開課班級: 碩動疫科技一A **授課老師: 楊忠達,張立鑫** **學分數:1**

課程大綱:

本課程將從最根本的文獻管理與數據素養開始。我們將確保每一位學生都理解數據的意義、變異性，以及科學圖表中不可或缺的元素。課程將涵蓋基本的統計概念（平均值、標準差）、圖表製作規範、科學問題的定義，以及如何閱讀一篇論文的核心論點，並檢視自己的碩士班研究計畫。

outline:

This course begins with the fundamentals of literature management and data literacy. Through practical examples, we will ensure that every student understands the meaning of data, its variability, and the essential elements of scientific figures. The course will cover basic statistical concepts (mean, standard deviation), standards for creating charts, defining scientific questions, and how to read the core arguments of a research paper and review one's own master's research proposal. The goal of this semester is to help students build the necessary skills and confidence for graduate research, ensuring they can interpret data, ask questions, and engage in basic scientific communication with their peers.

教學型態:

課堂教學

成績考核方式:

平時成績:30%
期中考:%
期末考:%
其它: Mid-term report: 30%
Final Presentation: 40%%

本科目教學目標:

By the end of this course, students should be able to: ・ Data Presentation and Interpretation: Explain the meanings of Mean, Standard Deviation (SD), and Standard Error of the Mean (SEM). Be able to use spreadsheet software (Excel/Google Sheets) to create standard bar charts and scatter plots that include error bars. ・ Identify Basic Research Designs: In a scientific paper, be able to distinguish the main Research Question, the Experimental Group, and the Control Group, and determine if the results are statistically significant. ・ Basic Literature Search: Be able to use PubMed/Google Scholar to find papers related to a specific topic and share methods for reading them. ・ Formulation of Scientific Questions: Be able to transform a vague observation into an extremely simple, verifiable question that includes operational variables. ・ Planning Scientific Sketches: Be able to hand-sketch a chart of expected results for a simple experiment (e.g., a draft of a bar chart with labeled X/Y axes, groups, and drawn error bars).

參考書目:

課程進度表：

週次	起訖月日	授課單元(內容)	備註
第1週	9.08~9.15	Course Introduction & A Navigator's Chart for a Master's Program Introduction to course objectives and grading. Explanation of graduation requirements, academic ethics, lab safety, and culture.	8日正式上課。8~12日課程加退選，轉學(系)生、復學生及延修生選課，雙主修、輔系申請，12日申辦抵免學分截止日
第2週	9.15~9.22	Literature Management with Zotero Hands-on tutorial: installation and setup, collecting references, inserting citations, creating bibliographies.	
第3週	9.22~9.29	Your AI Assistant for Research How to use AI (e.g., Gemini,; Perplexity) for brainstorming, literature summarization, grammar polishing, and code generation. How to verify AI-generated content to uphold academic ethics?	28日(日)孔子誕辰紀念日/教師節(放假),29日(一)補假
第4週	9.29~10.06	Holiday	29日成績優異提前畢業者提出申請截止日
第5週	10.06~10.13	Holiday	6日(一)中秋節(放假)，10日(五)國慶日(放假)
第6週	10.13~10.20	Scientific Data & Visualization Tidy Data principles, types of data (continuous vs. categorical), practice in data organization. The meaning and calculation of mean, median, standard deviation (SD). Introduction to box plots and bar charts.	14日學生宿舍安全輔導暨複合式防災疏散演練。18日多益測驗
第7週	10.20~10.27	Correlation, Causation, and the Ask a Good Question Scatter plots, correlation does not imply causation, using the FINER criteria to evaluate research questions.	24日(五)補假，25日(六)光復暨古寧頭大捷日(放假)。
第8週	10.27~11.03	Seminar Presentation Skills Narrative structure, visual design, oral presentation skills, and techniques for handling Q&A sessions.	30日校課程委員會
第9週	11.03~11.10	Experimental Design: Controls and Variables Positive and negative controls, independent variables, dependent variables, confounding variables. Introduction to sample size and statistical power analysis.	3~9日期中考試
第10週	11.10~11.17	Hypothesis Testing and an Intuitive Understanding of P-values The null hypothesis (H0) and alternative hypothesis (H1), the meaning and interpretation of P-values.	13日教務會議,16日教師期中成績上網登錄截止日

第11週	11.17~11.24	Research Ethics and Guidelines for IACUC / IRB Applications Academic integrity, authorship principles. Animal experiment ethics, the 3Rs principle, application procedures and document preparation for IACUC or IRB.	
第12週	11.24~12.01	Dissecting a Paper and Efficient Literature Search The IMRAD structure, applying Boolean logic (AND, OR, NOT) to literature searches.	24~28體育運動週。24日校園路跑。27日運動大會夜間開幕，28日運動大會活動，29日101週年校慶活動日，照常上班
第13週	12.01~12.08	Writing a Research Proposal (I): Introduction & Hypothesis How to state the research background, motivation, and significance, and review key literature.	
第14週	12.08~12.15	Writing a Research Proposal (II): Materials and Methods Writing a reproducible experimental protocol.	12日申請停修課程截止日
第15週	12.15~12.22	Writing a Research Proposal (III): Preliminary or Anticipated Results What kind of data is sufficient? What preliminary data can build reviewers' confidence in your ability to execute the project?	
第16週	12.22~12.29	Research Question Clinic Group discussions to strengthen each person's research concept (research question, hypothesis, IV/DV). ;	22日校務會議。25日行憲紀念日(放假)
第17週	12.29~1.05	Final Presentation (I): Oral Report on Research Proposal Students present their research proposals.	1日(四)開國紀念日(放假)
第18週	1.05~1.12		5~11日期末考試，10~11日學生退宿