SC 1181	Computer Programming I	3 credits

A study of the history of computer, the components of a computer system, coding and numbering systems, algorithm and development process of algorithms and expression of algorithms in terms of flowchart and pseudo code. The course also include the implementation of algorithms using one of the high level languages that are used widely in the industry by emphasizing on the nature and structure of the language, techniques of programming for both numerical and non-numerical processing. Thus students will gain the knowledge of the structure of the programming languages and how to develop structured programming.

SC 2151	Introduction to Microcomputer Applications	3 credits
	(Non-Science and Technology student only)	

A study of the structure and characteristics of microcomputers, and the techniques of applying microcomputer technology. The study will focus on software packages such as, word processing, spreadsheet, database management systems, etc. The course will cover current technologies as well as future trends.

SC 2182	Computer Programming II	3 credits
Prerequisite:	SC 1181 Computer Programming I	

A study of the algorithms development to solve more complex problems, the analysis of more complicated programs as well as the modification of the programs. Main topics include string processing, searching and sorting algorithms, and abstract data types such as linked list, stack, and queue. The course also include the study of a second high level language which will be widely used in the further courses by emphasizing the characteristics on the structured programming and modular programming. Students will learn to apply the basic data structures and algorithms to solve various complicated problems.

SC 2210	Files Organization	3 credits
Prerequisite:	SC2182 Computer Programming II	

Study of characteristics of computer files and mass storage media, operations on files, file organization and access methods: sequential, indexed-sequential, direct, extendible hashing, B-trees. Design of file management systems including with exercises in C++ or other high-level language.

SC 2211	Data Structures and Algorithms	3 credits
Prerequisite:	SC 2182 Computer Programming II	

A study of the analysis of complexity of algorithms, various data structures including array, string, stack, queue, dequeue, tree, graph, set and heap. The course also emphasize on the applications and analysis of algorithms developed employing the data structures mentioned above including time and memory requirement analysis of various searching and sorting algorithms.

SC 2212	Database Systems	3 credits
Prerequisites:	SC 2210 Files Organization and SC 2211 Data Structures and Algorithms	

A detailed study of database systems and database management, type of database systems emphasizing on relational database. The main topics will include functional dependency, normalization, query optimization, integrity and security of database systems, and concurrency control.

SC 2220	Computer Organization	3 credits
Prerequisite:	SC 2182 Computer Programming II	

A study of the computer systems configuration which include the functions of the components of CPU, emphasize given on ALU, CU and registers, memory unit and devices as well as the connection of each component by the system bus. The course also include the study of binary representation of various data types and machine instructions, microcodes, fundamentals of system programs such as linking, loading and execution of programs, assembly language programming.

SC 2231	Mathematics Foundation for Computer Science	3 credits

A Study of discrete mathematics as the basis of computer science. Topics include set theory, relation and function, recursive functions, logic and logical proving, mathematical reasoning, graph theory, tree, algebraic structure, probability, model of computation and automata.

SC 2232	Advanced Programming	3 credits
Prerequisite :	SC 2182 Computer Programming II	

A Study of practical software development to solve more complex problems, the analysis of more complicated programs as well as the implementation of the programs. This course emphasizes on practical programming. The computer science students have to pass the practical programming examination in order to fulfill the requirement of this course.

SC 3210	Programming Languages	3 credits
Prerequisite:	SC 2211 Data Structures and Algorithms	

A study of the computer programming languages on comparative basis with special consideration on syntax, semantics, and implementation, emphasizing the suitability of programming languages for various data manipulations and situations. The topics include exception handling, subroutines, visibility rules, concurrency and memory management.

SC 3211	Operating Systems	3 credits

Prerequisite:	SC 2220 Computer Organization

A study of component and functions of operating systems. Topics include uniprogramming, multi-programming, multitasking, multithreading, resource management functions of operating systems, process scheduling algorithms, device management algorithms, virtual memory management, and classical problems related to operating systems such as deadlock, starvation and concurrency.

SC 3220	Computer Architecture	3 credits
Prerequisite:	SC 2220 Computer Organization	

A study of computer system components, combinatory circuits, sequential circuits, micro-operations using flip-flop, registers, adder, and counter, computational operations and control of micro-operations. The course also involves the design of memory unit, design of set of instructions, design of parallel processing as well as SISD, SIMD, MISD, and MIMD architectures.

SC 3230	Theory of Computation	3 credits
Prerequisite:	SC 2231 Mathematics Foundation for Computer Science	

A study of methods of computation. Topics include sequential computation, parallel computation, logic circuits, finite-state machine, deterministic and non-deterministic machine, regular and non-regular set, push-down automata, Turing machine, computability and non-computability, halting problem, and example of class P and class NP problems. This course emphasize on the theories and proving techniques for various computational problems which are the basis of computer science.

SC 3231	Algorithms Design	3 credits
Prerequisites:	SC 2231 Mathematics Foundation for Computer Science	
	SC 2230 Discrete Structure	

A study of techniques for designing algorithms using divide and conquer, greedy method, dynamic programming and backtracking by emphasizing analysis of efficiency. The course also emphasizes on the design techniques for NP problem domain.

SC 3320	Digital System Design	3 credits
Prerequisite:	SC 2220 Computer Organization	

A study of use of Boolean functions in designing the combinatory and sequential circuits, flip-flop, counter, and registers, integrated circuits, Large Scale Integration (LSI), Very Large Scale Integration (VLSI), the design of various types of circuits used in computer systems such as adder, subtractor, multiplier, and divider circuits as well as other appropriate circuits.

SC 3351	Computer Networks	3 credits
Prerequisite:	SC 2220 Computer Organization	

A study of basic knowledge of computer network, data communication, transmission media, and communication devices, fundamentals of network design, network topology, multi-layer protocols, routing machines, circuit switching, packet switching, and message switching, case studies of computer networks such as ARPAnet, and Local Area Network.

SC 4299	Senior Projects	3 credits

Prerequisite:	fourth-year student status with at least 100 credits completed

Each student group must do a specific project in which students apply the knowledge acquired to design and develop a concrete program or system. The students must analyze the problem, define the solution and design the system using the various computer science concepts. The advisor whom the students selected will guide throughout the course of project development. The students must give presentation which include oral examination.

SC 4310	Software Engineering	3 credits
Prerequisite:	SC 2182 Computer Programming II	

A study of software life cycle, analysis of requirements, structured software design, development, implementation, testing, and maintenance of software, reusable software, documentation and software manuals, and software project management.

SC 4311	Computer Graphics	3 credits
Prerequisite:	SC 2211 Data Structures and Algorithms	

A study of fundamental concepts of graphics construction using computer, data structure for computer graphic and techniques for creating, storing, transformation, translation, rotation, clipping, and animation. The students will have opportunities to use commercial graphics packages and use high-level languages such as Pascal, FORTRAN, or C to write computer graphics programs.

SC 4312	Compiler Construction	3 credits
Prerequisite:	SC 2211 Data Structures and Algorithms	

A study of structure of compilers, steps of execution of compiler, symbol table, lexical analysis, semantic analysis, internal forms for a program, run time storage management, code optimization. Students are required to write implement simple compilers or portion of compilers such as parser.

SC 4320	Introduction to Microprocessors	3 credits
Prerequisite:	SC 3320 Digital System Design	

Introduction to microprocessor technology, evolution of microprocessor, microprocessor architecture and functions. The course also involves the study of typical 8, 16, and 32 bit microprocessors as well as different kinds of commercially available microprocessors.

SC 4321	VLSI Technology	3 credits
Prerequisite:	SC 3320 Digital System Design	

A study of Very Large Scale Integration circuits and different design techniques including automatic design method, discussion of the impact of VLSI technologies in computer systems.

SC 4331	Formal Languages and Automata	3 credits
Prerequisite:	SC 3230 Theory of Computation	

A study of fundamental mathematical theories related to languages and grammars. The topics include deterministic and non-deterministic finite automata, pushdown automata, linear bounded automata, Turing machines, regular languages, context-free languages, context-sensitive languages, recursive languages, closure problems of languages, concepts of effectiveness, undecidability and computational complexity.

SC 4332	Artificial Intelligence Concepts	3 credits
Prerequisite:	SC 2182 Computer Programming II	

A study of the fundamental concepts in AI and its purpose as well as different disciplines in the field. The topics include mathematical theorem proving, natural language processing, image processing, robotics, expert system and various techniques used in knowledge representation, searching, induction and heuristic algorithms. Case studies related to specific AI applications including expert system, language translation, voice processing, and others will be introduced. The course also emphasizes on the use of popular programming languages such as Prolog and LISP to solve AI related problems.

SC 4333	Systems Analysis and Design	3 credits

A study of the roles and importance of information system in organizational structure with regard to strategic planning and decision making, relationship among different information systems within an organization and the role of computer systems in information system. The course also discusses various computer technologies which can be used to implement information systems as well as efficient management of information system to meet the various needs of different level of organizational hierarchy.

SC 4352	Image Processing	3 credits
Prerequisite:	SC 2211 Data Structures and Algorithms or IT 2230 Information Structures	

Introduction to digital image processing including such topics as digital image representation, compression techniques, coding techniques, analysis of images represented in different formats, as well as optical character recognition techniques based on image processing to recognize Thai and English alphabetic.

SC 4353	Introduction to Virtual Reality	3 credits
Prerequisite:	Senior Students	

A study of virtual reality technology and its applications, including the algorithms to create the virtual environment, and algorithms used in geometric modeling, transformation, collision detection, texture mapping, lighting and shading, animation and physical simulation. Topics on various areas of VR Applications and peripherals will also be featured. The course includes laboratory training in order to give students a good opportunity to experiment with virtual reality software and enable them to create their own virtual reality applications for future uses.

SC 4370	Object-Oriented Concepts	3 credits
Prerequisite:	SC 2182 Computer Programming II	

A study of different software development methods, emphasizing on object oriented methods. A fundamental concepts of object oriented programming is introduced. Topics include inheritance, polymorphism, encapsulation, object oriented programming tools, class libraries, and application development using object oriented concept, analysis and design of object-oriented data architecture.

SC 4371	Selected Computer Language	3 credits
Prerequisite:	SC 2220 Computer Organization	

A study of and advanced computer programming language which is considered to be widely used in the software development industry.

SC 4372	System Programming	3 credits

Prerequisites:	SC 3220	Computer Architectures and
	SC 2211	Data Structures and Algorithms

A study of the characteristics of batch processing, compilation, linking, loading and execution of programs in relation to system libraries. Topics also include I/O subroutines, direct and indirect addressing methods, relocation of memory space, register addressing of operating systems, compilers, interpreters and database systems. The students are required to implement simple system program using assembly and/or C language.

SC 4390	Seminar in Computer Science	3 credits
Prerequisites:	Senior students with the consent at instructors	

Seminar of topics in advance or new technology in the field of computer science. An expert or professor in the specific field may be invited to be the lecturer. Each student must study some specific topics, make presentation and entertain questions from the others.

SC 4400 - 99	Selected Topics	3 credits
Prerequisite:	Senior students with the consent of instructors	

Special topics that the department and instructors think appropriate for students further develop-ment in study and research.