	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.6 Details for Competency HAS-109

HAS-109: Ethics and Policy Issues
Identity code: ETHICS_POLICY_4
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-109:00010	Ethics and Policy Issues in Computing	Imported assessment	Assessment: Understand the social impacts of computing technology and systems.: Given test and essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.7 Details for Competency HAS-110

HAS-110: Character Development I
Identity code: CHAR_DEVEL_I_4
Required? No
Credits: 4 (Graded)
Description
This competency provides a holistic approach to personal and social development, empowering students to become responsible, respectful, and compassionate members of society and citizen of the world. In order to pass the competencies, students must successfully achieve all skills through workshops organized by the university.
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skills and Assessments None specified.

2.5.8 Details for Competency HAS-111

HAS-111: Character Development II
Identity code: CHAR_DEVEL_II_3
Required? No
Credits: 3 (Graded)
Description
This competency provides a holistic approach to personal and social development, empowering students to become responsible, respectful, and compassionate members of society and citizen of the world. In order to pass the competencies, students must successfully achieve 4 out of the 6 skills through workshops organized by the university.
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-111:00010	Public manners	Quiz or exam	Demonstrate appropriate public manners: Write an essay explaining the importance and nature of public manners	Understand	*None*	*None*
HAS-111:00020	Media Literacy	Quiz or exam	Demonstrate basic media literacy: Write an essay that discusses the importance of media literacy including some relevant examples	Apply	*None*	*None*
HAS-111:00030	Drug and Gambling	Quiz or exam	Explain the risks associated with drugs and gambling: Write an essay discussing the negative effects of drugs and gambling, including reflection on how to avoid these habits.	Understand	*None*	*None*
HAS-111:00040	Love Counsellor & Sex Education	Quiz or exam	Demonstrate a thoughtful and mature approach to issues related to sex and romantic relationships: Write an essay summarizing issues and guidelines for healthy, satisfying romantic and sexual relationships	Understand	*None*	*None*
HAS-111:00050	Basic health and safety	Quiz or exam	Demonstrate an awareness of important issues related to health and safety: Write an essay explaining the importance of taking responsibility for personal health and safety, including some examples from your own life.	Understand	*None*	*None*
HAS-111:00060	Basic Law	Quiz or exam	Demonstrate an understanding of the importance of obeying the law: Write an essay explaining the importance of legal norms, and why it is usually a good idea to obey the law.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.9 Details for Competency HAS-112

HAS-112: Intellectual Property & Policy Management
Identity code: IP_POLICY_9
Required? No
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-112:00010	Intellectual Property & Policy Management	Imported assessment	Assessment: Intellectual Property & Policy Management: Intellectual Property & Policy Management	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.10 Details for Competency HAS-113

HAS-113: AI and Computer Engineering for Community Impact
Identity code: AI_COMMUNITY_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-113:00010	AI and Computer Engineering for Community Impact	Imported assessment	Assessment: AI and Computer Engineering for Community Impact: AI and Computer Engineering for Community Impact	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.11 Details for Competency HAS-108

HAS-108: Economics
Identity code: ECONOMICS_9
Required? No
Credits: 8 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-108:00010	Principles of Economics	Imported assessment	Assessment: Understand how resources are allocated through the driving forces of supply and demand, why markets can be a good way to organize economic activity, why markets can fail and what the government can do in those situations and acknowledge how to measure the performance of the overall economy, investigate the forces that drive the economic activity both in the short- and long-run and discuss the potential and limitations of fiscal and monetary policies.: Given test and essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.12 Details for Competency HAS-106

HAS-106: History of visual arts
Identity code: ART_HISTORY_8
Required? No
Credits: 8 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-106:00010	Cultural History of the Visual Arts	Imported assessment	Assessment: Understand controversy surrounding Leonardos and Michelangelos works, the role of censorship in the arts, the development of perspective experiments and visual theories from Antiquity onward, the concept of landscape and the status of the artist in the Ming dynasty, the impact of colonialism and post-colonial identity in South American Art, the rediscovery of Pompeii and Herculaneum and the Egyptian craze in the 1800s, the world of Opera and ballet, and the Impressionists ideas of what an artwork should be.: Given test and essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.5.13 Details for Competency HAS-107

HAS-107: History of music
Identity code: MUSIC_HISTORY_8
Required? No
Credits: 8 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HAS-107:00010	Music History	Imported assessment	Assessment: Understand in-depth analytical study of music of the Medieval, Renaissance, and Baroque Periods and Apply knowledge to practical decisions made by todays musician.: Given test and essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6 HCD Pillar

2.6.1 Details for Competency HCD-203

HCD-203: Interaction Design and Experience Design
Identity code: INTERACT_DESIGN_9
Required? No
Credits: 9 (Graded)
Description
No description provided
Responsible Instructor: Hossein Miri
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-203:00010	User surveys	Imported assessment	Assessment: Critique a user survey: Given an example of a user survey created for some hypothetical application to be built, write an evaluation document that identifies its good and bad points and suggests how the survey could be improved.	Evaluate	*None*	*None*
HCD-203:00020	Use case modeling	Imported assessment	Assessment: Create a use case model: Given a description of an application to be built, interview a potential user and create a use case model including use case diagram and use case narratives	Create	*None*	*None*
HCD-203:00030	Psychological principles influencing user experience	Imported assessment	Assessment: Identify user interfaces that have usability problems because they do not consider psychological principles: Find three applications whose user interfaces to not consider at least one important psychological principle and which are difficult to use as a result. Identify the relevant principles(s) and suggest how the user interface could be improved.	Evaluate	*None*	*None*
HCD-203:00040	User interface design guidelines	Imported assessment	Assessment: Identify user interfaces that violate guidelines: Find three applications whose user interfaces violate at least one important guideline for positive user experience. Identify the guidelines that is being violated and suggest how the user interface could be improved. NOTE this assessment can also be used to measure awareness of diversity issues.	Evaluate	*None*	*None*
HCD-203:00050	User experience	Imported assessment	Assessment: Apply diversity dimensions in analyzing user experience: Given an example of a user interface, evaluate the inclusivity of the interface and identify potential problems for people in various groups whose needs may not have been considered in the UI design.	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.2 Details for Competency HCD-302

HCD-302: Creating Explainable AI
Identity code: EXPLAINABLE_AI_4
Required? Yes
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Orathai Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-302:00010	Model explainability	Imported assessment	Assessment: Model explainability: write an essay	Understand	*None*	*None*
HCD-302:00020	Explainability in model development	Imported assessment	Assessment: Explainability in model development: write an essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.3 Details for Competency HCD-303

HCD-303: Human Psychology for User Interface Design
Identity code: PSYCH_FOR_UI_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-303:00010	UI Design	Imported assessment	Assessment: Understand the critical importance of user interface design. Demonstrate how the costs of bad design can often be severe (in user experience, money, and even human lives). Apply a high-level understanding of the user-interface design process to project.: Given test and UI wireframe assignment	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.4 Details for Competency HCD-304

HCD-304: Design Thinking, Innovation, and Creative Confidence
Identity code: DESIGN_CREATIVE_12
Required? No
Credits: 12 (Graded)
Description
The fundamental ideas and methods of design thinking will be introduced in this course. Students will practice using several techniques for idea testing through a series of practical exercises in this subject. During the course of the lesson, students will also learn how to identify user groups and customer needs, translate those needs into product specifications, and create a prototype.
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-304:00000	Fundamental Understanding of the Experiential Design Process	Imported assessment	Assessment: the final project.: the students will get to develop their interactive experiences	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.5 Details for Competency HCD-101

HCD-101: Visualization
Identity code: VISUALIZATION_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Hossein Miri
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-101:00010	Principles of Human Visual Perception	Imported assessment	Assessment: Summarize the critical characteristics of human vision that affect visualization: Pick three characteristics of visual perception, then explain how they impact the effectiveness of visualization using computer systems. This can be done orally or in writing.	Understand	*None*	*None*
HCD-101:00020	Storytelling with Data Visualization	Imported assessment	Assessment: Identify the important dimensions in a visualization: Given an example of a computer system or web site that depends on visualization, identify the most important dimensions used and critique the effectiveness.	Analyze	*None*	*None*
HCD-101:00030	Practical Guidelines for Visualization	Imported assessment	Assessment: Critique effective and ineffective visualizations: Find three examples of web sites that you think provide effective visualization, and three that are not effective. For each example, describe the factors and decisions by the designer that make the visualization effective or not effective. Refer to the practical guidelines and best practices for telling a story with visualization.	Evaluate	*None*	*None*
HCD-101:00040	Visualization Tools and Resources	Imported assessment	Assessment: Design a visualization for a data set or website or API.: Given a specific data set including some explanation of its contents, design one or more visualizations that effectively communicate the content and relationships in the data. In other words, create at least one of the three visualization designs using D3 for visualizing (1) numerical data, (2) spatial data, and (3) textual data.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.6 Details for Competency HCD-103

HCD-103: User Interface Design and Evaluation
Identity code: UI_DESIGN_EVAL_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: Hossein Miri
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-103:00010	UI development workflow	Imported assessment	Assessment: Create a plan for developing a UI: Given a description of a hypothetical application, create a detailed plan for developing the user interface for that application, including tasks, time estimates and suggested technologies or tools.	Create	*None*	*None*
HCD-103:00020	Building and evaluating UI mockups	Imported assessment	Assessment: Design a user interface according to specifications: Given a description of a hypothetical application (including a specification of its platform), create a mockup design for the UI for this application using Figma or some other tool of your choice. Present and explain your mockup design to the instructor.	Create	*None*	*None*
HCD-103:00030	Programming user interfaces	Imported assessment	Assessment: Implement a user interface based on a design: Implement the user interface designed in the assessment of the —mockup— skill.	Create	*None*	*None*
HCD-103:00040	UI quality evaluation	Imported assessment	Assessment: Apply user testing techniques to evaluate an implemented user interface.: Create a plan for testing the UI implemented in previous assessments, including a plan for analyzing the results and drawing conclusions. Run at least one testing session with a real user.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.7 Details for Competency HCD-104

HCD-104: Immersive Environments
Identity code: IMMERSIVE_ENV_6
Required? No
Credits: 6 (Graded)
Description
Immersive environments are simulations in which computer-generated imagery and other stimuli are combined with the experience of the real world, to engage the senses of users through real-time 3D graphics, audio, and interaction. Depending on the amount of real/physical versus simulated/generated material, the results can be labeled as Virtual Reality (VR), Augmented Reality (AR), or Mixed Reality (MR). There is also Extended Reality (XR) that is a collective/umbrella term for various forms of immersive environments. This is a competency in both the theory and practice of immersive environments that are used in a variety of settings, including training, education, healthcare, entertainment, online collaboration and scientific visualization. You will have the opportunity to learn about the basics and key concepts of immersive environments and how to get started creating content and designing interfaces and developing interactions, followed by deployment on headsets and mobile devices.
Responsible Instructor: Hossein Miri
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-104:00010	History, Context, Technology, Applications	Imported assessment	Assessment: Know what constitutes an immersive environment and why they have been created throughout history: Write an essay (max 3000 words) that summarizes your understanding of what immersive environments are and why they were created, i.e., what constitutes an immersive environment and why they have been created throughout history.	Understand	*None*	*None*
HCD-104:00020	History, Context, Technology, Applications	Imported assessment	Assessment: Identify what their application areas are and how they are used today in terms of technology and implementation: Write an essay (max 3000 words) that highlights some of the most common application areas of immersive environments as well as which one you believe is the most worthwhile with the greatest societal impact, including your logic and reasoning for your choice. In other words, identify the most common application areas of immersive environments and state (with your logic and reasoning) which one you believe is the worthiest of all with the highest social impact.	Analyze	*None*	*None*
HCD-104:00030	Presence, Immersion, Depth Perception, 3D Vision	Imported assessment	Assessment: Understand presence and immersion and know the difference between the two: Write an essay (max 1000 words) that outlines your understanding of the key concepts of presence and immersion, i.e., what presence and immersion are, and what the difference between the two is.	Evaluate	*None*	*None*
HCD-104:00040	Presence, Immersion, Depth Perception, 3D Vision	Imported assessment	Assessment: Remember what cues enable depth perception and how that leads to immersion: Write an essay (max 2000 words) that lays out your understanding of the key concepts of depth perception leading to the experience of immersion, as well as the source of depth information, i.e., visual, oculomotor, monocular, binocular, etc.	Evaluate	*None*	*None*
HCD-104:00050	Interfaces, Actions, Interactions, Input/output	Imported assessment	Assessment: Create an interactive immersive environment in a game engine (e.g., Unity) containing game objects, 3D models, and an animated character that uses physics and AI path-finding (e.g., Unity NavMeshAgent) to move towards a destination point specified by the user's mouse click.: Create an interactive immersive environment in a game engine (e.g., Unity) including game objects, lights, textures, animations, basic physics interactions (jumping, collision, etc) that has at least one 3D model imported from Blender as .fbx file as well as a character imported from Mixamo and then via scripting and NavMeshAgent, get your character to move towards a destination point when you click somewhere in the scene. You will be quizzed on how you set up the project and how you wrote the NavMeshAgent script.	Create	*None*	*None*
HCD-104:00060	Content Creation and Game development with Unity	Imported assessment	Assessment: Using Unity to create immersive environments and games: Using Unity to create immersive environments and games	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.8 Details for Competency HCD-201

HCD-201: Accessibility and Universal Design
Identity code: ACCESSIBILITY_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Hossein Miri
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-201:00010	Usability, Accessibility, and Principles of Universal Design	Imported assessment	Assessment: Explain what accessibility means and why it is important: In your group project, explain what accessibility means and why it is important. This also justifies your choice of project. Think about at least 3 types of disability. Imagine a blind and deaf and blind+deaf user. Design your project to address the issues for these 3 groups and enable them to use your system/software/app.	Understand	*None*	*None*
HCD-201:00020	Performing Universal Design Checks, Accessibility Evaluations, and Assistive Technology Tests	Imported assessment	Assessment: Apply accessibility principles and guidelines in real systems: In your group project, apply accessibility principles and guidelines and rules and best-practices that you have learned from the resources I have provided in the syllabus document.	Apply	*None*	*None*
HCD-201:00030	Performing Universal Design Checks, Accessibility Evaluations, and Assistive Technology Tests	Imported assessment	Assessment: Identify accessibility needs in both web and and non-web software: In your group project, identify accessibility needs in both web and and non-web software parts of your designed and developed system. In other words, design an accessible interface for your project system that implements both a mobile application and also a physical controller device.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.9 Details for Competency HCD-202

HCD-202: User Research Methodologies, Data and Design Thinking
Identity code: USER_RESEARCH_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-202:00010	Lean Entrepreneurship, Design Thinking, and Rapid Prototyping in Action	Imported assessment	Assessment: Build the right product for the right group of people: Get into groups (or go solo if you dare), identify market segments, validate customer needs, and test key assumptions to make sure that you build the right product for the right group of people. Prepare for a 15-min presentation - Think of the final presentation as a startup pitch. Communicate the problems, solutions, business model, etc. with evidence of validated needs, tractions, presales from the experiments	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.10 Details for Competency HCD-301

HCD-301: Ethics in computer engineering
Identity code: ETHICS_CE_2
Required? Yes
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-301:00010	Ethical principles for computing professionals	Imported assessment	Assessment: Apply the ACM code of professional ethics to real-world scenarios: Given a case study, analyze the content, alternatives and possible outcomes based on the principles in the ACM code	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.11 Details for Competency HCD-401

HCD-401: Ethical Principles for AI (Fairness, Accountability, Transparency, Ethics)
Identity code: ETHICAL_AI_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-401:00010	Bias in AI systems	Imported assessment	Assessment: Recognizing and preventing bias in AI systems: Given a description of an AI project, identify possible sources and types of bias and recommend ways to reduce or eliminate it.	Analyze	*None*	*None*
HCD-401:00020	Transparency in AI systems	Imported assessment	Assessment: Recognizing and promoting transparency: Given a description of an AI project, identify and explain areas where it may be lacking in transparency, and recommend ways to improve it.	Analyze	*None*	*None*
HCD-401:00030	Accountability for AI systems	Imported assessment	Assessment: Analyzing issues related to accountability: Find three articles from the popular press where accountability for AI system behavior is an issue. For each one, provide your recommendation about who should be responsible or accountable for damage doen.	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.12 Details for Competency HCD-501

HCD-501: Basic Game Design & Development
Identity code: INTRO_GAME_DESIGN_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-501:00010	Basic Game Design & Development	Imported assessment	Assessment: Basic Game Design & Development: Basic Game Design & Development	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.13 Details for Competency HCD-502

HCD-502: Advanced Game Design, Play & Mechanic
Identity code: ADV_GAME_DESIGN_4
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-502:00010	Advanced Game Design, Play & Mechanic	Imported assessment	Assessment: Advanced Game Design, Play & Mechanic: Advanced Game Design, Play & Mechanic	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.14 Details for Competency HCD-503

HCD-503: Story and Character Design & Development
Identity code: STORY_CHARACTER_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skills and Assessments None specified.

2.6.15 Details for Competency HCD-504

HCD-504: Interactive Design, Arts & Concepts
Identity code: INTERACT_ART_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-504:00010	Interactive Design, Arts & Concepts	Imported assessment	Assessment: Interactive Design, Arts & Concepts: Interactive Design, Arts & Concepts	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.16 Details for Competency HCD-505

HCD-505: Game Engine & Prototyping
Identity code: GAME_ENGINE_12
Required? No
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-505:00010	Game Engine & Prototyping	Imported assessment	Assessment: Game Engine & Prototyping: Game Engine & Prototyping	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.17 Details for Competency HCD-506

HCD-506: Gaming Economy & Tokenomics Design
Identity code: GAME_ECONOMY_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-506:00010	Gaming Economy & Tokenomics Design	Imported assessment	Assessment: Gaming Economy & Tokenomics Design: Gaming Economy & Tokenomics Design	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.18 Details for Competency HCD-507

HCD-507: E-Sport & Ecosystem Development (IP)
Identity code: ESPORTS_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-507:00010	E-Sport & Ecosystem Development (IP)	Imported assessment	Assessment: E-Sport & Ecosystem Development (IP): E-Sport & Ecosystem Development (IP)	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.19 Details for Competency HCD-508

HCD-508: AI for Gaming & Procedural Generation
Identity code: AI_FOR_GAMING_12
Required? No
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-508:00010	AI for Gaming & Procedural Generation	Imported assessment	Assessment: AI for Gaming & Procedural Generation: AI for Gaming & Procedural Generation	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.20 Details for Competency HCD-509

HCD-509: Virtual Production
Identity code: VIRTUAL_PRODUCTION_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-509:00010	Virtual Production	Imported assessment	Assessment: Virtual Production: Virtual Production	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.21 Details for Competency HCD-510

HCD-510: Motion Capture & Animation
Identity code: MOTION_CAPTURE_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-510:00010	Motion Capture & Animation	Imported assessment	Assessment: Motion Capture & Animation: Motion Capture & Animation	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.6.22 Details for Competency HCD-511

HCD-511: VR Gaming & Augmented Reality
Identity code: VR_GAMING_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
HCD-511:00010	Motion Capture & Animation	Imported assessment	Assessment: Motion Capture & Animation: Motion Capture & Animation	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7 MAT Pillar

2.7.1 Details for Competency MAT-101

MAT-101: Calculus - Differentiation
Identity code: CALC_DIFFERENTIATION_3
Required? No
Credits: 3 (Graded)
Description
No description provided
Responsible Instructor: Puttha Sakkaplangkul
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-101:00010	Differentiation	Imported assessment	Assessment: The concept of limits and derivatives: - Take a quiz that can show and solve the problems in the definition of limits and derivatives - Problem solving in class	Understand	*None*	*None*
MAT-101:00030	Differentiation	Imported assessment	Assessment: limits and derivatives problem solving: Take a quiz that can show and solve the problems in the definition of limits and derivatives Problem-solving in class	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.2 Details for Competency MAT-102

MAT-102: Calculus - Basic derivatives
Identity code: CALC_DERIVATIVES_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Puttha Sakkaplangkul
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-102:00010	Basic derivatives	Imported assessment	Assessment: the concept of basic functions: Take a quiz that can show and solve the problems in the of the basic functions Problem solving in class	Understand	*None*	*None*
MAT-102:00020	Basic derivatives	Imported assessment	Assessment: Basic functions derivatives: - Take a quiz that can show and solve the problems in the of the basic functions - Problem solving in class	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.3 Details for Competency MAT-103

MAT-103: Calculus - Integration
Identity code: CALC_INTEGRATION_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Puttha Sakkaplangkul
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-103:00010	Integration	Imported assessment	Assessment: The concept of antiderivatives and integrations: Take a quiz that can show and solve the problems in the antiderivatives and integrations Problem solving in class	Understand	*None*	*None*
MAT-103:00020	Integration	Imported assessment	Assessment: Antiderivatives and integrations problem solving: - Take a quiz that can show and solve the problems in the antiderivatives and integrations - Problem solving in class	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.4 Details for Competency MAT-104

MAT-104: Calculus - Optimization
Identity code: CALC_OPTIMIZATION_3
Required? No
Credits: 3 (Graded)
Description
No description provided
Responsible Instructor: Puttha Sakkaplangkul
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-104:00010	Optimization	Imported assessment	Assessment: The concept of optimization methods: Take a quiz that can show and solve the problems in the optimization methods Problem solving in class	Understand	*None*	*None*
MAT-104:00020	Optimization	Imported assessment	Assessment: Optimizations to its applications problem solving: - Take a quiz that can show and solve the problems in the optimization methods - Problem solving in class	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.5 Details for Competency MAT-105

MAT-105: Vector Calculus
Identity code: VECTOR_CALC_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: Puttha Sakkaplangkul
Prerequisites
None
Distribution Areas

- Math/Science

Skills and Assessments None specified.

2.7.6 Details for Competency MAT-106

MAT-106: Analytical Geometry
Identity code: ANALY_GEOM_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: Puttha Sakkaplangkul
Prerequisites
None
Distribution Areas

- Math/Science

Skills and Assessments None specified.

2.7.7 Details for Competency MAT-107

MAT-107: Differential Equations and Approximation
Identity code: DIFF_EQUATIONS_12
Required? No
Credits: 12 (Graded)
Description
This course is a continuation of the ideas in Differential and Integral Calculus. This course introduces the ideas of differentiation and integration, respectively. The course begins with a strengthening of our integration skills. We introduce three new techniques for use in different situations which, when combined with the Method of Substitution and Integration by Parts, allow us to integrate a wide variety of functions. We also extend the range of integration problems we are willing to consider, allowing discontinuities in the integrand, and integration over an interval of infinite extent. Our second main theme is the study of differential equations, i.e. equations that involve the derivative of a function. To solve such an equation, i.e. to determine the unknown function, usually requires the computation of an integral. Differential equations are ubiquitous in the natural sciences and social sciences, because they are useful in modeling the behavior of systems over time. We will discuss how to write a mathematical model for a physical system, and also how to compute solutions for two fundamental types of equations. Our third theme is that of Approximation. The idea of approximation shows up in numerical integration, and in Newton's method for finding an approximate root of a function. We shall also devote a substantial portion of the course to finding polynomial approximations to functions. To do so, we will develop the notions of an infinite sequence, and infinite series (a summation with infinitely many terms). We will discuss convergence of these series in terms of limits and derive tests for convergence. We will also see how many functions may be described in terms of a power series.
Responsible Instructor: Puttha Sakkaplangkul
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-107:00000	Differential Equations and Approximation	Imported assessment	Assessment: Differential Equations and Approximation: Take a quiz on the topic of Differential Equations and Approximation	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.8 Details for Competency MAT-201

MAT-201: Matrices and Linear Transformations (Linear algebra)
Identity code: LINEAR_ALG_12
Required? Yes
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: Kawisorn Kamtue
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-201:00010	Vectors and Matrices	Imported assessment	Assessment: Calculating basic operations for vectors and matrices: Solve basic vectors/matrices equations (including additions/subtraction, dot product, matrices multiplication (by block), transpose, etc.)	Apply	*None*	*None*
MAT-201:00020	Linear transformation	Imported assessment	Assessment: Determining basic matrices of linear transformations: Given a basic linear transformation (e.g., rotation), design a matrix equivalent to the transformation. Vice versa	Understand	*None*	*None*
MAT-201:00030	Matrix Factorization	Imported assessment	Assessment: Applying matrix decomposition to solve linear equations: Given a 2x2 matrix A, find a limit to A to the n-th power as n approaches infinity	Apply	*None*	*None*
MAT-201:00040	Eigenvectors and eigenvalues	Imported assessment	Assessment: Calculating eigenvalues and eigenvectors: Given a 2x2 and 3x3 matrices, find their eigenvalues and eigenvectors	Apply	*None*	*None*
MAT-201:00050	Rank and nullity of matrices and linear transformation	Imported assessment	Assessment: Determining the rank and nullity of a matrix and linear transformation: Given a matrix or linear transformation, determine its rank	Apply	*None*	*None*
MAT-201:00060	Solving Linear Equations	Imported assessment	Assessment: Solving linear equations: Given a set of linear equations, write them in matrix form. Determine if the solution is unique. If yes, calculate the unique solution.	Analyze	*None*	*None*
MAT-201:00070	Least square minimisation	Imported assessment	Assessment: Solving least square minimisation method: Derive the solution to least square minimisation	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.9 Details for Competency MAT-202

MAT-202: Data Domains — Time/Frequency Domain
Identity code: DATA_DOMAINS_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-202:00010	Data Domains — Time/Frequency Domain	Imported assessment	Assessment: The concept of Data Domains: Analyst the concept of Data Domains	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.10 Details for Competency MAT-203

MAT-203: Descriptive Statistics
Identity code: DESC_STATS_2
Required? Yes
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-203:00010	Descriptive	Imported assessment	Assessment: Understand Fundamental of Descriptive statistics: Take a quiz the calculate measures of the data such as mean, mode, median, variance, standard deviation, coefficient of variation	Understand	*None*	*None*
MAT-203:00020	Descriptive	Imported assessment	Assessment: Organize, summarize, present, and interpret the data: Given data set to Organize, summarize, present Descriptive statistcs approprotely and then wirting a paragraph to interpret the results.	Understand	*None*	*None*
MAT-203:00030	Data visualization	Imported assessment	Assessment: Demonstrate ability to visualize data for statistical analysis: Given data set to Apply the statistical packages to visulize various sets of data appropriately and then wirting a paragraph to interpret the results.	Apply	*None*	*None*
MAT-203:00040	Exploratory Data Analysis Distributions & Relationships	Imported assessment	Assessment: Investigating a data set to understand the shape of the data: Given data set to Apply the exploratory data analysis with staistical packages to investigate data.	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.11 Details for Competency MAT-204

MAT-204: Producing Data
Identity code: PROD_DATA_3
Required? Yes
Credits: 3 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-204:00010	Sampling method	Imported assessment	Assessment: Understand and apply different sampling techniques and ways to avoid bias: Take a quitz that evaluate sampling concept the data, select an appropriate sampling design for data collection, dentify the difference between a parameter and a statisticand.	Understand	*None*	*None*
MAT-204:00020	Probaility Concept	Imported assessment	Assessment: Understand the concepts of probability, conditional probability, and the Bayes" theorem: Take a quiz that evaluate the key concepts of probability conditional probability, and the Bayes" theorem	Understand	*None*	*None*
MAT-204:00030	Random variable	Imported assessment	Assessment: Understand the concept of random variable defined over a sample space: Take a quiz that evaluate the key concepts of random variable	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.12 Details for Competency MAT-205

MAT-205: Probability distribution
Identity code: PROB_DIST_3
Required? Yes
Credits: 3 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-205:00010	Concepts and definitions	Imported assessment	Assessment: Understand various characteristics and rules of probability: Take a quiz that evaluate the key concepts of probability	Understand	*None*	*None*
MAT-205:00020	Sampling Distributions	Imported assessment	Assessment: Understand Sampling distribution namely χ2-square, Student-t, and Snedecor"s F-distributions and use them to make conclusions about problems that arise in applied statistics.: Take a quiz that evaluate sampling distribution and explain the findings.	Understand	*None*	*None*
MAT-205:00030	Probability	Imported assessment	Assessment: Understand various important discrete and continuous distributions and apply them to determine probabilities in real-world problems.: Assignment to demonstate the ability to select appropriate discrete distribution amd show the process to the conclusion of hypothesis testing and interprete th result collectly.	Understand	*None*	*None*
MAT-205:00040	Probability	Imported assessment	Assessment: Apply various important discrete and continuous distributions and apply them to determine probabilities in real-world problems: Generate data for different probability distributions using the statistical packages	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.13 Details for Competency MAT-206

MAT-206: Inference Statistics
Identity code: INFER_STATS_3
Required? Yes
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-206:00010	Estimation	Imported assessment	Assessment: Demonstrate understanding of the central limit theory and confidence intervals: Take a quitz that determine various characteristics and rules of probability, determine probability of events and identify them as independent or dependent	Understand	*None*	*None*
MAT-206:00020	Hypothesis	Imported assessment	Assessment: Understand inference for comparing means (ANOVA): Assignment to demonstate the ability to select appropriate methods and show the process to the conclusion of hypothesis testing and interprete th result collectly	Evaluate	*None*	*None*
MAT-206:00030	Hypothesis	Imported assessment	Assessment: Demonstrate the ability to develop and test hypothesis: Assignment to demonstate the ability to select appropriate methods and show the process to the conclusion of hypothesis testing and interprete th result collectly.	Analyze	*None*	*None*
MAT-206:00040	Correlation and Regression	Imported assessment	Assessment: Use a regression model to predict numeric values: Project assignment by set regression problem with a involving qualitative or categorical predictor variables. and apply statistical package so identify appropriate model and write one to two pages describing and interpreting the results	Evaluate	*None*	*None*
MAT-206:00050	Correlation and Regression	Imported assessment	Assessment: Use the least-squares method to estimate the regression coefficients in a multiple regression model and carry out hypothesis testing to determine which regression coefficients are significant.: Take a quitz that estimate and testing hypoithesis regression coefficients and correlations.	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.7.14 Details for Competency MAT-207

MAT-207: Discrete Mathematics
Identity code: DISCRETE_MATH_12
Required? Yes
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
MAT-207:00010	Mathematical representation of common computing problems	Imported assessment	Assessment: Recognize mathematical principles that are appropriate for modeling and solving computing problems: Given a text description of a typical computing problem, determine a mathematical approach that could be used to solve this problem	Understand	*None*	*None*
MAT-207:00020	Mathematical representation of common computing problems	Imported assessment	Assessment: Express a common computing problem in mathematical terms and notation build a mathematical model for solving the problem.: Given a text description of a common computing problem, create a formal description of that problem using mathematical notation.	Create	*None*	*None*
MAT-207:00030	Mathematical processes for solving computing problems	Imported assessment	Assessment: Solve a common computing problem using mathematical processes.: Given a formal, mathematical model of a common computing problem, use well known mathematical processes to solve that problem.	Apply	*None*	*None*
MAT-207:00040	Formal representations for mathematical models in computing	Imported assessment	Assessment: Equations, proofs and other formal representations for solving computing problems: Use Equations, proofs and other formal representations for solving computing problems	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8 SCI Pillar

2.8.1 Details for Competency SCI-101

SCI-101: Fundamentals of Biology
Identity code: BIOLOGY_12
Required? No
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: Wipawee Dejtisakdi
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-101:00010	Modern Biology	Imported assessment	Assessment: The concept of Biology: Test and written assignments as the central medium of assessment. Understand basis for further studies in biochemistry, cell biology, genetics and molecular biology. Recognize the chemical principles underlying biological processes and cell structures as well as the analysis of genetics and heredity from a molecular perspective. This is the introductory biology course for all science and non-science majors.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.2 Details for Competency SCI-102

SCI-102: Fundamentals of Chemistry
Identity code: CHEMISTRY_12
Required? No
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: Duangkamol Gleeson
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-102:00010	Modern Chemistry	Imported assessment	Assessment: The concept of fundamental principles of chemistry: Test and written assignments as the central medium of assessment. Understand fundamental principles of chemistry and a presentation of chemically interesting applications and sophisticated problems. These will form the basis for introducing the relationships between the structure of molecules and their chemical properties and behavior.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.3 Details for Competency SCI-103

SCI-103: Physics II
Identity code: PHYSICS_II_12
Required? No
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: Prathan Buranasiri
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-103:00010	Physics II for Engineering Students	Imported assessment	Assessment: Understand calculus-based introductory physics sequence for engineering students.: Test and written assignments as the central medium of assessment	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.4 Details for Competency SCI-104

SCI-104: Quantum Physics
Identity code: QUANTUM_PHYSICS_12
Required? No
Credits: 12 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-104:00010	Quantum Circuit	Imported assessment	Assessment: Quantum Circuit: write an essay	Understand	*None*	*None*
SCI-104:00020	Quantum algorithms	Imported assessment	Assessment: Quantum algorithms: write an essay	Understand	*None*	*None*
SCI-104:00030	Quantum applications	Imported assessment	Assessment: Quantum applications: write an essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.5 Details for Competency SCI-105

SCI-105: Kinematics describe motion
Identity code: KINEMATICS_3
Required? No
Credits: 3 (Graded)
Description
No description provided
Responsible Instructor: Chinnapat Rattanasirawit
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-105:00010	Units, Physical Quantities, Vectors,Motion in One Dimension, Motion in 2 or 3 Dimensions	Imported assessment	Assessment: Evaluation of units, physical quantities and vectors: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-105:00020	Units, Physical Quantities, Vectors,Motion in One Dimension, Motion in 2 or 3 Dimensions	Imported assessment	Assessment: Units, Physical Quantities and Vectors problem solving: An assignment to demostrate the ability to solve related sophisticated problems	Analyze	*None*	*None*
SCI-105:00030	Units, Physical Quantities, Vectors,Motion in One Dimension, Motion in 2 or 3 Dimensions	Imported assessment	Assessment: The concept of motion in one dimension: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-105:00040	Units, Physical Quantities, Vectors,Motion in One Dimension, Motion in 2 or 3 Dimensions	Imported assessment	Assessment: The Motion problem solving: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*
SCI-105:00050	Units, Physical Quantities, Vectors,Motion in One Dimension, Motion in 2 or 3 Dimensions	Imported assessment	Assessment: The circular motion and the motion in 2 or 3 dimensions.: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-105:00060	Units, Physical Quantities, Vectors,Motion in One Dimension, Motion in 2 or 3 Dimensions	Imported assessment	Assessment: Motion kinematically problem solving: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*
SCI-105:00070	Units, Physical Quantities, Vectors,Motion in One Dimension, Motion in 2 or 3 Dimensions	Imported assessment	Assessment: Analyses projectile motion kinematically: **Project assignment to demonstrate ability to setup the experiment and to analyze the projectile motion from experimental data.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.6 Details for Competency SCI-106

SCI-106: Dynamics explain motion
Identity code: DYNAMICS_3
Required? No
Credits: 3 (Graded)
Description
No description provided
Responsible Instructor: Chinnapat Rattanasirawit
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-106:00010	Newton"s Laws of Motion, Applications of Newton"s Laws, Circular Motion, Gravity	Imported assessment	Assessment: The Newton's Laws problems sloving: Given an assignment of sophisticated problems to solve	Analyze	*None*	*None*
SCI-106:00020	Newton"s Laws of Motion, Applications of Newton"s Laws, Circular Motion, Gravity	Imported assessment	Assessment: The concept of Newton's Laws of motion: -Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-106:00030	Newton"s Laws of Motion, Applications of Newton"s Laws, Circular Motion, Gravity	Imported assessment	Assessment: The Applications of Newton"s Laws problem solving: An assignment to demostrate the ability to solve related sophisticated problems	Apply	*None*	*None*
SCI-106:00040	Newton"s Laws of Motion, Applications of Newton"s Laws, Circular Motion, Gravity	Imported assessment	Assessment: Circular Motion problem solving: An assignment to demostrate the ability to solve related sophisticated problems	Apply	*None*	*None*
SCI-106:00050	Newton"s Laws of Motion, Applications of Newton"s Laws, Circular Motion, Gravity	Imported assessment	Assessment: Applying the Newton's Law of Gravitation to solve physics problems: An assignment to demostrate the ability to solve related sophisticated problems	Apply	*None*	*None*
SCI-106:00060	Newton"s Laws of Motion, Applications of Newton"s Laws, Circular Motion, Gravity	Imported assessment	Assessment: The Applications of Newton"s Laws: Take a quiz that evaluates key distinctions and concepts on these topics	Apply	*None*	*None*
SCI-106:00070	Newton"s Laws of Motion, Applications of Newton"s Laws, Circular Motion, Gravity	Imported assessment	Assessment: The involvement of Newton's Law of Gravitation found in real-life: Take a quiz that evaluates key distinctions and concepts on these topics	Apply	*None*	*None*
SCI-106:00080	Newton"s Laws of Motion, Applications of Newton"s Laws, Circular Motion, Gravity	Imported assessment	Assessment: The concept of Circular Motion: Take a quiz that evaluates key distinctions and concepts on these topics	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.7 Details for Competency SCI-107

SCI-107: Energy and Momentum
Identity code: ENERGY_MOM_3
Required? No
Credits: 3 (Graded)
Description
No description provided
Responsible Instructor: Prathan Buranasiri
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-107:00010	Work & Kinetic Energy,Power & Potential Energy, Energy & Momentum	Imported assessment	Assessment: The concept of power, gravitational potential energy and elastic potential energy: Take a quiz that evaluates key distinctions and concepts on these topics	Apply	*None*	*None*
SCI-107:00020	Work & Kinetic Energy,Power & Potential Energy, Energy & Momentum	Imported assessment	Assessment: The concept of momentum,collisions, impulse and the conservation of momentum: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-107:00030	Work & Kinetic Energy,Power & Potential Energy, Energy & Momentum	Imported assessment	Assessment: the concept of work and kinetic energy and how they relate to the force: Take a quiz that evaluates key distinctions and concepts on these topics	Apply	*None*	*None*
SCI-107:00040	Work & Kinetic Energy,Power & Potential Energy, Energy & Momentum	Imported assessment	Assessment: Work and kinetic energy problem solving: An assignment to demostrate the ability to solve related sophisticated problems.	Understand	*None*	*None*
SCI-107:00050	Work & Kinetic Energy,Power & Potential Energy, Energy & Momentum	Imported assessment	Assessment: Power, gravitational potential energy and elastic potential energy problem solving: An assignment to demostrate the ability to solve related sophisticated problems.	Understand	*None*	*None*
SCI-107:00060	Work & Kinetic Energy,Power & Potential Energy, Energy & Momentum	Imported assessment	Assessment: Momentum,collisions, impulse and the conservation of momentum problem solving: An assignment to demostrate the ability to solve related sophisticated problems	Apply	*None*	*None*
SCI-107:00070	Work & Kinetic Energy,Power & Potential Energy, Energy & Momentum	Imported assessment	Assessment: The conservation force, non conservation force, and conservation of energy: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-107:00080	Work & Kinetic Energy,Power & Potential Energy, Energy & Momentum	Imported assessment	Assessment: Conservation force, non conservation force, and conservation of energy problem solving: An assignment to demostrate the ability to solve related sophisticated problems	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.8 Details for Competency SCI-108

SCI-108: Thermodynamics
Identity code: THERMODYN_3
Required? No
Credits: 3 (Graded)
Description
No description provided
Responsible Instructor: Lunchakorn Tannukij
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-108:00010	Thermal Properties of Matter, 1st Law and 2nd of Thermodynamics, Entropy, Introduction to Information Theory	Imported assessment	Assessment: Understand components involved in the 1st law of thermodynamics: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-108:00020	Thermal Properties of Matter, 1st Law and 2nd of Thermodynamics, Entropy, Introduction to Information Theory	Imported assessment	Assessment: Apply the concepts of ideal gas to simplified gas systems in nature: An assignment to demostrate the ability to solve related sophisticated problems	Apply	*None*	*None*
SCI-108:00030	Thermal Properties of Matter, 1st Law and 2nd of Thermodynamics, Entropy, Introduction to Information Theory	Imported assessment	Assessment: Understand the origin and consequences of 2nd law of thermodynamics: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-108:00040	Thermal Properties of Matter, 1st Law and 2nd of Thermodynamics, Entropy, Introduction to Information Theory	Imported assessment	Assessment: Understand the involvement of the 1st law in thermal systems found in real-life: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-108:00050	Thermal Properties of Matter, 1st Law and 2nd of Thermodynamics, Entropy, Introduction to Information Theory	Imported assessment	Assessment: Understand the concept of entropy: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-108:00060	Thermal Properties of Matter, 1st Law and 2nd of Thermodynamics, Entropy, Introduction to Information Theory	Imported assessment	Assessment: Apply the basic usages of entropy in information theory: An assignment to demostrate the ability to solve related sophisticated problems	Apply	*None*	*None*
SCI-108:00070	Thermal Properties of Matter, 1st Law and 2nd of Thermodynamics, Entropy, Introduction to Information Theory	Imported assessment	Assessment: The concept of phase changes (heat capacitie, latent heat): Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.9 Details for Competency SCI-109

SCI-109: Electricity
Identity code: ELECTRICITY_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Prathan Buranasiri
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-109:00010	Coulomb's Law	Quiz or exam	Understand the concept of Coulomb's Laws: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-109:00020	Properties of Electric Charges	Quiz or exam	Understand the properties of Electric charges: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-109:00030	Properties of Electric Charges	Quiz or exam	Understand the electric charging by induction and conduction: Given an assignment of sophisticated problems to solve.	Understand	*None*	*None*
SCI-109:00040	Coulomb's Law	Quiz or exam	Applying Coulomb's Laws to solve physics problems.: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*
SCI-109:00050	Electric Field and Motion	Quiz or exam	Understand the concept of electric field: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-109:00060	Electric Field and Motion	Quiz or exam	Understand the concept of motion of charged particles in a uniform electric field lines and its application : An assignment to demostrate the ability to solve related sophisticated problems.	Understand	*None*	*None*
SCI-109:00070	Electric Potential	Quiz or exam	Understand the concept of electric potential: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-109:00080	Electric Potential	Quiz or exam	Applying the Electric field and Electric Potential to solve physics problems.: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.10 Details for Competency SCI-110

SCI-110: Magnetism
Identity code: MAGNETISM_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Lunchakorn Tannukij
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-110:00010	Magnetic fields & magnetic force	Quiz or exam	Understand general properties of magnetic fields: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-110:00020	Magnetic fields & magnetic force	Quiz or exam	Apply the concept of magnetic forces to charged particles and electric currents in a magnetic field: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*
SCI-110:00030	Sources of magnetic fields	Quiz or exam	Apply the concept of Ampére's law to find magnetic fields around magnetic sources: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*
SCI-110:00040	Electromagnetic induction	Quiz or exam	Apply Faraday's law to find induced electricity in a coil: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*
SCI-110:00050	Electromagnetic induction	Quiz or exam	Understand Electricity generation and the involvement of Faraday's law: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-110:00060	Electrodynamics	Quiz or exam	Understand the brief origin and physical meaning of Maxwell's equations: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-110:00070	Electrodynamics	Quiz or exam	Apply the concept of waves in the contect of electromagnetic waves: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.8.11 Details for Competency SCI-111

SCI-111: Light and Optics
Identity code: OPTICS_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Chinnapat Rattanasirawit
Prerequisites
None
Distribution Areas

- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SCI-111:00010	The nature of light, Reflection of light	Quiz or exam	Understand the concept of nature of light : Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-111:00020	The nature of light, Reflection of light	Quiz or exam	Understand the concept of light reflection: Given an assignment of sophisticated problems to solve.	Understand	*None*	*None*
SCI-111:00030	Refraction and Snell's Law	Quiz or exam	Understand the concept of refraction and Snell's Law.: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-111:00040	Refraction and Snell's Law	Quiz or exam	Applying the knowledge of refraction and Snell's law to solve physics problems.: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*
SCI-111:00050	Image formation by lens and mirrors	Quiz or exam	Understand the concept of Image formation by lens and mirrors: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-111:00060	Image formation by lens and mirrors	Quiz or exam	Apply the knowledge of image formation by lens and mirrors to solve physics problems: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*
SCI-111:00070	Diffraction and Interference of light waves	Quiz or exam	Understand the concept of diffraction and interference: Take a quiz that evaluates key distinctions and concepts on these topics	Understand	*None*	*None*
SCI-111:00080	Diffraction and Interference of light waves	Quiz or exam	Applying the knowledge of diffraction and interference to solve physics problems.: An assignment to demostrate the ability to solve related sophisticated problems.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9 SEC Pillar

2.9.1 Details for Competency SEC-101

SEC-101: Data Acquisition, Preparation, Transformation and Cleaning
Identity code: DATA_AQUISITION_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-101:00010	Data Acquisition, Preparation, Transformation and Cleaning	Imported assessment	Assessment: evaluate the relation of Data Acquisition, Preparation, Transformation and Cleaning: write an essay to describe the concept	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.2 Details for Competency SEC-102

SEC-102: Data Reduction and Compression
Identity code: DATA_COMPRESS_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-102:00010	Data Reduction and Compression	Imported assessment	Assessment: Data Reduction and Compression Evaluation: write an essay to describe their relation in Data set	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.3 Details for Competency SEC-103

SEC-103: Data Govermance
Identity code: DATA_GOVERN_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-103:00010	Data governance process, semantics rules and policies	Imported assessment	Assessment: Construct a data governance process according to the application's requirement: Engage with a third party in a data analytics task and construct the governance process that are acceptable to the third party while allowing the task to be completed.	Evaluate	*None*	*None*
SEC-103:00020	Data governance process, semantics rules and policies	Imported assessment	Assessment: Write semantics rules for data governance including information extraction, data integration and data cleaning: Implement a role-based access control or other semantics to control data access for a team or an organization	Create	*None*	*None*
SEC-103:00030	Data governance process, semantics rules and policies	Imported assessment	Assessment: Develop policies and processes to ensure the privacy and security of data: Develop policies and processes for a data collection project to ensure privacy & security of subjects providing data.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.4 Details for Competency SEC-201

SEC-201: Data Privacy, Security and Integrity
Identity code: DATA_PRIVACY_4
Required? Yes
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-201:00010	Data and Information	Quiz or exam	Understanding the personal data definition and its properties.: An assignment to demonstrate an ability to classify personal data and analyze the personal data handling in existing systems against data properties.	Analyze	*None*	*None*
SEC-201:00020	Data and Information	Hands-on problem	An ability to analyze information flows and data sinks with taint analysis.: An assignment to demonstrate an ability to create a information flow diagram and analyze from data security,	Create	*None*	*None*
SEC-201:00030	Data Security	Quiz or exam	Understanding of the data security paradigm, security principles, and cryptography methods.: Take a quiz that evaluates an ability to analyze and create a data security module in a software application.	Evaluate	*None*	*None*
SEC-201:00040	Data Integrity	Quiz or exam	Understading of the data integrity concepts, integrity principles, and digital signatures: Take a quiz that evaluates an ability to analyze and create a data integrity module in a software application.	Understand	*None*	*None*
SEC-201:00050	Data Privacy	Quiz or exam	Understanding of the data privacy paradigm, privacy principles, and proof of knowledge that enhances data privacy.: Take a quiz that evaluates an ability to analyze and design a data privacy preservation module in a software application.	Analyze	*None*	*None*
SEC-201:00060	Data Privacy	Hands-on problem	Understanding of the data privacy laws and regulations.: An assignment to demonstrate an ability to analyze the compliance of a real-world system with data privacy laws and regulations.	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.5 Details for Competency SEC-202

SEC-202: Creating Secure Software
Identity code: SEC_SOFTWARE_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-202:00010	Security risks in software systems	Imported assessment	Assessment: Discuss in detail the security challenges that face modern system designers.: Write an essay that introduces the overall concept of security risks in software systems, then enumerates and explains at least three specific types of security risk common in modern software.	Understand	*None*	*None*
SEC-202:00020	Designing for security	Imported assessment	Assessment: Create part of a security-aware design: Given a specific design assignment, for a component of a real system, create a design that explicitly considers and mitigates security risks	Create	*None*	*None*
SEC-202:00030	Testing for security	Imported assessment	Assessment: Perform a security audit of a real software system: Given a real, functioning software system 1) analyze potential security risks 2) create test scenarios to evaluate those risks 3) write a report summarizing your findings.	Evaluate	*None*	*None*
SEC-202:00040	Database security	Imported assessment	Assessment: Fix relational database security issues: Given a real, functioning software system that uses a relational database for its backend 1) analyze and/or test to identify security risks 2) modify the code to fix at least two of these security problems.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.6 Details for Competency SEC-203

SEC-203: Securing System Infrastructure
Identity code: SEC_INFRASTRUCT_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: Orathai Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-203:00010	Infrastructure security threats	Imported assessment	Assessment: Infrastructure security threats: write an essay	Understand	*None*	*None*
SEC-203:00020	Best practice for infrastructure security	Imported assessment	Assessment: Best practice for infrastructure security: write an essay	Understand	*None*	*None*
SEC-203:00030	Infrastructure security solutions	Imported assessment	Assessment: Infrastructure security solutions: write an essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.7 Details for Competency SEC-204

SEC-204: Security Policy and Processes
Identity code: SEC_POLICY_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sorakrit Phruthanontachai
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-204:00010	Security policy	Imported assessment	Assessment: Security policy: write an essay	Understand	*None*	*None*
SEC-204:00020	Security Process	Imported assessment	Assessment: Security Process: write an essay	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.8 Details for Competency SEC-205

SEC-205: Distributed ledger and Blockchain
Identity code: BLOCKCHAIN_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-205:00010	Blockchain mechanism	Imported assessment	Assessment: Describe a blockchain mechanism method and propose potential applications & related services.: Describe a blockchain mechanism method and propose potential applications & related services.	Apply	*None*	*None*
SEC-205:00020	Blockchain applications	Imported assessment	Assessment: Create blockchain applications method for potential services.: Create a smart contract that automatically deduct monthly loan payment from another incoming transaction	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.9 Details for Competency SEC-303

SEC-303: Vulnerability Assessment for Software Applications
Identity code: VULNERABILTY_ASSMT_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-303:00010	Vulnerability Assessment for Software Applications	Imported assessment	Assessment: Vulnerability Assessment for Software Applications: Vulnerability Assessment for Software Applications	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.10 Details for Competency SEC-401

SEC-401: Privacy Attacks
Identity code: PRIVACY_ATTACKS_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Pasin Manurangsi
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-401:00010	Attacks on Anonymized Data	Imported assessment	Assessment: Undestand the concepts and applications of de-anonymization attacks, reconstruction attacks and can apply the attacks in simple settings: Take a quiz on the topic, Assignment write a program to perform reconstruction attacks on a given aggregated data	Understand	*None*	*None*
SEC-401:00020	Attacks on Machine Learning Models	Imported assessment	Assessment: Understand the concepts of membership inference attacks, model inversion attacks, secret sharer: Take a quiz on the topic.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.11 Details for Competency SEC-402

SEC-402: Differential Privacy (DP)
Identity code: DIFF_PRIVACY_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: Pasin Manurangsi
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-402:00010	Concepts and definitions	Imported assessment	Assessment: Understand the concepts of differential privacy and can determine if a given algorithm is differentially private understand the utility-privacy tradeoff for Laplace, Gaussian, exponential mechanisms and Randomized Response: Take a quiz on whether given algorithms are differentially private (and for what parameters) and can compute their utilities	Understand	*None*	*None*
SEC-402:00020	Properties of DP	Imported assessment	Assessment: Understand the concepts of post-processing, composition, group differential privacy and protection against privacy-related attacks: Take a quitz that evaluate the key concepts of probability conditional probability, and the Bayes" theorem	Understand	*None*	*None*
SEC-402:00030	Applications in ML	Imported assessment	Assessment: Understand the DP-SGD algorithm, its privacy accounting and how to apply it to real datasets: Build differentially private machine classification models using the DP-SGD algorithms on simple datasets, demonstate the effects on different parameters to its utility	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.12 Details for Competency SEC-301

SEC-301: Security Challenges in Modern AI Systems
Identity code: SEC_AI_SYSTEMS_4
Required? Yes
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Orathai Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-301:00010	AI Security Risks	Quiz or exam	Understanding of the AI security risks and AI security recommendation.: Take a quiz that evaluates an ability to analyze AI security risks and apply standard AI security recommendation.	Analyze	*None*	*None*
SEC-301:00020	AI Security Risks	Hands-on problem	An ability to analyze and model AI security threats in a real-world system.: A group project to demonstrate an ability to analyze a real-world AI system and model its security threats.	Analyze	*None*	*None*
SEC-301:00030	Adversarial AI	Quiz or exam	Understanding of the AI specific attacks and how to protect them.: Take a quiz that evaluates an ability to analyze and identify AI specific attacks and how to protect them.	Analyze	*None*	*None*
SEC-301:00040	AI Safety	Hands-on problem	Understanding of the AI Safety and how research in this field is conducted.: A group project to demonstrate an ability to study a current research trend in AI Safety from existing works and identify research gaps.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.9.13 Details for Competency SEC-302

SEC-302: Robustness of AI Components and Systems
Identity code: ROBUST_AI_SYSTEMS_6
Required? Yes
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: Orathai Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEC-302:00010	Model Robustness	Imported assessment	Assessment: Model Robustness: create a model	Analyze	*None*	*None*
SEC-302:00020	AI System robustness	Imported assessment	Assessment: AI System robustness: write an essay to evaluate the system	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10 SEN Pillar

2.10.1 Details for Competency SEN-099

SEN-099: Programming Essentials
Identity code: PROG_ESSENTIALS_4
Required? No
Credits: 4 (Graded)
Description
Basic idea of what programming is and does.
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-099:00010	Programming Essentials	Hands-on problem	Programming Essentials: Write a simple, single module program	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.2 Details for Competency SEN-101

SEN-101: Algorithmic Thinking & Problem Solving
Identity code: ALGO_THINKING_2
Required? Yes
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-101:00010	Analysis techniques for program design	Imported assessment	Assessment: Turning verbal specifications into algorithms: Given a written specification for what a non-trivial program should do, create a detailed set of flowcharts or pseudocode that correctly expresses a solution	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.3 Details for Competency SEN-102

SEN-102: Intro to Programming
Identity code: INTRO_PROG_4
Required? Yes
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites

- SEN-101 - Algorithmic Thinking & Problem Solving

Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-102:00010	Controlling program flow	Imported assessment	Assessment: Creating conditional structures: Write a non-trivial program based on a written specification that uses conditional logic to control processing	Create	*None*	*None*
SEN-102:00020	Controlling program flow	Imported assessment	Assessment: Creating iteration structures: Write a non-trivial program based on a written specification that uses loop constructions	Create	*None*	*None*
SEN-102:00030	Functions and modules	Imported assessment	Assessment: Creating reusable code units: Write a non-trivial program that uses functions, modules and (if relevant) packages to effectively distribute processing	Create	*None*	*None*
SEN-102:00040	Simple data structures	Imported assessment	Assessment: Using arrays, structs, tuples, slices and other simple data structures: Given a written specification, write a non-trivial program that chooses and utilizes appropriate native data structures	Create	*None*	*None*
SEN-102:00050	Text files	Imported assessment	Assessment: Using text files: Write a program that reads and parses information from a text file, does some analysis on that data, and writes the results to a text file with a different format.	Create	*None*	*None*
SEN-102:00060	Binary files and data	Imported assessment	Assessment: Using binary files: Write a program that reads and processes binary data, for instance, image files.	Create	*None*	*None*
SEN-102:00070	Comparing programming languages	Imported assessment	Assessment: Comparing programming languages: Given essay	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.4 Details for Competency SEN-103

SEN-103: Programming Multi-module Applications
Identity code: MULTIMODULE_4
Required? No
Credits: 4 (Graded)
Description
Using the principles of low coupling, high coherence and separation of concerns to design and implement software with multiple functional components, in a variety of scenarios single executable, multi co-located executables, components distributed across a network.
Responsible Instructor: Sally Goldin
Prerequisites

- SEN-102 - Intro to Programming

Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-103:00010	Single executable systems	Imported assessment	Assessment: Create a simple multi-module, single executable system: Given a written specification for a software system, create a single executable, multi-module solution in C, Java and/or Python.	Create	*None*	*None*
SEN-103:00020	Multiple executable systems	Imported assessment	Assessment: Create a simple software system with multiple communicating executables: Given a written specification for a software system, create a multi-module solution that uses communicating components written in multiple languages	Create	*None*	*None*
SEN-103:00030	Distributed systems	Imported assessment	Assessment: Design a distributed multi-component system: Given a written description of its capabilities, design a web application including its components, interfaces and REST API	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.5 Details for Competency SEN-107

SEN-107: Fundamental Data Structures
Identity code: BASIC_DATA_STRUCT_4
Required? Yes
Credits: 4 (Graded)
Description
This competency introduces students to lists, queues, stacks, trees, hash tables and graphs, using the C language.
Responsible Instructor: Sally Goldin
Prerequisites

- SEN-102 - Intro to Programming

Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-107:00010	Sequential data structures	Imported assessment	Assessment: Creating and using lists: Create a program that implements a linked list including item insertion and removal at any specified location	Create	*None*	*None*
SEN-107:00020	Recursive algorithms	Self-assessment	Assessment: Understanding and using recursion: Given three programs, each of which uses a recursive algorithm but which has bugs, fix the bugs so the programs operate correctly	Analyze	*None*	*None*
SEN-107:00030	Hierarchical data structures	Imported assessment	Assessment: Creating and using binary trees: Create a program that implements a sorted binary tree. Use it to sort a file of text strings	Create	*None*	*None*
SEN-107:00040	Hierarchical data structures	Imported assessment	Assessment: Creating and using trees with arbitrary branching factors: Create a program that builds and uses a tree with an arbitrary branching factor, e.g.. a tree that represents folders and files on a hard disk	Create	*None*	*None*
SEN-107:00050	Content-addressable data structure	Imported assessment	Assessment: Using content-addressable storage: In a language that provides library support for hash tables, write a program dictionary program that allows you to add, remove and look up words and definitions, where there can be an unlimited number of definitions for each world	Apply	*None*	*None*
SEN-107:00060	Graphs	Imported assessment	Assessment: Creating and using graphs: Given a text file that holds a representation of vertices and edges, read the file and build a graph. Then execute breadth first and depth first traversals of the graph to search for specific vertices.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.6 Details for Competency SEN-108

SEN-108: Basic Algorithms
Identity code: BASIC_ALG_2
Required? Yes
Credits: 2 (Graded)
Description
This competency introduces a number of fundamental algorithms associated with specific data structures, including binary sort, breadth-first traversal and depth-first traversal
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-108:00010	Simple sorting	Hands-on problem	Assessment:Simple sorting : Write a program that uses a sorted binary tree to order a set of data	Create	1, 2	1, 2
SEN-108:00020	Tree traversals	Hands-on problem	Assessment:Tree traversals: Write a program that implements breadth-first and/or depth-first tree traversals in both general and binary trees	Create	1, 2	1, 2
SEN-108:00030	Graph traversal	Hands-on problem	Assessment:Graph traversal: Write a program that uses breadth-first and/or depth-first graph traversal to solve a problem	Create	1, 2	1, 2

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.7 Details for Competency SEN-208

SEN-208: Advanced Data Structures and Algorithms
Identity code: ADV_DATA_STRUCT_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites

- SEN-107 - Fundamental Data Structures

Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-208:00010	Basic complexity analysis	Imported assessment	Assessment: Evaluating the complexity of algorithms: Given pseudocode for three different algorithms, determine the worst case complexity for each one.	Evaluate	*None*	*None*
SEN-208:00020	Sorting and searching	Imported assessment	Assessment: Comparing sort algorithms: Create a program that sorts integers using a bubble sort. Create another program that uses a quick sort. Measure the time it takes to sort several given data sets and write a one page description of the results.	Create	*None*	*None*
SEN-208:00030	Network data structures	Imported assessment	Assessment: Use a network data structure in an application: Write a program that builds and uses a network data structure to solve some problem	Create	*None*	*None*
SEN-208:00040	Graph and network algorithms	Imported assessment	Assessment: Implement and compare two minimum path length algorithms: Write two programs to find the minimum weight path in a network, for some application, one using Dijkstra's algorithm and one using A* Compare the performance and behavior.	Create	*None*	*None*
SEN-208:00050	Graph and network algorithms	Imported assessment	Assessment: Implement a minimum spanning tree algorithm: Write a program to implement Prim's algorithm or another minimum spanning tree algorithm to solve a relevant problem.	Create	*None*	*None*
SEN-208:00060	Graph and network algorithms	Imported assessment	Assessment: Find the minimum total weight path in a network: Given a program that implements Dijkstra's shortest path algorithm, but which has bugs, fix the bugs so that the program works correctly.	Analyze	*None*	*None*
SEN-208:00070	Other essential algorithms	Imported assessment	Assessment: Recognize and explain other essential algorithms: Given a list of the essential algorithms covered in the source material, choose two. Explain 1) their purpose or objective and 2) the basic logic of how they work.	Understand	*None*	*None*
SEN-208:00090	Heuristic approaches to computation	Imported assessment	Assessment: Understanding heuristic algorithms: Write a program that solves the Knapsack problem. Then find a case where the solution it calculates is not optimal.	Create	*None*	*None*
SEN-208:00100	Heuristic approaches to computation	Imported assessment	Assessment: Implement a bio-inspired heuristic algorithm: Write a program to apply a genetic algorithm approach to a relevant problem. Some background will be supplied, e.g. suggestions for how to represent problem solutions as chromosomes.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.8 Details for Competency SEN-209

SEN-209: Designing and implementing data bases
Identity code: DATABASES_6
Required? No
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-209:00010	Relational storage concepts	Imported assessment	Assessment: Use a spreadsheet to model a set of relational data: Given a description of a data set with several relationships, create a spreadsheet with multiple tables that captures the relationships, and enter some sample d	Create	*None*	*None*
SEN-209:00020	Designing a relational schema	Imported assessment	Assessment: Design and implement a simple relational schema: Given a description of a data set with several relationships, define a set of tables that captures these relationships and write the SQL DDL to create the tables, then test with an SQLite database.	Create	*None*	*None*
SEN-209:00030	Querying a relational database	Imported assessment	Assessment: Create and execute SQL queries to retrieve data: Given a database with a known schema, which already contains data, create and execute SQL queries to answer a set of questions about that data.	Create	*None*	*None*
SEN-209:00040	Storing data in a relational database	Imported assessment	Assessment: Add and modify data in a relational DB using SQL: Given a database with a known schema, which already contains data, create and execute SQL statements to add new records, modify existing records, and delete records, according to a set of instructions.	Create	*None*	*None*
SEN-209:00050	Database operations in software	Imported assessment	Assessment: Write a program that queries and modifies a relational database: Given a database with a known schema, which already contains data, write a program that statements to retrieve specific information, add new records, modify existing records, and delete records, according to a set of instructions. Note that this assessment may use the same database and instructions as the assessment for the previous skill.	Create	*None*	*None*
SEN-209:00060	Non-relational databases	Imported assessment	Assessment: Create and use a NoSQL database with a simple schema: Given a description of a set of data and relationships, plus some sample data 1) create a NoSQL database to hold this information 2) load the sample data into the NoSQL database 3) write a program that will both retrieve and update information in the NoSQL database.	Create	*None*	*None*
SEN-209:00070	Comparing database systems	Imported assessment	Assessment: Choose a database system for a specific application: Given a description of a particular software application, in terms of its users, functionality, platform, performance requirements and so on, decide what database system you would use. Explain and justify your choice in writing (at least one page).	Evaluate	*None*	*None*
SEN-209:00080	Database operations in software	Imported assessment	Assessment: Apply advanced database concepts: Given descriptions of several scenarios involving database systems that have various problems, describe (in writing) how you could use one or more of the —advanced— topics to solve or improve the problem.	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.9 Details for Competency SEN-304

SEN-304: Object Oriented Design and Programming
Identity code: OO_PROG_4
Required? No
Credits: 6 (Graded)
Description
Core principles of the object-oriented paradigm including classes and instances, member data and methods, encapsulation, inheritance, polymorphism, separation of concerns, etc. Students will create a UML-based design for a simple object-oriented system, then implement it in Java.
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-304:00010	Discovering classes	Hands-on problem	Discovering classes: Use a problem specification to define a set of classes. Refine the classes using CRC cards	Analyze	*None*	*None*
SEN-304:00020	Encapsulation, inheritance and polymorphism	Hands-on problem	Taking advantage of OO properties: Revise a set of classes to extract general structural or behavioral characteristics and to maximize data-hiding	Create	*None*	*None*
SEN-304:00030	Design using UML	Hands-on problem	Use UML to create an OO design: Create a use case diagram and a class diagram for an OO application. Create sequence diagrams for core interactions.	Create	*None*	*None*
SEN-304:00040	Design patterns	Hands-on problem	Identify opportunities to apply design patterns: Analyze a pre-existing design and identify any opportunities for applying design patterns.	Apply	*None*	*None*
SEN-304:00050	Translating an object-oriented model into code	Hands-on problem	Implement a UML-based OO design: Implement, test and debug the application represented by your UML design. Update the design diagrams to reflect any changes during implementation.	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.10 Details for Competency SEN-305

SEN-305: Functional Programming
Identity code: FUNC_PROG_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-305:00010	Functional Programming	Imported assessment	Assessment: Functional Programming: Writing an essay to describe how Functional Programming works.	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.11 Details for Competency SEN-306

SEN-306: Dataflow Programming
Identity code: DATAFLOW_PROG_4
Required? No
Credits: 4 (Graded)
Description
In computer programming, dataflow programming is a programming paradigm that models a program as a directed graph of the data flowing between operations, thus implementing dataflow principles and architecture.
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-306:00010	Dataflow Programming	Imported assessment	Assessment: Dataflow programming: Hands-on in coding the program	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.12 Details for Competency SEN-307

SEN-307: Domain-specific programming languages
Identity code: DSL_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-307:00010	Domain-specific programming languages	Imported assessment	Assessment: Domain-specific programming languages: Domain-specific programming languages	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.13 Details for Competency SEN-201

SEN-201: Software Engineering Processes
Identity code: SE_PROCESSES_6
Required? Yes
Credits: 6 (Graded)
Description
No description provided
Responsible Instructor: Sally Goldin
Prerequisites

- SEN-102 - Intro to Programming

Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-201:00010	Motivation for software engineering	Imported assessment	Assessment: Explain the difference between a software engineering approach to development and an ad hoc approach: Given a story about a software development project that failed, identify areas where a software engineering approach might have improved the outcomes	Understand	*None*	*None*
SEN-201:00020	Problem definition processes	Imported assessment	Assessment: Interview a stakeholder to create a problem definition for a software system: Given a general description of a software system to be built, interview a stakeholder (real stakeholder or a professor in that role) to elicit a problem description. Express the problem as a requirements list, a set of use cases, or both.	Analyze	*None*	*None*
SEN-201:00030	Design processes	Imported assessment	Assessment: Create a high level architecture design for a system: Given a problem description for a software system, plus other constraints, create an architecture diagram and a corresponding description for that system.	Create	*None*	*None*
SEN-201:00040	Design processes	Imported assessment	Assessment: Create a detailed design for a system component: Given a functional description for one component of a software system, create a detailed design for that component in the form of a sequence diagram plus an activity diagram.	Create	*None*	*None*
SEN-201:00050	Configuration management	Imported assessment	Assessment: Explain how to use an SCM to solve common team development problems: Given a narrative that describes several scenarios in a development team, explain in detail how to use a specific SCM (git, CVS, SVN etc.) to solve or avoid the problem in each of the scenarios.	Apply	*None*	*None*
SEN-201:00060	Software testing	Imported assessment	Assessment: Create and execute a set of unit tests for a software module: Given a code module plus an explanation of what it is supposed to do, create unit tests for that module, using a framework of your choice. Run the unit test suite and fix any defects. Repeat until the unit tests all complete successfullu.	Create	*None*	*None*
SEN-201:00070	Software testing	Imported assessment	Assessment: Create a functional test plan: Given an actual software system, plus a document listing its required functionality, create a functional test plan you could use to verify that the system performs as specified. You are not required to actually execute the test plan.	Create	*None*	*None*
SEN-201:00080	Deployment and maintenance	Imported assessment	Assessment: Write a script to deploy a simple web application: Given a running web application, plus an SCM repository that holds the code, write a script in the language of your choice to deploy the application to a server. Do not use a Ci/CD tool for this assessment.	Create	*None*	*None*
SEN-201:00090	Software documentation	Imported assessment	Assessment: Add high quality documentation to existing code: Given a code module with no comments or documentation (in a familiar programming language), figure out what each function in the module does. Then add appropriate documentation to the code, following best practices plus the	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.14 Details for Competency SEN-202

SEN-202: Software Quality Assurance
Identity code: SE_TESTING_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-202:00010	Software Quality Assurance	Imported assessment	Assessment: Software Quality Assurance: Software Quality Assurance	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.15 Details for Competency SEN-203

SEN-203: Software Design
Identity code: SE_DESIGN_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-203:00010	Software Quality Assurance	Imported assessment	Assessment: Software Quality Assuranc: Topic #426 Software Quality Assurance	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.16 Details for Competency SEN-205

SEN-205: Requirements Analysis and Problem Definition
Identity code: REQ_ANALYSIS_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-205:00010	Requirements Analysis and Problem Definition	Imported assessment	Assessment: Requirements Analysis and Problem Definition: Requirements Analysis and Problem Definition	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.17 Details for Competency SEN-212

SEN-212: Software Configuration Management
Identity code: SCM_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-212:00010	Software Configuration Management	Imported assessment	Assessment: Software Configuration Management: Software Configuration Management	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.18 Details for Competency SEN-213

SEN-213: Software Measurement
Identity code: SE_METRICS_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-213:00010	Software Measurement	Imported assessment	Assessment: Software Measurement: Software Measurement	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.19 Details for Competency SEN-214

SEN-214: Software Maintenance and Evolution
Identity code: SE_MAINTENANCE_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skills and Assessments None specified.

2.10.20 Details for Competency SEN-301

SEN-301: Designing and Building Secure Software
Identity code: SECURE_SW_DESIGN_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-301:00010	Designing and Building Secure Software	Imported assessment	Assessment: Designing and Building Secure Software: Designing and Building Secure Software	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.21 Details for Competency SEN-302

SEN-302: Designing and Building Mission Critical Software
Identity code: MISSION_CRITICAL_SW_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skills and Assessments None specified.

2.10.22 Details for Competency SEN-401

SEN-401: Agile Development Processes (including DevOps)
Identity code: AGILE_SE_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skills and Assessments None specified.

2.10.23 Details for Competency SEN-402

SEN-402: Software Project Management
Identity code: SW_PROJ_MGMT_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-402:00010	Software Project Management	Imported assessment	Assessment: Software Project Management: Software Project Management	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.24 Details for Competency SEN-403

SEN-403: Software Organization Maturity and Continuous Improvement
Identity code: SW_MATURITY_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skills and Assessments None specified.

2.10.25 Details for Competency SEN-404

SEN-404: Legacy Software Strategies
Identity code: LEGACY_SW_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-404:00010	Legacy Software Strategies	Imported assessment	Assessment: Legacy Software Strategies: Legacy Software Strategies	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.26 Details for Competency SEN-405

SEN-405: Open Source Software
Identity code: OPENSOURCE_SW_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical
- Humanities and Social Sciences

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-405:00010	Open Source Software	Imported assessment	Assessment: Open Source Software: Open Source Software	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.27 Details for Competency SEN-311

SEN-311: Web Architectures
Identity code: WEB_ARCH_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-311:00010	Fundamental concepts of web-based applications	Quiz or exam	Understand fundamental TCP/IP network architecture: Take a quiz that evaluates key distinctions and concepts on these topics	Evaluate	*None*	*None*
SEN-311:00020	Fundamental concepts of web-based applications	Quiz or exam	Understand fundamental concepts of HTTP protocol : 1.Take a quiz that evaluates key distinctions and concepts on these topics 2.Web application development assignments	Evaluate	*None*	*None*
SEN-311:00030	Fundamental concepts of web-based applications	Quiz or exam	Understand the concepts and components of web-based application : 1.Take a quiz that evaluates key distinctions and concepts on these topics 2.Web application development assignments"	Evaluate	*None*	*None*
SEN-311:00040	Basic knowledge on web development	Quiz or exam	Apply fundamental knowledge to create a working web-based application: 1.Web application development assignments 2.An project to demonstrate the front-end web development skills"	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.10.28 Details for Competency SEN-312

SEN-312: Mobile Application Architectures
Identity code: MOBILE_ARCH-4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: UNSPECIFIED
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SEN-312:00010	Fundamental concepts of mobile applications	Quiz or exam	Understand fundamental TCP/IP network architecture: Take a quiz that evaluates key distinctions and concepts on these topics	Evaluate	*None*	*None*
SEN-312:00020	Fundamental concepts of mobile applications	Quiz or exam	Understand fundamental concepts of RESTful API : 1. Take a quiz that evaluates key distinctions and concepts on these topics 2.Mobile application development assignments	Evaluate	*None*	*None*
SEN-312:00030	Fundamental concepts of mobile applications	Quiz or exam	Understand the concepts and components of mobile application : Take a quiz that evaluates key distinctions and concepts on these topics Mobile application development assignments	Evaluate	*None*	*None*
SEN-312:00040	Basic knowledge on mobile app development	Hands-on problem	Apply fundamental knowledge to create a working mobile application: 1.Mobile application development assignments 2.An project to demonstrate the app development skills"	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11 SYS Pillar

2.11.1 Details for Competency SYS-101

SYS-101: Operating Systems
Identity code: OS_UNIX_4
Required? Yes
Credits: 4 (Graded)
Description
This competency provides an overview of operating systems responsibilities & required mechanisms for multitasking and resource management of a computer system. This competency will focus on the virtualization abstraction and concurrency aspect of operating systems.
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-101:00010	Principles of Operating Systems	Imported assessment	Implement and Use an OS Shell: Implement a Linux shell that interacts with file system, processes and signal handling	Apply	*None*	*None*
SYS-101:00020	Virtualization	Imported assessment	Design and Implement a basic OS kernel: Implement a simplified OS kernel that can manage multiple processes and virtual memory	Remember	*None*	*None*
SYS-101:00030	Concurrency	Imported assessment	Design and Implement a concurrent network server: Implement a client-server backend service that demonstrates useful synchronized data structure for network applications	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.2 Details for Competency SYS-102

SYS-102: Basic Computer Architecture
Identity code: COMPUTER_ARCH_4
Required? Yes
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-102:00010	State machines	Imported assessment	Assessment: State machine design: Given a problem description, devise a state machine that solves the problem, and implement an equivalent circuit using digital elements through truth table analysis	Create	*None*	*None*
SYS-102:00020	Processor architecture	Imported assessment	Assessment: Computer architecture: Given an example set of instructions, design a processor data path that can execute those instructions	Create	*None*	*None*
SYS-102:00030	Assembly language programming	Imported assessment	Assessment: Assembly programming: Given a problem, design and implement a program, written in assembly language for a chosen processor, that solves that problem	Create	*None*	*None*
SYS-102:00040	Interrupt-driven programming and asynchronous event handling	Imported assessment	Assessment: Interrupt-driven programming: Given a problem, design and implement a program, written in assembly language for a chosen processor, that solves that problem using interrupt service routines to handle events asynchronously	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.3 Details for Competency SYS-202

SYS-202: Real Time and Embedded Systems
Identity code: RT_EMBEDDED_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skills and Assessments None specified.

2.11.4 Details for Competency SYS-205

SYS-205: Storage and File Systems Fundamentals
Identity code: FILE_SYSTEMS_2
Required? No
Credits: 2 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-205:00010	Storage and File Systems Fundamentals	Imported assessment	Assessment: Storage and File Systems Fundamentals: Writing the evaluation of the concept	Understand	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.5 Details for Competency SYS-206

SYS-206: Computer Design Processor Architectures and Digital Design using HDLs
Identity code: DIGITAL_DESIGN_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skills and Assessments None specified.

2.11.6 Details for Competency SYS-207

SYS-207: Networks
Identity code: NETWORKS_4
Required? No
Credits: 4 (Graded)
Description
Network architecture, OSI
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-207:00010	Interesting Properties of Networks & Layers	Quiz or exam	Assessment: Interesting Properties of Networks & Layers: Take a quiz	Understand	*None*	*None*
SYS-207:00020	Three level reference model	Quiz or exam	Assessment: Three level reference model: Take a quiz	Understand	*None*	*None*
SYS-207:00030	Link Layer concepts	Hands-on problem	Assessment: Link Layer concepts: Capture and analyze network traffic trace to explicitly show where three (3) Link-Layer techniques work in the trace.	Analyze	*None*	*None*
SYS-207:00040	Link Layer implementation	Hands-on problem	Assessment: Link Layer implementation: Refer to the protocol standard document(s) and use its/their contents to interpret what and how one (1) of the identified techniques from the trace is doing exactly.	Apply	*None*	*None*
SYS-207:00050	Network layer concepts	Hands-on problem	Assessment: Network layer concepts: Capture and analyze network traffic trace to explicitly show where three (3) Network-Layer techniques work in the trace.	Analyze	*None*	*None*
SYS-207:00060	Network layer implementation	Hands-on problem	Assessment: Network layer implementation: Refer to the protocol standard document(s) and use its/their contents to interpret what and how one (1) of the identified techniques from the trace is doing exactly.	Apply	*None*	*None*
SYS-207:00070	End-to-End layer concepts	Hands-on problem	Assessment: End-to-End layer concepts: Capture and analyze network traffic trace to explicitly show where three (3) End-to-End-Layer techniques work in the trace	Analyze	*None*	*None*
SYS-207:00080	End-to-End layer implementation	Hands-on problem	Assessment: End-to-End layer implementation: Refer to the protocol standard document(s) and use its/their contents to interpret what and how one (1) of the identified techniques from the trace is doing exactly.	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.7 Details for Competency SYS-208

SYS-208: Digital and Analog Circuit Design
Identity code: CIRCUIT_DESIGN_4
Required? No
Credits: 4 (Graded)
Description
This course introduces the integration of analog and digital systems by creating Direct Digital Synthesis Function Geneator
Responsible Instructor: Sumek Wisayataksin
Prerequisites
None
Distribution Areas

- Core Technical
- Math/Science

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-208:00010	DC Analog Circuit	Quiz or exam	Analyze the DC analog circuit: Take a quiz to evaluate the concept of topics	Evaluate	*None*	*None*
SYS-208:00020	AC Analog Circuit	Quiz or exam	Analyze the AC analog circuit: Take a quiz to evaluate the concept of topics	Evaluate	*None*	*None*
SYS-208:00030	Digital Circuit	Quiz or exam	Digital Data Interface, SPI : Take a exam by creating the program to control peripheral according to the spec.	Create	*None*	*None*
SYS-208:00040	Analog and Digital Conversion	Quiz or exam	Understand the analog to digital conversion : Take a exam by creating the program to control peripheral according to the spec.	Create	*None*	*None*
SYS-208:00050	Print Circuit Board Design	Quiz or exam	Create the PCB for Electronic system: Exermine the correctness of the pcb outcome.	Create	*None*	*None*
SYS-208:00060	Electronic System Design	Quiz or exam	Integrate digital and analog circuit into the PCB: Integrate digital and analog circuit into the PCB	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.8 Details for Competency SYS-301

SYS-301: Cyber Physical Systems
Identity code: CYBER_PHYS_SYS_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-301:00010	Cyber Physical System	Imported assessment	Assessment: Cyber Physical System: Coding the system	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.9 Details for Competency SYS-302

SYS-302: Cloud Computing
Identity code: CLOUD_COMP_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-302:00010	Virtualization and Container Infrastructure	Imported assessment	Assessment: Deploy services using virtualization or container infrastructure: Deploy a modern web services using virtualization or container infrastructure	Apply	*None*	*None*
SYS-302:00020	Cloud Service Model	Imported assessment	Assessment: Create cloud service model method for potential services.: Given an example website, comes up with a potential cloud service model or pricing scheme for users	Evaluate	*None*	*None*
SYS-302:00030	Cloud service orchestration	Imported assessment	Assessment: Use cloud service orchestration to maintain service quality of a web service: Using Kubernetes or other orchestration mechanism to ensure the availability of a web service	Apply	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.10 Details for Competency SYS-303

SYS-303: Scalable Management of Data and Models
Identity code: SCALABLE_DATA_MODEL_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-303:00010	Working with Data Models	Imported assessment	Assessment: Working with different Data Models for given datasets: Given a sets of diverse data, evaluate appropriate data models to be used	Evaluate	*None*	*None*
SYS-303:00020	Big data modeling	Imported assessment	Assessment: Understand big data modeling method: Evaluate differences among big data modeling method and its related application	Apply	*None*	*None*
SYS-303:00030	Data management systems	Imported assessment	Assessment: Create data management systems for potential services.: Implement a data management mechanism to process large amount of data for a given problem	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.11 Details for Competency SYS-304

SYS-304: Scalable Algorithms and Infrastructure
Identity code: SCALABLE_ALGO_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-304:00010	Asynchronous programming model	Imported assessment	Assessment: Implement asynchronous programming model to improve the concurrency of a service: Enhance a web service or process using asynchronous programming	Create	*None*	*None*
SYS-304:00020	Parallel algorithm	Imported assessment	Assessment: Create parallel algorithm to process data in parallel.: Implement a parallel algorithm to perform search across computing cluster	Apply	*None*	*None*
SYS-304:00030	Fundamental Workflow to ML Operation	Imported assessment	Assessment: Design a scalable environment to for developing applications or AI solutions: Given an example scenario of developing an AI solution, comes up with a process of development and potential architectural design to contain a solution	Apply	*None*	*None*
SYS-304:00040	Application for Distributed Computing Framework	Imported assessment	Assessment: Deploy services using virtualization or container infrastructure. Conducting/desigining an experiment to analyze/measure the performance of the service: Setup the distributed computing cluster and experimenting a performance of resources based on a different assigned tasks (models, workloads, etc.) using a virtual machine	Apply	*None*	*None*
SYS-304:00050	Application for ML Model Serving a Web Application	Imported assessment	Assessment: Create and deploy a website that serves the ML model: Develop and deploy a website that will be able to contain the ML model, with a consideration (design) for CI/CD through the process	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.12 Details for Competency SYS-401

SYS-401: Parallel Computing
Identity code: PARALLEL_COMP_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-401:00010	Parallel Computing	Imported assessment	Assessment: Parallel Computing: Writing the solution to solve the problem	Analyze	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.13 Details for Competency SYS-402

SYS-402: Distributed Data Storage
Identity code: DISTRIB_DATA_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-402:00010	Physical Storage systems	Imported assessment	Assessment: Evaluate type of physical storage systems required for potential services.: Given an example application, evaluate potential storage to be used for the application	Evaluate	*None*	*None*
SYS-402:00020	File system organization	Imported assessment	Assessment: Understand file system organization method for potential services.: Describe the difference between common filesystems used in modern computing system	Understand	*None*	*None*
SYS-402:00030	Disk Array	Imported assessment	Assessment: Create a virtual disk array method for potential services.: Configure a disk array to support redundancy for potential services	Apply	*None*	*None*
SYS-402:00040	Distributed File system and network-attached storage	Imported assessment	Assessment: Evaluate distributed file system and network-attached storage method for potential services.: Given a scenario, evaluate the file system or network storage solution suitable for the service	Evaluate	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork

2.11.14 Details for Competency SYS-403

SYS-403: Big Data Computing
Identity code: BIG_DATA_4
Required? No
Credits: 4 (Graded)
Description
No description provided
Responsible Instructor: Akkarit Sangpetch
Prerequisites
None
Distribution Areas

- Core Technical

Skill Code	Topic	Assessment Type	Assessment	Complexity Level	Engineering SLO	Computing SLO
SYS-403:00010	Big Data architecture	Imported assessment	Assessment: Understand big data architecture and its application for potential services.: Given various use cases (unstructured and structured), describe how or which data architecture that can be used to serve the use cases	Apply	*None*	*None*
SYS-403:00020	Distributed Queries & Machine learning	Imported assessment	Assessment: Create distributed Queries & Machine learning method for potential services.: Given a problem, utilize SparkQL or similarly distributed technology to address the problem	Apply	*None*	*None*
SYS-403:00030	Distributed data pipeline	Imported assessment	Assessment: Create distributed data pipeline method for potential services.: Create a data processing pipeline using distributed architecture	Create	*None*	*None*

Category	Code	Learning Outcome
Engineering SLO	1	Engineering problem solving
	2	Designing to meet requirements
	3	Effective communication
	4	Ethical awareness
	5	Teamwork
	6	Experimental design and data analysis
	7	Self-learning
Computing SLO	1	Computational problem solving
	2	Designing, implementing and evaluating from requirements
	3	Effective communication
	4	Ethical and professional awareness
	5	Teamwork