DOCTOR OF PHILOSOPHY PROGRAM IN **COMPUTER SCIENCE**

- FACULTY OF SCIENCE

DOCTOR OF PHILOSOPHY PROGRAM IN COMPUTER SCIENCE

Computer Science has come a long way from desktop machine or mainframes, and nowadays is embedded in most everything including smart phones, smart cars and smart home appliances, especially significant in innovative medical equipments.

As the most important applied science in national development, individuals are enabled to access all new knowledge in a borderless fashion, so as to catch up with up-to-date developments. Consequently, academic advancements are possible on a continuous basis.

Objectives

Desirable characteristics of graduates are as follows:

- Moral and professionally ethical
- Endowed with both leadership and followership capable of working as a responsible team member
- Mastering in-depth principles and theories in Computer Science
- Keen in analytical thinking and able to apply at work effectively
- Competent in advanced research skills in Computer Science
- Creative, good at quantitative analysis
- Exemplary in state-of-the-art IT communications in both Thai and English languages

Admission

In accordance with the Graduate School Rules and Regulations. The program committee reserves the rights to require more qualifications as deemed appropriate.

Medium of Instruction

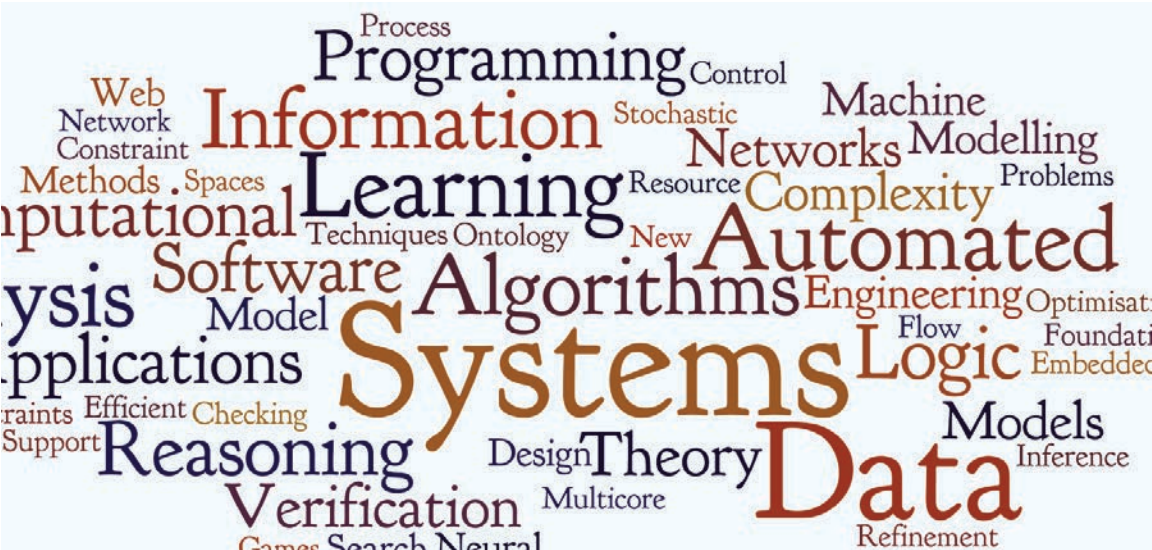
Thai and English

Research Focus

- Bioinformatics
- Intelligent Systems
- Knowledge Representation and Reasoning
- Machine Learning

Requirement for Graduation

In accordance with the Graduate School Rules and Regulations.



Doctor of Philosophy Program in **Computer Science**

■ FACULTY OF SCIENCE

Structure of the Program

1. Credit Requirements. *

Requirements	Option 1.1	Option 2.1	Option 2.2
Coursework	-	12	24
Core Courses	-	6	18
Electives	-	6	6
Required Non-credit Courses	4	4	7
Dissertation	48	36	48
Total	**48**	**48**	**72**

* Minimum credits required.

2. Core Courses

Requirements	Option 1.1		Option 2.1		Option 2.2	
	Course No.	Credits	Course No.	Credits	Course No.	Credits
Advanced Analysis of Algorithms	-	-	254611	3	254611	3
Advanced Computer Architecture	-	-	254621	3	254621	3
Theory of Computation and Algorithms	-	-	-	-	254511	3
Principles of Computer Architecture	-	-	-	-	254521	3
Principles of Operating Systems	-	-	-	-	254522	3
Computer Security and Cryptography	-	-	-	-	254524	3
Total	**0**	**0**	**0**	**6**	**0**	**18**

3. Electives

Requirements	Option 1.1		Option 2.1		Option 2.2	
	Course No.	Credits	Course No.	Credits	Course No.	Credits
Advanced Software Engineering	-	-	254632	3	254632	3
Advanced Multimedia System	-	-	254635	3	254635	3
Web Modeling	-	-	254641	3	254641	3
Advanced Topics in Network Security	-	-	254644	3	254644	3
Ontology Methodology and Engineering	-	-	254652	3	254652	3
Artificial Intelligence and Application	-	-	254653	3	254653	3
Special Topics in Data Mining Applications	-	-	254654	3	254654	3
Advanceed Machine Learning	-	-	254658	3	254658	3
Special Topics in Computer Science	-	-	254661	3	254661	3
Total	-	-	9	≥6	9	≥6

4. Required Non-credit Courses.

Requirements	Option 1.1		Option 2.1		Option 2.2	
	Course No.	Credits	Course No.	Credits	Course No.	Credits
Seminar I	254691	1	254691	1	254691	1
Seminar II	254692	1	254692	1	254692	1
Seminar III	254693	1	254693	1	254693	1
Seminar IV	254694	1	254694	1	254694	1
Research Methodology in Science and Technology	-	-	-	-	254593	3
Total	-	4	-	4	-	7

5. Dissertation Credit Requirements.

Requirements	Option 1.1		Option 2.1		Option 2.2	
	Course No.	Credits	Course No.	Credits	Course No.	Credits
Dissertation I, Type 1.1	254671	8	-	-	-	-
Dissertation II, Type 1.1	254672	8	-	-	-	-
Dissertation III, Type 1.1	254673	8	-	-	-	-
Dissertation IV, Type 1.1	254674	8	-	-	-	-
Dissertation V, Type 1.1	254675	8	-	-	-	-
Dissertation VI, Type 1.1	254676	8	-	-	-	-
Dissertation I, Type 2.1	-	-	254695	9	-	-
Dissertation II, Type 2.1	-	-	254696	9	-	-
Dissertation III, Type 2.1	-	-	254697	9	-	-
Dissertation IV, Type 2.1	-	-	254698	9	-	-
Dissertation I, Type 2.2	-	-	-	-	254681	8
Dissertation II, Type 2.2	-	-	-	-	254682	8
Dissertation III, Type 2.2	-	-	-	-	254683	8
Dissertation IV, Type 2.2	-	-	-	-	254684	8
Dissertation V, Type 2.2	-	-	-	-	254685	8
Dissertation VI, Type 2.2	-	-	-	-	254686	8
Total	**-**	**48**	**5**	**36**	**6**	**48**

Course Descriptions

254511 Theory of Computation and Algorithms 3(3-0-6)

A study of the following: finite state concept; acceptors; regular expressions; closure properties; sequential machine and finite state transducers; state minimization; formal grammars; computability and Turing machines; basic techniques used in the design and analysis of algorithms including divide and conquer, greedy methods, dynamic programming, and search techniques; and introduction to NP-complete and NP-hard problems.

254521 Principles of Computer Architecture 3(3-0-6)

Fundamental computer design, optimization, and trade-offs; topics include: models of computation, embedded systems, high performance processors, pipelined machines, RISC processors, VLIW, superscalar, multiple processors, multi-cores, power consumption, and performance evaluation.

254522 Principles of Operating Systems 3(3-0-6)

Fundamental concepts in operating systems, sequential processes and concurrent processes, process management, memory management, intercrosses communication, storage management, and distributed systems.

254524 Computer Security and Cryptology 3(3-0-6)

The three aspects of computer security: confidentiality, integrity, and availability; cryptography; access control; authentication; trusted computing and current biometric technology; an examination of the role and application of cryptography and the mechanisms used to implement security policies; reading papers from the security literature and applying them to material given in the lectures.

252593 Research Methodology in Science and Technology 3(3-0-6)

The research process, problem identification, data collecting methods, data analysis techniques, writing proposals and reports, technical evaluation, and research ethics.

254611 Advanced Analysis of Algorithms 3(3-0-6)

An explanation of the concepts and techniques in the design and evaluation of algorithms in several areas from an analytical perspective rather than an implementation perspective; comparative discussion of the complexity and efficiency of various algorithms with respect to space and run-time requirements including the following topics: models of computation, basic and advanced data structure, algorithms for graph theory, algebra, geometry, text processing, algorithms on non-sequential models, dynamic programming, and approximation algorithms.

254621 Advanced Computer Architecture 3(3-0-6)

Qualitative and quantitative examination of computer design trade-offs with the goal of developing an understanding of cutting-edge research in computer architecture covering the following topics: advanced processor designs, such as superscalar and out-of-order execution; advanced memory systems, such as non-blocking caches and multi-porting/banking and alternative virtual memory implementations; I/O systems; interconnects; multiprocessor/multi-core architectures; performance and cost metrics; and benchmarking.

254632 Advanced Software Engineering 3(3-0-6)

A study of the following aspects of software: software process models, software development methodologies, software project management, software quality measurement and metrics, software modeling techniques, software verification and validation, configuration management, testing techniques, and quality assurance.

254635 Advanced Multimedia Systems 3(3-0-6)

Multimedia data storage (text, audio, image and video), perception and recognition theory, multimedia data processing and encryption, multimedia representation techniques via the WWW, advanced multimedia systems, and research topics about multimedia systems.

254641 Web Modeling 3(3-0-6)

WWW technologies, text analysis, advanced crawling techniques, modeling and understanding human behavior on the web, commerce on the web, and models and applications.

254644 Advanced Topics in Network Security 3(3-0-6)

Computer network protocol analysis with emphasis on TCP/IP networks; vulnerability analysis; various types of network vulnerabilities and their exploits; buffer overflow attack; SQL and common injection; IP, DNS, and ARP spoofing; flooding; wireless network security; and reviews of both real systems and research articles in the area of network security.

254652 Ontology Methodology and Engineering 3(3-0-6)

The ontology development process; the ontology life cycle; methods and methodology for building ontologies, tool suites, and the languages that support them; an overview of the concepts and theoretical foundations of ontologies and their relationship with knowledge bases including developing ontology and uses of ontologies for the Semantic Web.

254653 Artificial Intelligence and its Application 3(3-0-6)

The intelligence development process, concepts of artificial intelligence, machine learning, game playing, problem solving and searches, knowledge representation, natural language processing, pattern recognition, and intelligent systems, expert systems, and applications.

254654 Special Topics in Data Mining 3(3-0-6)

The interdisciplinary applications of data mining selected from the following: web and text data mining, bioinformatics and /or intelligence analysis, and analysis in depth using state of the art techniques in the application of data mining.

254658 Advanced Machine Learning 3(3-0-6)

Principle of the three main styles of learning: supervised, unsupervised, and reinforcement; applications of machine learning applicable to particular domain problems; topics of interest; and specialised areas and new developments in machine learning.

254661 Special Topics in Computer Science 3(3-0-6)

A special area of study in computer science which is chosen by the instructor and which may differ each time.

254671 Dissertation 1, Option 1.1 8 Credits

Undertaking a literature review of various data bases comprising fundamental knowledge and research articles on topics related to computer science tailored to the interests and capabilities of each individual student under the guidance of an advisor.

254672 Dissertation 2, Option 1.1 8 Credits

Compilation of further information and the allocation of frameworks and guidelines for research under the guidance of an advisor.

254673 Dissertation 3, Option 1.1 8 Credits

Conducting research within allocated frameworks and guidelines under the guidance of an advisor.

254674 Dissertation 4, Option 1.1 8 Credits

Conducting research within allocated frameworks and guidelines under the guidance of an advisor.

254675 Dissertation 4-5, Option 1.1 8 Credits

Reviewing the research and writing research articles suitable for publication in a national or international journal under the guidance of an advisor.

254676 Dissertation 6, Option 1.1 8 Credits

Writing the final dissertation report, preparing for and completing the dissertation defense, making any changes or modifications recommended (if any), and submitting a summary of the dissertation results to the program committee.

254681 Dissertation 1, Option 2.2 8 Credits

Undertaking a literature review of various data bases comprising fundamental knowledge and research articles on topics related to computer science tailored to the interests and capabilities of each individual student under the guidance of an advisor.

254682 Dissertation 2, Option 2.2 8 Credits

Compilation of further information and the allocation of frameworks and guidelines for research under the guidance of an advisor.

254683 Dissertation 3, Option 2.2 8 Credits

Conducting research within allocated frameworks and guidelines under the guidance of an advisor.

254684 Dissertation 4, Option 2.2 8 Credits

Conducting research within allocated frameworks and guidelines under the guidance of an advisor.

254685 Dissertation 5, Option 2.2 8 Credits

Reviewing the research and writing research articles suitable for publication in a national or international journal under the guidance of an advisor.

254686 Dissertation 6, Option 2.2 8 Credits

Writing the final dissertation report, preparing for and completing the dissertation defense, making any changes or modifications recommended (if any), and submitting a summary of the dissertation results to the program committee.

254695 Dissertation 1, Option 2.1 9 Credits

Undertaking a literature review of various data bases comprising fundamental knowledge and research articles on topics related to computer science tailored to the interests and capabilities of each individual student under the guidance of an advisor.

254696 Dissertation 2, Option 2.1 9 Credits

Compilation of further information and the allocation of frameworks and guidelines for research under the guidance of an advisor.

254697 Dissertation 3, Option 2.1 9 Credits

Conducting research within allocated frameworks and guidelines and writing research articles suitable for publication in a national or international journal under the guidance of an advisor.

254698 Dissertation 4, Option 2.1 9 Credits

Writing the final dissertation report, preparing for and completing the dissertation defense, making any changes or modifications recommended (if any), and submitting a summary of the dissertation results to the program committee.

254691 Seminar 1 1(0-2-1)

Student description of the following: meanings, characteristics, objectives, categories, and processes of research methodology; literature reviews; discussion of concepts and theories of topics of interest; and presentation and discussion of papers under the guidance of a supervisor.

254692 Seminar 2 1(1-2-0)

Critique of academic research, exchange of ideas on interesting issues, and presentation and discussion of papers under the guidance of a supervisor.

254693 Seminar 3 1(1-2-0)

Presenting and discussing ideas about proposed publications.

254694 Seminar 4 1(1-2-0)

Presenting and discussing ideas about proposed publications relevant to the student's dissertation.