# Teaching Plan for FDAS, Student

| Subject Title | Subject length in hours |
|---|---|
| Fundamentals of Data Analytics and Statistics | 76 |

Subject Description

The objective of the course is to provide students with the concepts, interpretations and application of Data Analytics and Statistics from very basics. This subject covers the most essential data science knowledge that enables students to build a solid background to continue more advanced studies in the data science program. Upon completion of the subject a student will be able to gain the high level understanding of data science and application.

Textbooks/manuals
Lecture Notes of Fundamentals of Data Analytics and Statistics, Metro College of Technology

**Method of Evaluation**
**(**e.g., graded homework, quizzes, projects, final examination, et cetera; the type, number, and % value of each**)**

| Type | Number | % Value | Type | Number | % Value | Type | Number | % Value |
|---|---|---|---|---|---|---|---|---|
| Quiz | 2 | 40 | Exam | 1 | 60 | | | |
| | | | | | | | | |

**Teaching Method**

| **Method** | Number of hours |
|---|---|
| ☒ Lecture | 70 |
| ☐ Computer Based Learning | |
| ☐ Seminar | |
| ☐ Supervised Practical (e.g. clinic) | |
| ☒ Supervised Lab (e.g. computers) | 6 |
| ☐ Distance Education | |

**Location**

☒ Classroom/Lab (College)
☐ Classroom/Lab (Off-campus)
☐ Practicum

Does this subject require a final examination or a formal evaluation?

☒ Yes ☐ No

If “Yes”, indicate the passing mark: 60%

# Teaching Plan for FDAS, Student

## Objectives

Theory (the key elements that a student is expected to know upon completion of subject)

Core Competency: Be aware of 'data and statistical' thoughts and methods [App F-K-1]

1. Know data analytics and use cases
2. Understand data collection and preparation
3. Understand data driven approaches to various types of reports
4. Know basic data exploration process such as correlation, trend and outliers
5. Know procedures of data cleaning under different scenarios
6. Be aware of Big Data, attributes, analytics methods and use cases
7. Know data analytics software in market and features
8. Be aware of applying graphics (e.g. trend, distribution and outliers) to understand data value
9. Understand SQL and use cases

Core Competency: Know statistics, distribution and pattern by intuition [App F-K-2]

1. Understand descriptive statistics and interpretation.
2. Know statistical test concepts and interpretation
3. Know how to convert practical cases into quantitative projects
4. Know feature transformation and engineering
5. Know variable selection
6. Know data mining, machine learning and statistical modeling concepts and use cases

# Teaching Plan for FDAS, Student

## Objectives

Skill ( the key behaviors that a student is expected to be able to perform upon completion of the subject)

Core Competency: To think in a 'data and statistical' way, and understand data, statistics and errors by intuition [App F-S-1].

1. To check different formatted raw data by eyeballs.
2. To use SQL to query and update data bases
3. To analyze and judge data distribution
4. To do basic data QC by exploring data using statistics and intuition
5. To obtain various statistics that summarize various patterns
6. To compute data correlation based on different data dependency measures and explain them in an intuitive way
7. To do basic statistical test
8. To conduct variable transformation and selection for advanced analysis

**Subject Outline and Teaching Calendar**

| Date | Contact Hours | Main Topic<br>Sub-Topics |
|---|---|---|
| Day 1 | **5.0 L**<br><br><br><br><br>(5.0) | **Introduction to Data Science**<br>1) Data science process and components --learn history of statistics, science of statistics, application of statistics data analytics and their connections with data science. [App F-K-1(1)]<br>2) Practical cases of applying data science to various industries [App F-K-1(2,3,4)]<br>3) Class exercises<br>4) Homework exercises |
| Day 2 | **5.0L+0.5T**<br><br><br><br>[0.5]<br>(5.0) | **Data Collection and Preparation**<br>1) Data collection, processing, sampling, QC, production, report and visualization [App F-K-1(2,3,4,5) ]<br>2) Various uses cases of data processing [App F-K-1(3,4,5,9)] [App F-K-2(3)]<br>3) Class exercises<br>Tutorial<br>4) Homework exercises |
| Day 3 | **5.0L+0.5T**<br>[0.5]<br><br><br><br><br>(5.0) | Tutorial<br>2) Various cases of data processing (continued) App F-K-1(3,4,5)] [App F-S-1(1,4)]<br>**Descriptive Statistics**<br>1) Concepts of descriptive statistics, and calculation method. [App F-K-2(1,2,3)]<br>2) Class exercises<br>3) Homework exercises |
| Day 4 | **5.0L+0.5T**<br>[0.5]<br><br><br><br><br><br>(5.0) | Tutorial<br>4) Examples of computing descriptive statistics using different software [App F-K-2(1,2,3)] [App F-S-1(1,3,5)]<br>**Introducing Distributions and Statistical Tests**<br>1) Concepts of distribution, frequency, quintiles, outliers [App F-K-1(4,5)] [App F-K-2(1)]<br>2) Class exercises<br>3) Homework exercises |
| Day 5 | **5.0L+0.5T**<br>[0.5] | Tutorial<br>1) Concepts of distribution, frequency, quintiles, outliers (cont.) [App F-K-2(1,2)] [App F-S-1(3,5)] |

| Date | Contact Hours | Main Topic<br>Sub-Topics |
|---|---|---|
| | | 2) Different kinds of distribution, shape and attributes<br>[App F-K-2(2,3)] [App F-S-1(1,3,5)] |
| | | 3) Test 1 |
| | (5.0) | 4) Homework exercises |
| | **5.0L+0.5T**<br>[0.5] | Tutorial |
| Day 6 | | 1) Different statistical tests, p values and interpretation [App F-K-2(1,2,3)] |
| | | 2) Basic statistical test using software [App F-K-2(1,2)] [App F-S-1(3,5)] |
| | | 3) Class exercises |
| | (5.0) | 4) Homework exercises |
| | **5.0L+0.5T**<br>[0.5] | Tutorial |
| Day 7 | | 1) Basic statistical test using software (cont.) [App F-S-1(3,5)] |
| | | **Introducing Correlation**<br>1) Introduce concepts of correlation, different type of correlation measures [App F-K-1(1,4,8)] [App F-K-2(1,4,5)] [App F-S-1(6,8)]<br>2) Introduce binning data, bucket analysis and profiling to recognize pattern [App F-K-1(4,5,8)] [App F-S-1(2,5,6,8)] |
| | | 3) Class exercises |
| | (5.0) | 4) Homework exercises |
| | **5.0L+0.5T**<br>[0.5] | Tutorial |
| Day 8 | | 1) Introduce binning data, bucket analysis and profiling to recognize pattern (cont.) [App F-K-1(4,5,8)] [App F-S-1(2,5,6,8)] |
| | | 2) Use intuitive methods to present data association [App F-K-1(8)] [App F-K-2(3,4)] [App F-S-1(3)] |
| | | 3) Weight of evidence, IV and calculation [App F-K-1(8)] [App F-K-2(4,6)] |
| | | 4) Class exercises |
| | (5.0) | 5) Homework exercises |
| | **5.0L+0.5T**<br>[0.5] | Tutorial |
| Day 9 | | 3) Weight of evidence, information value and calculation (cont.) [App F-K-1(8)] [App F-K-2(4,6)] [App F-S-1(3,6,7,8)] |

| Date | Contact Hours | Main Topic<br>Sub-Topics |
|---|---|---|
| | | 6) Conduct correlation study using software [App F-S-1(4,5,6,8)] |
| | | **Understand the Concept and Reason of Feature Engineering and Selection** |
| | | 1) Concepts of feature [App F-K-2(4,5,6)] |
| | | 2) Various methods of feature engineering and selection [App F-K-1(1,8)] |
| | | 3) Test 2 |
| | (5.0) | 4) Homework exercises |
| | **5.0L+0.5T** | |
| | [0.5] | Tutorial |
| Day 10 | | 1) Various methods of feature engineering and selection (cont.)<br>[App F-K-1(1,8)] [App F-S-1(4,6)] |
| | | 2) Test impact and efficiency of feature engineering and selection<br>[App F-K-1(1,8)] [App F-S-1(4,8)] |
| | | 3) Use cases of feature engineering and selection<br>[App F-K-1(1,2,3,8)] [App F-S-1(4,6,8)] |
| | | **Introducing Analytics Tools** |
| | | 1) Overview of popular Analytics Tools [App F-K-1(7)] [App F-K-2(6)] |
| | | 2) Class exercises |
| | (5.0) | 3) Homework exercises |
| | **5.0L+0.5T** | |
| | [0.5] | Tutorial |
| Day 11 | | 4) Comparison of Analytic Tools [App F-K-1(7)] [App F-K-2(6)] |
| | | 5) Test different analytic tools [App F-K-1(1,3,7)] |
| | | **Introducing SQL for Data Analysis** |
| | | 1) Overview of databases and SQL [App F-K-1(9)] [App F-K-2(5,6)] |
| | | 2) Data query and manipulation using SQL [App F-K-1(9)] [App F-S-1(2,5,8)] |
| | | 3) Class exercises |
| | (5.0) | 4) Homework exercises |
| | **5.0L+0.5T** | |
| | [0.5] | Tutorial |
| | | 2) Data query and manipulation using SQL [App F-K-1(9)] [App F-S-1(2,5,8)] |

| Date | Contact Hours | Main Topic<br>Sub-Topics |
|---|---|---|
| Day 12 | | 5) Test SQL using R and SAS [App F-S-1(2,8)]<br>**Introducing Predictive Model, Data Mining and Machine Learning**<br>1) Basic concepts and knowledge of predictive model, data mining and machining learning, Including regression, classification, association rules. [App F-K-1(2,6,8)] [App F-K-2(3,4,5,6)]<br>2) Class exercises |
| | (5.0) | 3) Homework exercises |
| Day 13 | **5.0L** | **Review and Exam**<br>Review for examination, Questions and Answers<br>Examination |

Notes: the hours in [ ] are the time with instructor's supervision and the hours in ( ) are the minimum time a student should spend on review, homework, project and pre-reading new contents after class.

Legends in the course outline: **L**- Lecture T- tutorial