Tamkang University Academic Year 113, 2nd Semester Course Syllabus

Course Title	DATA ANALYSIS	Instructor	CHIEN-HO YEN
Course Class	TKFXB2B DEPARTMENT OF ARTIFICIAL INTELLIGENCE, 2B	Details	◆ General Course ◆ Required ◆ One Semester ◆ 3 Credits
Relevance to SDGs	SDG4 Quality education SDG8 Decent work and economic growth		

Departmental Aim of Education

Ⅰ. Students may analyze problems in applied science based on the fundamental knowledge of programming, mathematics, and artificial intelligence.

Ⅱ. Students may plan and implement an AI system following the procedures of problem analysis, experiment testing, data visualizing, derivation and deduction.

Ⅲ. Educate the students to be AI engineers who may accomplish their missions indepedently and may collaborate with their colleagues in the workplace.

Ⅳ. Students may have basic skills and global competence for career diversification, and may keep lifelong learning.

Subject Departmental core competences

A. Professional analysis.(ratio:50.00)

B. Practical application.(ratio:35.00)

C. Professional attitude.(ratio:10.00)

D. Global Mobility.(ratio:5.00)

Subject Schoolwide essential virtues

1. A global perspective. (ratio:10.00)

2. Information literacy. (ratio:30.00)

3. A vision for the future. (ratio:10.00)

4. Moral integrity. (ratio:5.00)

5. Independent thinking. (ratio:30.00)

6. A cheerful attitude and healthy lifestyle. (ratio:5.00)

7. A spirit of teamwork and dedication. (ratio:5.00)

8. A sense of aesthetic appreciation. (ratio:5.00)

Course Introduction	This course aims to introduce the fundamental concepts and techniques of data analysis. The R language is used as a tool to implement data analysis operations. The course content covers essential statistical knowledge necessary for data analysis, various data structures, data preprocessing techniques, data visualization, and machine learning methods such as logistic regression, decision tree analysis, and support vector machines. Learning from this course will provide students with a comprehensive understanding of data analysis techniques and their applications in real-world scenarios.

The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.

Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.

I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.
II.Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.
III.Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.

No.	Teaching Objectives	objective methods
1	The objective of this course is to provide students with the skills necessary for effective data analysis. Students will gain a strong foundation in statistical concepts, data structures, and the use of R for data manipulation and analysis. Furthermore, their ability to solve real-world problems based on data analysis will be enhanced.	Psychomotor

The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCD	12345678	Lecture, Discussion, Practicum	Testing, Discussion(including classroom and online), Report(including oral and written)

Course Schedule

Week	Date	Course Contents	Note
1	114/02/17 ~ 114/02/23	Introduction to data analysis	1. Basic concepts of data analysis 2. The type and scale of the data 3. The operation process of data analysis

2	114/02/24 ~ 114/03/02	Statistical knowledge necessary for data analysis	1. Descriptive statistics and inferential statistics 2. Data statistics 3. Statistical charts
3	114/03/03 ~ 114/03/09	Introduction to R language and basic arithmetic functions	1. Operating environment 2. Introduction to basic functions 3. Commonly used arithmetic functions
4	114/03/10 ~ 114/03/16	Vector data and array data	1. Data creation and calculation 2. Adding, modifying, and deleting data 3. Data indexing and naming
5	114/03/17 ~ 114/03/23	Dataframe data and list data	1. Data creation and calculation 2. Adding, modifying, and deleting data 3. Data indexing and naming
6	114/03/24 ~ 114/03/30	Factor data and time series data	1. Data creation and calculation 2. Adding, modifying, and deleting data 3. Data indexing and naming
7	114/03/31 ~ 114/04/06	Processing of string data	1. Sentence segmentation and string data joining 2. Sorting of string data 3. Search for string data
8	114/04/07 ~ 114/04/13	Data preprocessing	1. Data integration 2. Data cleaning 3. Data transformation
9	114/04/14 ~ 114/04/20	Midterm Exam/Midterm Assessment Week (teachers can adjust the week as needed)	
10	114/04/21 ~ 114/04/27	Calculation of data statistics and making of statistical charts	1. Various types of statistics 2. Commonly used Statistical charts
11	114/04/28 ~ 114/05/04	Data visualization	1. Basic plotting functions 2. Low-level drawing and high-end drawing 3. Layout setting and drawing parameter setting
12	114/05/05 ~ 114/05/11	Logistic regression analysis	1. Basic concepts 2. Application areas 3. Practical examples

13	114/05/12 ~ 114/05/18	Decision tree analysis	1. Basic concepts 2. Application areas 3. Practical examples
14	114/05/19 ~ 114/05/25	Support vector machine	1. Basic concepts 2. Application areas 3. Practical examples
15	114/05/26 ~ 114/06/01	Model evaluation	1. Confusion matrix 2. ROC curve
16	114/06/02 ~ 114/06/08	Feature engineering	1. Feature transformation 2. Feature construction 3. Feature dimensionality reduction
17	114/06/09 ~ 114/06/15	Final Exam/Final Assessment Week (teachers can adjust the week as needed)	
18	114/06/16 ~ 114/06/22	Flexible Teaching Week: Generally, no in-person classes; teachers may arrange teaching activities or final assessments, among other options.	

Key capabilities	Information Technology Problem solving
Interdisciplinary	STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)
Distinctive teaching	Project implementation course Special/Problem-Based(PBL) Courses
Course Content	AI application
Requirement	1. Please be punctual and orderly 2. 3 unexcused absences, with a score of 0 for attendance *note: The course lasts 150 minutes, and the rest of the time is used flexibly by the professor
Textbooks and Teaching Materials	Self-made teaching materials:Presentations, Handouts Name of teaching materials: Provide the handouts and slides for this course. Using teaching materials from other writers:Textbooks Name of teaching materials: Reference books: R語言邁向Big Data之路: 王者歸來 (第2版) 作 者：洪錦魁/ 蔡桂宏； Practical Statistics for Data Scientists, authors: Peter Bruce, Andrew Bruce, Peter Gedeck

References	None
Grading Policy	◆ Attendance： 10.0 % ◆ Mark of Usual：30.0 % ◆ Midterm Exam： 30.0 % ◆ Final Exam： 30.0 % ◆ Other〈 〉： %
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at http://info.ais.tku.edu.tw/csp or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at http://www.acad.tku.edu.tw/CS/main.php . **※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.**