

# SDSC8009: DATA MINING AND KNOWLEDGE DISCOVERY

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## Effective Term

Semester B 2024/25

## Part I Course Overview

### Course Title

Data Mining and Knowledge Discovery

### Subject Code

SDSC - Data Science

### Course Number

8009

### Academic Unit

Data Science (DS)

### College/School

College of Computing (CC)

### Course Duration

One Semester

### Credit Units

3

### Level

R8 - Research Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Basic Machine Learning Knowledge Python Programming

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

Data mining focuses on algorithms and computational paradigms that allow computers to find patterns and regularities in dataset, perform predictions and generally improve the performance through interaction with data. It is currently regarded as the key element of a more general knowledge discovery process that deals with extracting useful knowledge from raw data. Students in this course will learn advanced algorithms for mining data with various forms.

The learning journey will start with the classical data mining methods for tabular and graph data and next move into vision based analytics with advanced algorithms. Students will be exposed to different model architectures and learning algorithms such as classical and deep learning ones. The journey will go further into the various real-world applications.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe essential data mining algorithms	15	x	
2	Explain basics of problem solving via data mining	15	x	
3	Implement data mining algorithms introduced in this course.	20	x	
4	Apply algorithms taught in this course into emerging real-world problems.	20	x	x
5	Demonstrate novel knowledge extracted from data of considered real problems through utilizing algorithms taught in this course	30	x	x

#### A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

#### A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

#### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	- large class activity - questions and discussion	1, 2, 3, 4, 5 39 hours/sem

### Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Group Project Students will conduct a collaborative research project based on taught concepts.	1, 2, 3, 4, 5 40	

2	Individual Assignment Students will utilize designed assignments to test their gained understanding of a subset of taught concepts and their implementation.	1, 2, 3, 4	30	
3	Take-home Test An open book and notes examination aiming at assessing the understanding of the overall materials and some open questions for demonstrating the capability of the further exploration.	2, 3, 4, 5	30	

**Continuous Assessment (%)**

100

**Examination (%)**

0

**Assessment Rubrics (AR)****Assessment Task**

Group Project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 &amp; thereafter)

**Criterion**

Application of class materials and teamwork

**Excellent**

(A+, A, A-) High

**Good**

(B+, B, B-) Significant

**Fair**

(C+, C, C-) Moderate

**Marginal**

(D) Basic

**Failure**

(F) Not even reaching marginal levels

**Assessment Task**

Individual Assignment (for students admitted before Semester A 2022/23 and in Semester A 2024/25 &amp; thereafter)

**Criterion**

Application of class materials

**Excellent**

(A+, A, A-) High

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**Assessment Task**

Take-home Test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

Understanding of class materials

**Excellent**

(A+, A, A-) High

**Good**

(B+, B, B-) Significant

**Fair**

(C+, C, C-) Moderate

**Marginal**

(D) Basic

**Failure**

(F) Not even reaching marginal levels

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**Assessment Task**

Group Project (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**

Application of class materials and teamwork

**Excellent**

(A+, A, A-) High

**Good**

(B+, B) Significant

**Marginal**

(B-, C+, C) Basic

**Failure**

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### **Assessment Task**

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## **Part III Other Information**

### **Keyword Syllabus**

- Data Mining Essentials
- Dimensionality Reduction and Visualization
- Clustering and Classification
- Introduction to Neural Networks
- Network Embedding
- Deep Neural Networks
- Selected Data Mining Applications

### **Reading List**

#### **Compulsory Readings**

<b>Title</b>	
1	Pang-Ning Tan, Michael Steinbach, and Vipin Kumar. Introduction to Data Mining (2nd Edition), Pearson, 2018.
2	Lecture notes
3	Journal articles and conference papers selected by the instructor

**Additional Readings**

<b>Title</b>	
1	Nil