Descriptions of Courses

CS200 Introduction to Computer Science
This course provides students with an overall view of computer science. It introduces general concepts and widely used technical terms in operating systems, algorithms, assembly programming, software engineering, data structures, artificial intelligence, etc. in order to help students obtain a comprehensive view of computer science.

CS202 Problem Solving
This course is about methods for problem solving and algorithm development. Through various lab work, students learn good programming practice in design, coding, debugging, and documentation.

CS204 Discrete Mathematics
This course covers mathematical concepts that are frequently employed in computer science: sets, relations, propositional logic, predicative logic, graphs, trees, recurrences, recursion, and fundamental notions in abstract algebra such as groups and rings.

CS206 Data Structure
This course provides students with fundamental concepts in data structures and algorithms in a broad context of solving problems using computers.

CS211 Digital System and Lab
This course provides students with an understanding of digital systems as building blocks of modern digital computers. This course puts emphasis on providing students with hands-on experience on digital systems. The course includes both lecture and laboratory work on the topics of: boolean algebra, binary system, combinatorial logic, asynchronous sequential circuits, algorithmic state machine, asynchronous sequential circuits, VHDL, CAD tools and FPGAs.

CS220 Programming Principles
This course's goal is to provide students with programming principles and a good feel for the elements of style and the aesthetics of programming, which are necessary in controlling the intellectual complexity of large yet robust software systems. The covered topics include: induction and recursion, data abstraction and representation, values and applicative programming, objects and imperative programming, streams and demand-driven programming, modularity and hierarchy, exceptions and advanced control, and higher-order functions and continuations.

CS230 System Programming
This course's goal is to provide students with programming techniques necessary in dealing with "systems" development. The covered topics include low-level machine oriented programming, device-control programming, and other various programming techniques for computer operating environment.

CS300 Algorithms
This course introduces the basic concepts of design and analysis of computer algorithms: the basic principles and techniques of computational complexity (worst-case and average behavior, space usage, and lower bounds on the complexity of a problem), and algorithms for fundamental problems. It also introduces the areas of NP-completeness and parallel algorithms. (Prerequisite: CS204, CS206)

CS310 Embedded computer systems
Embedded systems are found everywhere. The goal of this course is to develop a comprehensive

understanding of the technologies behind the embedded computer systems, including hardware and software components. Students will gain hands-on experience in designing a embedded system using CAD tools and FPGAs. (Prerequisite: CS211)

CS311 Computer Organization

This course provides students with a basic understanding of computer organization and architecture. It is concerned mostly with the hardware aspects of computer systems: structural organization and hardware design of digital computer systems, underlying design principles and their impact on computer performance, and software impact on computer. (Prerequisite: CS211)

CS320 Programming Languages

This course provides students with the necessary underlying principles in the design and implementation of programming languages. Lectures use a variety of existing general-purpose programming languages from different programming paradigms: imperative, functional, logical, and object-oriented programming. (Prerequisite: CS220)

CS322 Formal Languages and Automata

This course covers various types of finite automata, properties of language classes recognizable by automata, context-free grammar, pushdown automata, the Turing machine, and computability. (Prerequisite: CS204)

CS330 Operating Systems and Lab.

In this course, students learn about basic concepts of operating systems, with an emphasis on multi-tasking, and time-sharing. We choose one specific operating system, and study in detail its organization and functions. Students are also required to program a simple operating system, and to develop performance improvement techniques.

CS350 Introduction to Software Engineering

This course provides students with basic concepts in software engineering in order to develop high-quality software economically. Key concepts are life cycle models, development techniques, automation tools, project management skills, and software metrics.

CS360 Introduction to Database

This is an introductory-level course to database systems. Students learn about various models, such as E-R models, relational models, and object-oriented models; query languages such as SQL, relational calculus, and QBE; and file and indexing systems for data storage. Advanced topics, such as data inheritance, database design issues, database security, and access rights, are also covered. (Prerequisite: CS206)

CS362 File Structures

The techniques of storing, maintaining, and accessing large databases to disk effectively is becoming very important. The file processing technique is a core technology that can be used for this purpose. This course introduces basic disk I/O concepts, blocking and buffering, and covers various file structures, such as sequential files, hash files, indexed sequential files, and multi-key files. Students are required to implement these file structures in programming languages such as C++ and build a simple DBMS.

CS370 Symbolic Programming

Students learn LISP and PROLOG, the two most commonly used programming languages in artificial intelligence. The basic programming concepts, grammar, and symbol manipulation are covered in the course. Using intelligent problem solving methods, students build natural language processing systems, database programs, pattern matching programs, learning programs, expert systems, etc.

CS402 Introduction to Logic for Computer Science

This course is about basics of logic used in computer programming. Topics covered in this course are: propositional calculus, predicate calculus, axiomatic theories, skolemization, unification, and resolution.

CS408 Computer Science Project

Students learn project management and large-system programming skills that are not usually covered in any single course. Students form teams, and execute one of project ideas suggested by a professor. The scope of the project must cover multiple areas in computer science and be of a magnitude sufficient for a team project.

CS410 Introduction to VLSI Design

Students learn about very large-scale VLSI chip design using nMOS technology. For basic design methodology, students study stix diagram and layout design; advanced topics like switch and gate logic, PLA's 2-phase clocking, design rules, floor planning, and design technique are covered.

CS420 Compiler Design

Through this course, students study basic rules and implementation considerations in implementing a programming language. More details on grammar checks for program syntax, implementation optimization, relations between programming languages and compilers, the role of interpreters, run-time systems, and semantically accurate expressions are also covered.

CS422 Computation Theory

This course deals with models of computation, computable and incomputable functions, temporal and spatial complexities, tractable and intractable functions.

CS440 Data Communication

This course covers basic principles in data communications, such as LAN, WAN, multimedia (e.g., voice and video) transmission. It introduces students to key elements and concepts in network construction. Compared to CS441, emphasis is placed on lower layer protocols and network topologies.

CS441 Introduction to Computer Network

The goal of this course is to provide undergraduate students with sound understanding of fundamental concepts and problems in networking and to train them in network programming. We will cover topics in the data link, networking, transport, and application layers.

CS455 Software Project

In this course, students develop programs of practical value, using basic software engineering techniques and software tools. Students are evaluated based on the team effort put into project documentation and development process management. Final deliverables are evaluated based on productivity and reliability.

CS470 Introduction to Artificial Intelligence

This course introduces basic concepts and design techniques of artificial intelligence, and later deals with knowledge representation and inference techniques. Students are to design, implement, and train knowledge-based systems.

CS480 Introduction to Computer Graphics

The goal of this course is for students to acquire theory and hands-on experience in computer graphics. Topics covered are: basic functions and principles of input and output devices used in computer graphics,

architectures and features of graphics systems, basic geometric models and their generation algorithms, theories and practice behind 2D and 3D conversion. Basic ideas of hidden line and surface removal and color models are introduced.

CS489 Computing Ethics and Social Issues
Computers have had a significant impact on our life, more so than any other machine before. In this course, we discuss social problems that computers have caused and ethical issues that challenge technical experts.

CS490 Research in Computer Science
Students work either alone or as a team to conduct a research project and present its results as a thesis. Students can join an advisor's research projects, or learn practical problem solving techniques, as well as research idea development, project management skills and technical writing.

CS492 Special Topics in Computer Science
The goal of this course is to expose undergraduate students to recent research problems and results in the selected area of research.

CS495 Individual Study
This course is to allow a student interested in a specific topic to work with faculty and conduct research in one's area of interest. At the beginning of a semester, a student must discuss a research topic with faculty, and submit a study plan. Any student, no matter what grade one is in, can take this course, and get up to 4 credits.

CS496 Seminar
Domestic and international researchers are invited to give talks on various topics and future directions in computer science and to get involved in discussion with students.

❒ Graduate Program

CS500 Design and Analysis of Algorithms
This course introduces basic techniques for the design and analysis of computer algorithms, such as divide-and-conquer, the greedy method, and dynamic programming. Students learn to reason algorithmically about problems arising in computer applications, and experience the practical aspects of implementing an abstract algorithm.

CS504 Computational Geometry
Computational geometry studies algorithms and data structures for processing and storing geometric objects. This courses discusses algorithm design techniques such as plane sweep and geometric divide & conquer; data structures such as point location structures, interval trees, segment trees, and BSP trees; and geometric structures such as arrangements, triangulations, Voronoi diagrams, and Delaunay triangulations.

CS510 Computer Architecture
This goal of this course is to provide the student with an understanding of (*i*) the architectural aspect of the performance issues, and (*ii*) investigation of the full spectrum of design alternatives and their trade-offs.

CS520 Theory of Programming Languages
This course reviews design principles and implementation techniques of various programming languages.

This course also introduces a wide spectrum of programming paradigms such as functional programming, logic programming, and object-oriented programming.

CS522 Theory of Formal Languages and Automata
This course is intended to understand the current theories of deterministic parsing of context-free grammars. Two basic parsing schemes, LR(k) and LL(k) parsing, are considered and the practical SLR(1) and LALR(1) techniques are discussed. The syntactic error recovery in LR-based parsing is also discussed.

CS530 Operating System
The main focus of this course is to understand the concurrency features of modern operating systems. Concurrent programming is dealt with in detail to simulate various parts of an OS. Other topics that are required to understand the process-oriented OS structure are also discussed.

CS540 Network Architecture
The goal of this course is to provide students with an understanding on the following topics. (1) the concept of layered architectures, (2) the design and implementation of communication protocols, (3) the multimedia communication protocol, and (4) the design of high-speed protocols. The course also covers many aspects of protocol engineering: design, implementation and test of communication protocols.

CS542 Internet Systems Technology
This course reviews the state-of-the-art of today's Internet and Web architectures, describes the challenges facing them, and discusses emerging approaches. In particular, the course covers issues around Internet traffic characterization; Protocols; Web server performance; Mobile Services and Systems, Server clustering; Caching architectures; Peer-to-peer service, Quality of Service (QoS) on the Web; and System support for E-commerce. The goal of the course is to gain understanding of the current research issues and a vision of the next generation Web architecture.

CS544 Information Security
The main objective of this course is to provide students with comprehensive knowledge of information security. The course helps students to build profound understanding of information security by teaching the fundamentals of information security, which include, but are not limited to: cipher, access control, protocol, and software engineering. The primary fous of the course is on the general concept of information security.

CS550 Software Engineering
This course covers fundamental concepts required in developing reliable softwares in a cost-effective manner.

CS560 Database System
This course addresses current technologies of various aspects of database systems. The main objective of this course is to study the design and implementation issues of high performance and high functionality database systems. Through this course, the students will have concrete concepts on database systems and will have in-depth knowledge on most issues of advanced database researches.

CS562 Database Design
The goal of this course is to establish a consistent framework for database design. Practical database design methodology, major principles, tools and analysis techniques for various phases of database design process are studied.

CS570 Artificial Intelligence
The goal of this course is to give both a comprehensive introduction to core concepts of AI and hands-on

experience in symbolic language programming. This course not only provides a thorough discussion of AI's foundational technologies including predicate calculus, search, and AI languages, but introduces processing, pattern recognition, computer vision, and neural networks.

CS574 Natural Language Processing I

As a typical application of symbolic AI machine translation (M.T) addresses the major issues involving computational linguistics, rules base, and more fundamentally knowledge representation and inference. In this regard, the goal of the course is to provide students with first-hand experience with a real AI problem. The topics include application of M.T., basic problems in M.T., and classical approaches to the problems.

CS576 Computer Vision

The goal of this course is to provide students with theory and application of computer vision. Major topics include digital image fundamentals, binary vision, gray-level vision, 3-D vision, motion detection and analysis, computer vision system hardware and architecture, CAD-based vision, knowledge-based vision, neural-network-based vision.

CS579 Computational Linguistics

This course focuses on universal models for languages, especially English and Korean. For computational study, issues on knowledge representation, generalized explanation on linguistic phenomena are discussed. When these models are applied to natural language processing, properties needed for computational models and their implementation methodologies are studied.

CS580 Interactive Computer Graphics

This course presents the principles of three-dimensional graphics, including geometric, modeling and realistic image synthesis. It also covers techniques for representing, manipulating, and rendering three-dimensional objects.

CS590 Semantic Web

"Semantic Web" allows machines to process and integrate Web resources intelligently. Beyond enabling quick and accurate web search, this technology may also allow the development of intelligent internet agents and facilitate communication between a multitude of heterogeneous web-accessible devices.

CS600 Graph Theory

This course is intended as a first course in graph theory. It covers the basic theory and applications of trees, networks, Euler graphs, Hamiltonian graphs, matchings, colorings, planar graphs, and network flow.

CS610 Parallel Processing

This course discusses both parallel software and parallel architectures. It starts with an overview of the basic foundations such as hardware technology, applications and, computational models. An overview of parallel software and their limitations is provided. Some existing parallel machines and proposed parallel architectures are also covered.

CS620 Theory of Compiler Construction

This course's goal is to expose students to some research issues in modern programming language implementation. Topics include conventional data-flow analysis techniques, semantics-based flow analysis, type inference, type-based program analysis, and garbage collection.

CS642 Distributed Processing Systems

This course covers various high-level issues in distributed processing. We also analyze ISO / OSI upper

layers (presentation, application layer protocols) and document switching systems.

CS644 Advanced Network Architecture
This course serves to provide a more complete understanding of network architecture. In particular, these topics are discussed: internet architecture, architecture components, and architectural implication of new technologies and non-technical issues. The course is composed of lectures, invited presentations and term projects.

CS650 Advanced Software Engineering
In this course, the fundamental concepts of object-orientation are covered from requirement analysis to implementation with various object-oriented methods including OMT, Booch method, and UML. In addition, several advanced topics in the field of object-orientation are also covered. These advanced topics include parallel and distributed object system, real-time issues, and so on.

CS655 System Modeling and Analysis
Today's information systems are getting more complex, and need for automation systems is ever increasing. In this course we address basic modelling methods in system analysis and study static and dynamic analysis of systems using Petri Nets.

CS660 Information Storage and Retrieval
This course covers content analysis and indexing, file organization and record classification for information storage, query formulation, retrieval models, search or selection process, and application systems on question-answering systems, on-line information services, library automation, and other information systems.

CS662 Distributed Database
The goal of this course is to study the theory, algorithms and methods that underlie distributed database management systems.

CS664 Advanced Database System
The goal of this course is to study the formal foundation of database systems. The course covers advanced topics such as deductive databases, relational database theory, fixed point theory, stratified negation, closed-world assumption, safety, multivalved dependency, generalized dependency and crash recovery.

CS670 Fuzzy and Intelligent System
The aim of this course is to introduce basic concepts and knowledge of the fuzzy theory and its applications. This course also covers some important intelligent systems including the neural network model and genetic algorithm, and the fusion of the different techniques will be discussed.

CS674 Natural Language Processing II
The goal of this course is to provide students with current topics in natural language processing (NLP). Students are expected to get acquainted with various leading-edge ideas and techniques in NLP.

CS676 Pattern Recognition
Through this course, students are expected to acquire general ideas of pattern recognition and its application. Three fields (character, speech and image processing) will be studied in which pattern recognition techniques can be successfully applied.

CS678 Intelligent Robotics
The goal of this course is to provide students with state-of-the-art technologies in intelligent robotics. Major

topics include sensing, path planning, and navigation, as well as artificial intelligence and neural networks for robotics.

CS682 Digital Storytelling
The need for a computational approach to storytelling is growing due to the digitalization of all media types - text, image, and sound. Regardless of media types, the story forms the underlying deep structure. This course is concerned with computational aspects of storytelling: building a computational model for storytelling, narrative design, and applications of the computational model to the Web, games, e-books, and animation. Students are expected to build a coherent perspective on designing, implementing, and analyzing digital media.

CS684 Human-Computer Interaction
This course discusses the basic and core concepts of HCI, namely, the way of interacting with the computerized environment. The course begins with issues related to humans, then broadens the discussion domain to society and culture. Based on basic studies on human, society and culture, we shall discuss the issues in designing, analyzing and implementing various interaction architectures.

CS700 Topics in Computation Theory
Students study recent papers or books in the area of Theory of Computation.

CS710 Topics in Computational Architecture
This course covers recently developed, new computer architectures. Students study and analyze new computational models, high-level languages, computer architectures etc.

CS712 Topics in Parallel Processing
In this course, students study parallel processing architectures, algorithms, and languages, especially their use in 5th generation computers. The course is based on recent papers, and can be seen as a continuation of Parallel Processing (CS610).

CS720 Topics in Programming Languages
This course covers recent research topics related to programming languages, such as theory, new paradigms, programming language design & implementation etc.

CS730 Topics in Operating Systems
The goal of this course is to develop abilities related to role and performance of operating systems. Students study and debate topics such as designing and implementing a new operating systems for a new environment, utilizing an existing operating systems effectively, OS architecture, ways of evaluating OS performance, file systems, threads, parallel operating systems, etc.

CS744 Topics in System Architecture
In this course, students learn about the structure of computer systems through individual projects and experiments related to user interfaces and object-oriented architectures.

CS750 Topics in Software Engineering
Students study advanced topics in software engineering, such as formal specification, reuse, software development environments, theory of testing, proving program correctness, etc.

CS760 Topics in Database System
In this course, students study and discuss recent developments and topics in database systems.

CS770 Topics in Computer Vision

This course consists of lectures about major topics related to computer vision, seminars, and projects. Recent major topics are motion detection and analysis, parallel computer vision systems, CAD-based 3-D vision, knowledge-based vision, neural network-based vision, etc.

CS772 Topics in Natural Language Processing

This course covers the theory of natural language processing and recent developments in practice. Students study the theory of language, parsing, situational semantics, belief models etc. They practice by designing and developing utilities and systems.

CS774 Topics in Artificial Intelligence

The goal of this course is to provide students with recent theory of AI and its application. It covers information representation. heuristic search, logic and logic language, robot planning, AI languages, expert system, distributed AI system, uncertainty problem and so on.

CS776 Topics in Cognitive Science

This course defines humans' cognitive ability, and then studies a variety of methodologies by which cognitive psychology, artificial intelligence, computer science, linguistics, and philosophy apply this ability to machines. This course focuses on 'neural networks' as a computational model of the brain and as a method for approaching fields that computers cannot solve efficiently, such as pattern recognition, voice recognition and natural language processing.

CS780 Topics in Interactive Computer Graphics

This course covers advanced topics of computer graphics such as modeling geometric objects, rendering and processing three-dimensional objects, and manipulating motion. The course surveys and analyzes recent results, and discusses the research focus for the future.

CS788 Topics on Human-Computer Interaction

This course focuses on technical problems in the interaction between humans and computers. Human-Computer interaction (HCI) is related to somatology, sociology, psychology as well as software and hardware. Through this course, students survey and analyze recent research tendencies, and discuss the future developments.

CS790 Technical Communication in Computer Science

The ability to communicate about technical matters is critical for IT professionals. The purpose of this course is to develop the student's technical communication skills, primarily in writing, but also in oral communication. Students practice the skills necessary for writing technical papers. Through active discussions and reviews, students work on their ability to convey technical ideas in a concise and well-organized manner.

CS960 M.S. Thesis Research

A student selects an M.S. thesis topic with an advisor, and carries on independent research. The student is required to submit an M.S. thesis as an end product.

CS965 Individual Study in M.S.

Students are given an individual project in which they can bring the material learnt in other courses into practice. They experience the experimental side of problems, and improve their experimental and analytic abilities. Before registering for this course, students must discuss their project with the responsible professor.

CS966 Seminar (M.S.)

Domestic and international researchers are invited to give talks on various topics and future directions in

computer science and to get involved in discussion with students.

CS980 Ph.D. Dissertation Research
A student selects a Ph.D. thesis topic approved by an advisor, and carries on independent research. The student is required to submit a Ph.D. thesis as an end product.

CS986 Seminar (Ph.D.)
Domestic and international researchers are invited to give talks on various topics and future directions in computer science and to get involved in discussion with students.