Doctor of Philosophy Program in Computer Science (International Program)

In reviewing process, the subjects will be slightly adapted

Clarification of the code

Example 3((3)-0-6)

Number of credit((lecture hrs*)-lab hrs*-self-study hrs*)

*hrs per week

344-711 Design and Analysis of Algorithms 3(3-0-6)

Advanced data structures; graph algorithms; arithmetic algorithms; geometric algorithms; string problems; parallel algorithms; NP-completeness

344-712 Cryptography 3(3-0-6)

Principles of security and the need of security; threats and attacks; current applied cryptography; cryptosystem; cryptanalysis; number theory; classical encryption schemes; symmetric-key cryptography; asymmetric-key cryptography; message authentication and hash function; digital signature; pairing-based cryptography; cryptography in the cloud; applications in advanced research

344-713 Evolutionary Algorithm 3(3-0-6)

Evolutionary algorithm; genetic algorithm; genetic programming; multiobjective evolutionary algorithm

344-721 Computer Systems Organization 3(3-0-6)

Computer systems analysis and design; organizational dependence on computations; speed and cost; instruction set architecture; instruction set design; pipeline and vector machines; memory hierarchy design; operating systems

344-722 Theory of Operating Systems 3(3-0-6)

Protection; communication and synchronization in distributed systems; distributed file systems; deadlock theory; virtual memory theory; uniprocessor and multiprocessor thread management

344-731 Advanced Computer Networks 3(3-0-6)

Computer networks protocols; hardware elements; software algorithms; error handling; routing; flow control; host-to-host communication and local area networks and advanced network problem solving

344-741 Programming Language Design 3(3-0-6)
Language constructs; extensibility and abstractions; runtime support; language design process

344-742 Object-Oriented Analysis and Design 3(3-0-6)
Object-oriented model; software requirement analysis; object-oriented analysis approaches, dynamic and static modeling; software architecture; object-oriented software architecture design; research seminar

344-743 Advanced Programming Technique for Embedded System 3(3-0-6)
Embedded system; smart object; embedded operating system development; embedded operating system customization; performance optimization; high definition multimedia handling for embedded system

344-751 Software Methodology 3(3-0-6)
รากฐานของวิศวกรรมซอฟต_แวร_ การแทนอย_างมีแบบแผนในกระบวนการซอฟต_แวร_ การใชJความมีแบบแผนในการสรJางสิ่งแวดลJอมการทำงานที่มีการวัดและกำหนดโครงสรJาง
Software engineering foundation; formal representations in the software process; using formalism in creating a measured and structured working environment

344-761 Database Systems Concepts and Design 3(3-0-6)
Advanced data modeling; deductive databases; object-oriented databases; distributed and multidatabases systems; emerging database technology

344-762 Data Science 3(3-0-6)
Data science process; exploratory data analysis; data cleaning; supervised learning; unsupervised learning; data visualization; recommender systems, big data; data science and ethical issues

344-763 Networks Analytics 3(3-0-6)
Models and algorithms networks; methods of measuring the importance or centrality of a node and a link in a network; influence and community detection; concept of connectivity; the evolution of networks over time; models of network generation; concepts and tools; basic graph theory

344-764 Data Warehousing and Data Mining **3(3-0-6)**

Data warehousing concepts and architecture; multidimensional data model; types of data warehouses and data warehouse design; data integration concepts, processes, and techniques; data warehousing tools and technology; development of data cube technology; data mining

344-765 Information Learning and Retrieval **3(3-0-6)**

Text-based information retrieval; boolean retrieval; index construction; term weighting; vector space model; evaluation in information retrieval; information retrieval techniques for the web; document classification; vector space classification; machine learning on documents

344-771 Artificial Intelligence and Problem Solving **3(3-0-6)**

Advanced techniques for symbolic processing; knowledge engineering; uncertainty representation and management; learning agents; advanced problem solving in artificial intelligence

344-772 Artificial Neural Networks **3(3-0-6)**

Elementary principles of neurophysiology; artificial neural models; single and multiple layer networks; cascade correlation; recurrent networks; selforganizing maps; bidirectional assorciative memory; counterpropagation networks; adaptive resonance theory; spatiotemporal sequences; deep learning; hardware realization of neural networks; fault tolerant design aspects

344-773 Machine Learning **3(3-0-6)**

Concepts, theories, and goals of machine learning; supervised learning; artificial neural networks, support vector machines, kernel methods; unsupervised learning; clustering, dimensionality reduction, deep learning, reinforcement learning, adaptive control; applying learning theories to solve the advanced problems

344-774 Scientific Visualization **3(3-0-6)**

การศึกษาแบบจำลองทางกายภาพ วิธีต_างๆ ในวิทยาการคณนา แบบขอมูลสองและ
Study of physical models; methods of computational science; two and three dimensional data types; visual representation schemes for scalar; vector and sensor data; isosurface and volume visualization methods; visual monitoring; interactive steering

344-775 Image Processing and Computer Vision **3(3-0-6)**

Signal and image processing; image enhancement; image filtering in time and frequency domain; geometric transformation; image segmentation; visual perception; object representation; pattern recognition

344-781 Formal Languages and Computation Complexity **3(3-0-6)**

Finite automata and regular languages; pushdown automata and context-free languages; turing machines and recursively enumerable sets; linearbounded automata and context-sensitive languages; computability and halting problems; undecidable problems; recursive functions; Chomsky hierarchy; computational complexity

344-782 Numerical Analysis and Applications **3(3-0-6)**

Linear systems; approximation of eigenvalues and eigenvectors; numerical methods for ordinary and partial differential equations; optimization methods and approximation theory; Monte Carlo methods and simulation

344-783 Advanced Discrete Mathematics **3(3-0-6)**

Combinatorial analysis; discrete structures; algorithmic thinking; applications in Science and Computer Science

344-784 Design of Fault-tolerant Digital Systems **3(3-0-6)**

Fault models; coding in computer systems; module and system level fault detection mechanism; reconfiguration techniques in multiprocessor system and VLSI processor arrays; software fault tolerance techniques; survey of practical fault-tolerant systems

344-785 Theory of High-speed Parallel Computation **3(3-0-6)**

Theoretical and practical aspects of parallel and pipeline computation; time and processor bounds on classes of computations; data alignment network speed and cost bounds; conflict-free access memories; overall computer system idea

344-791 Thesis Seminar I **1(0-2-1)**

Topic on current issue in computer science and related to thesis

344-792 Thesis Seminar II **1(0-2-1)**

Topic on current issue in computer science and related to thesis

344-793 Research Methodology **2(2-0-4)**

Role and importance of research; types of research; research in other discipline; research in computer science and its methods; generic research methods; research and experimental design; statistical methods for research; software package for research; research evaluation and report writing; oral and poster presentation

344-811 Parallel Numerical Algorithms **3(3-0-6)**

Numerical algorithms for vector and parallel computers, parallel algorithms in numerical linear algebra; numerical handling for ordinary and partial differential equations; numerical optimization techniques

344-812 Multiagent Systems **3(3-0-6)**

Intelligent agents; multiagent interactions; mechanism design and efficient mechanism; game theory; protocols for multiagent resource allocation; negotiation in multiagent systems; multiagent technology and its applications in advanced researches

344-821 Computer Systems Analysis **3(3-0-6)**

Scheduling policies; paging algorithms; multiprogrammed resource management systems; queuing theory; analytical models of computer systems and application

344-822 Distributed Computer Systems **3(3-0-6)**

Distributed systems architecture; remote file access; messagebased systems; client-server paradigm; distributed algorithms; replication and consistency; concurrency control; models of distributed computation; distributed operating systems

344-841 Parallel Programming **3(3-0-6)**

Issues in design and development of parallel programs for various types of parallel computers; various programming models according to both machine types and application area; cost models; debugging and performance evaluation of parallel programs with actual application examples

344-851 Large Scale Software Project Management **3(3-0-6)**

Theoretical and practical aspects of large scale software project management; team programming; quality and productivity measurement with emphasis on practice of software planning; development of programming system product

344-891 Thesis Seminar III **3 1(0-2-1)**

Topic on current issue in computer science and related to thesis

344-892 Thesis Seminar IV **4 1(0-2-1)**

Topic on current issue in computer science and related to thesis

344-893 Special Topics in Computer Science I **3(3-0-6)**

Discussion on current research issues in computer science and related topics

344-894 Special Topics in Computer Science II **2(2-0-4)**

Discussion on current research issues in computer science and related topics

344-901 Thesis **36(0-108-0)**

Research study on the topic of interested fields available in the department under supervision of a faculty advisor; thesis overviews should be presented to the thesis committee regularly every semester; the thesis must be written in an appropriate format

344-902 Thesis **48(0-144-0)**

Research study on the topic of interested fields available in the department under supervision of a faculty advisor; thesis overviews should be presented to the thesis committee regularly every semester; the thesis must be written in an appropriate format

344-903 Thesis **72(0-216-0)**

Research study on the topic of interested fields available in the department under supervision of a faculty advisor; thesis overviews should be presented to the thesis committee regularly every semester; the thesis must be written in an appropriate format

344-991 Thesis Seminar V **1(0-2-1)**

Topic on current issue in computer science and related to thesis

344-992 Thesis Seminar VI **1(0-2-1)**

Topic on current issue in computer science and related to thesis