

# Description of Courses

## ■ Master and Doctoral Program

### **KSE521 Business Intelligence 3:0:3(6)**

Business intelligence plays a pivotal role in turning a large set of data into information and knowledge for effective decision making. This course covers the fundamental concepts and skills associated with major business intelligence applications including database, data warehouse, and data mining.

### **KSE522 Knowledge System Modeling and Design 3:0:3(6)**

This course will examine the nature and principles of knowledge systems from performance and methodology perspectives. It will also cover the software engineering modeling concept and basic elements of knowledge systems using the specific programming language UML and JESS.

### **KSE523 Knowledge Service Design Using Web Technologies 3:1:3(6)**

The students will learn knowledge service design based on Web technologies and will develop a knowledge service project during the course. The course will highlight the features of different Web Service Technologies and introduce various Scripting languages, provide an up-to-date survey of developments in Web Service Technologies, and present technologies to support real-time software development.

### **KSE524 Information Search and Management 3:1:3(6)**

This course will cover traditional material as well as recent advances in information retrieval (IR), the study of the indexing, processing, and querying of textual data. Students will learn tools and techniques to do research in the area of information search and management.

### **KSE525 Data Mining and Knowledge Discovery 3:0:3(6)**

Data mining plays an important role in discovering useful knowledge from huge amounts of data. This course teaches the basic concepts and methods of data mining. More specifically, frequent patterns and associations; classification and prediction; and cluster analysis will be covered. The main goal of this course is to give the students a broad knowledge of various data mining methods without confining to a specific domain. This course is intended as a prerequisite for advanced data mining courses.

### **KSE526 Analytical Methodologies for Big Data 3:0:3(6)**

This course discusses basic analytical methodologies for big data, which are vital to data scientists. For big data analytics, it is required to extend existing algorithms so that they can support big data. In this course, the lecturer will first teach MapReduce, which is the representative framework of processing big data, and then the methodologies of extending the algorithms---mostly for text retrieval/processing and graph analysis---into MapReduce. As a result, the students will achieve the basic capabilities needed to design the algorithms of big data analytics.

### **KSE527 Deep Learning 3:0:3(6)**

In this course, we will learn about introductory materials for deep learning, which is a machine learning methodology that learns multiple layers of non-linear representations for given prediction tasks, while reviewing some of its applications to computer vision and natural language processing. The course will be mostly focused on understanding deep learning methodology, rather than implementing and using existing deep learning frameworks. We will have three to four lab courses on Tensorflow basics.

### **KSE531 Human-Computer Interaction: Theory and Design 3:0:3(6)**

This course acquaints the students to principles and practice in human-computer interaction design. The context of computer supporting of human decision-making tasks is emphasized. Based on relevant background knowledge from the perspectives of cognitive science, information design, and human factors engineering, more specific topics including task-based design methodologies,

cognitive task analysis, strategy analysis, and information aiding and visualization are taught.

**KSE611 Introduction to Learning Science**

**3:0:3(6)**

The purpose of this class is to expose students to the foundational theoretical, technological, and methodological issues underlying previous work in learning science. In addition, the class introduces students to the wide range of current learning environments for formal and informal interaction and learning on-line, and explores current research in improving the quality of experiences these environments have to offer.

**KSE612 Human Decision Making and Support**

**3:0:3(6)**

Types, strategies, limitations, and models of human decision making are considered. Human problem solving strategies and heuristics in choice, estimation, and diagnosis problems are analyzed. Also discussed are various intelligent approaches and systems to support the human strategies providing timely and well-designed information.

**KSE621 Advanced Techniques in Information Retrieval and Data Mining**

**3:1:3(6)**

This course covers emerging advanced topics in Information Retrieval (IR) and Data Mining (DM). For the topics selected, students will not only learn about the most recent research progress, but also have an opportunity to practice skills for doing research and identifying interesting new research directions.

**KSE622 Soft-computing in Intelligent System Design**

**3:0:3(6)**

The first objective is to learn what kind of role precision and imprecision have in engineering and engineering system design. The second objective is to understand the need to use soft-computing in designing intelligent systems. The third objective is to have a basic understanding of different kinds of soft-computing methodologies as well as hybrid methodologies. The fourth objective is to design and build a fully functional Fuzzy Logic Controller / fuzzy application in a real world project case.

**KSE623 Knowledge Structure and Modeling**

**3:1:3(6)**

Knowledge structure is an interrelated collection of facts or knowledge about a particular topic. It is composed of concepts linked to other concepts by labeled relationships. The course involves modeling of knowledge structure using XML, RDF, and ontology using the semantic Web as a knowledge source.

**KSE624 Mobile and Pervasive Computing for Knowledge Services**

**3:1:3(6)**

Over the past decade, there has been an increasing trend towards integrating sensing, communication, and computation into the physical world, from electronic toys to cars, from augmented classrooms to smart homes. In this course, we will take an interdisciplinary look at current research topics in mobile and pervasive computing by reading and discussing recent literature and discuss how we can provide intelligent knowledge services using mobile and pervasive computing.

**KSE625 Data Mining for Social Networks**

**3:0:3(6)**

The advent of *online social networks* has been one of the most exciting events in this decade. Many popular online social networks such as Twitter, Facebook, and LinkedIn have become increasingly popular. Such social networks typically contain a tremendous amount of content and linkage data which can be leveraged for analysis. This abundant data provides unprecedented opportunities for knowledge discovery in the context of social networks. This course teaches key concepts and algorithms for analyzing online social networks from the *data mining* point of view. The course will cover many interesting topics including ranking, community detection, node classification, evolution, social influence analysis, expert discovery, and link prediction. The instructor will introduce the representative papers (two for each week) published in the data mining field.

**KSE631 Content Networking**

**3:0:3(6)**

Today's Internet is all about content that ranges from movie titles (e.g., Netflix) to user generated

content (e.g., Youtube and Twitter). Further, ever increasing popularity of the mobile Internet has dramatically changed business and technologies for content networking. In this course, we review enabling technologies for the mobile Internet and content networking and discuss state-of-the-art content networking research issues such as mobility, context awareness, and social networking.

**KSE641 Cognitive Engineering**

**3:0:3(6)**

Approaches to enhance overall performance in complex human-machine cognitive systems are considered. The engineering methods to design system intelligence and interaction are discussed in an systems engineering point of view, covering prescriptive and descriptive models of human and machine intelligence, analysis and design of task-function complexes, and some application-oriented issues.

**KSE643 Knowledge Engineering and Intelligent Decision Making**

**3:0:3(6)**

Knowledge engineering plays a key role in integrating knowledge into computer systems for intelligent decision making. This course covers the fundamental concepts, methods, and tools related to knowledge engineering and applies them to the Web for the design of intelligent decision making systems.

**KSE651 Organizational Learning and Knowledge Consulting**

**3:0:3(6)**

The first objective is to learn different kinds of theories related to organizational learning and knowledge creation. The second objective is to learn basic elements in consulting as well as some consulting tools and methods that can be used in facilitating workshops and idea generation. The third objective is to apply the content of the class to practice in projects.

**KSE652 Intelligent Social Computing**

**3:0:3(6)**

Social computing relies on Web 2.0 and ubiquitous computing technologies and includes a range of topics such as crowd-service interaction analysis, collective intelligence service development, and intelligent social web system design. In this course, we review recent social computing service platforms (e.g., human computation, crowdsourcing, social Q&A, and social recommendation) and investigate intelligent social computing system design issues (e.g., incentives, quality of user contribution, sustainability). To this end, we will take an interdisciplinary look at current research topics in social computing by reading and discussing recent literature.

**KSE653 Service UX Design**

**3:0:3(6)**

The purpose of this class is to introduce the definition of service design and experience design as well as related theoretical, technological, and methodological issues underlying previous work in service design. Students will explore current theory and cases, as well as research trends that are needed in order to design the "invisible" service. In addition, students will actively participate in hands-on design practices by learning and applying methods learned in class.

**KSE801 Special Topics in Knowledge Service Engineering I**

**3:0:3**

This course is offered to meet the ad hoc demand of students in special areas of Knowledge Service Engineering which is not covered by regular courses.

**KSE808 Invited Lectuer I**

**1:0:1**

This course is offered to meet the ad hoc demand of students in special areas of Knowledge Service Engineering which is not covered by regular courses.

**KSE809 Invited LectuerII**

**2:0:2**

This course is offered to meet the ad hoc demand of students in special areas of Knowledge Service Engineering which is not covered by regular courses.

**KSE960 MS Thesis**

This listing is for participation in advanced research under the direction of a faculty member.

**KSE966 Seminar in MS**

**1:0:1**

Regularly held seminars on up-to-data topics help M.S. students grasp the current direction of

development and applications in the general Knowledge Service Engineering areas.

**KSE980 Ph.D Thesis**

This listing is for participation in advanced research under the direction of a faculty member.

**KSE986 Seminar in Ph.D**

**1:0:1**

Regularly held seminars on up-to-date topics help Ph.D. students grasp the current direction of development and applications in the general Knowledge Service Engineering areas.