Ph.D. of Science Programme in Computer Science

Degree Designation Ph.D. (Computer Science)

Curriculum Structure	Plan 1.1	Plan 1.2	Plan 2.1	Plan 2.2
Required Courses	-	-	6	6
Elective Courses not less than	-	-	6	18
Thesis	48	72	36	48
Thesis Seminar	*6	*6	*6	*6
Research Methodology	*2	*2	*2	*2
Total	**48**	**72**	**48**	**72**

* = None Credit

Courses Description

Plan 1.1

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

Plan 1.2

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

Plan 2.1

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

Plan 2.2

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

Required Courses (Ph.D. Computer Science)

Required Courses		Credit
344-711	**Design and Analysis of Algorithms** Advanced data structures; graph algorithms; arithmetic algorithms; geometric algorithms; string problems; parallel algorithms; NP-completeness	3(3-0-6)
344-721	**Computer Systems Organization** Computer systems analysis and design; organizational dependence on computations; speed and cost; instruct set design; pipeline and vector machines; memory hierarchy design ; systolic machines	3(3-0-6)

Elective Course (Ph.D. Computer Science)

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

Elective Courses		Credit
344-761	**Database Systems** Advanced data modeling; deductive databases; object-oriented databases; distributed and multidatabases systems; emerging database technology	**3(3-0-6)**
344-781	**Formal Languages and Computation Complexity** Finite automata and regular languages; pushdown automata and context-free languages; turing machines and recursively enumerable sets; linear- bounded automata and context-sensitive languages; computability and halting problems; undecidable problems; recursive functions; Chomsky hierarchy; Computational complexity	**3(3-0-6)**
344-782	**Numerical Analysis and Applications** 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	**3(3-0-6)**
344-783	**Advanced Discrete Mathematics** Combinatorial analysis; discrete structures; algorithmic thinking; applications in Science and Computer Science	**3(3-0-6)**
344-722	**Theory of Operating Systems** Protection; communication and synchronization in distributed systems; distributed file systems; deadlock theory; virtual memory theory; uniprocessor and multiprocessor thread management	**3(3-0-6)**
344-731	**Computer Networks** Computer networks protocols; hardware elements; software algorithms; error handling; routing; flow control; host-to-host communication and local area networks	**3(3-0-6)**
344-742	**Object-Oriented Design** Object-oriented data modeling ; language integration; object algebras; extensibility; transactions; object managers; versioning and configuration; active data; research seminar	**3(3-0-6)**

Elective Courses		Credit
344-751	**Software Methodology** Software engineering foundation; formal representation in the software process; use of formalism in creating a measured and structured working environment	**3(3-0-6)**
344-711	**Artificial Neural Networks** Elementary principles of neurophysiology; artificial neuron models; single and multiple layer networks; cascade correlation; recurrent networks; self-organizing maps; bidirectional assorciative memory; counterpropagation networks; adaptive resonance theory; spatiotemporal sequences; hardware realization of neuron networks; fault tolerant design aspects	**3(3-0-6)**
344-772	**Scientific Visualization** 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	**3(3-0-6)**
344-784	**Design of Fault-Tolerant Digital Systems** 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	**3(3-0-6)**
344-785	**Theory of High-Speed Parallel Computation** 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	**3(3-0-6)**
344-811	**Parallel Numerical Algorithms** Numerical algorithms for vector and parallel computers, parallel algorithms in numerical linear algebra; numerical handling for ordinary and partial differential equations; numerical optimization techniques	**3(3-0-6)**

Elective Courses		Credit
344-821	**Computer Systems Analysis** Scheduling policies; paging algorithms; multiprogrammed resource management systems; queuing theory; analytical models of computer systems and application	**3(3-0-6)**
344-822	**Distributed Computer Systems** Distributed systems architecture; remote file access; message-based systems; client server paradigm; distributed algorithms; replication and consistency; concurrency control; models of distributed computation; distributed operation systems	**3(3-0-6)**
344-841	**Parallel Programming** Issues in design and development of parallel programs for various types of parallel computer; various programming models according to both machine types and application area; cost models; debugging and performance evaluation of parallel programs with actual application examples	**3(3-0-6)**
344-851	**Large Scale Software Project Management** 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	**3(3-0-6)**
344-893	**Special Topics in Computer Science I** Discussion on current research issues in computer science and related topics	**3(3-0-6)**
344-894	**Special Topics in Computer Science II** Discussion on current research issues in computer science and related topics	**3(3-0-6)**
344-895	**Special Topics in Computer Science III** Discussion on current research issues in computer science and related topics	**3(3-0-6)**

Elective Courses		Credit
344-896	**Special Topics in Computer Science IV** Discussion on current research issues in computer science and related topics	3(3-0-6)
344-897	**Special Topics in Computer Science V** Discussion on current research issues in computer science and related topics	3(3-0-6)
344-898	**Special Topics in Computer Science VI** Discussion on current research issues in computer science and related topics	3(3-0-6)

Thesis Seminar

Thesis Seminar		Credit
344-791	**Thesis Seminar I** Topic on current issue in computer science and related to thesis	1(0-2-1)
344-792	**Thesis Seminar II** Topic on current issue in computer science and related to thesis	1(0-2-1)
344-891	**Thesis Seminar III** Topic on current issue in computer science and related to thesis	1(0-2-1)
344-892	**Thesis Seminar IV** Topic on current issue in computer science and related to thesis	1(0-2-1)
344-991	**Thesis Seminar V** Topic on current issue in computer science and related to thesis	1(0-2-1)
344-992	**Thesis Seminar VI** Topic on current issue in computer science and related to thesis	1(0-2-1)

Research Methodology

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