國立東華大學

教學計劃表　Syllabus

課程名稱(中文) Course Name in Chinese	科學教育測驗與統計		學年/學期 Academic Year/Semester		113/2
課程名稱(英文) Course Name in English	Measurement And Statistics in Science Education				
科目代碼 Course Code	SCE_51200	系級 Department & Year	碩士	開課單位 Course-Offering Department	教育與潛能開發學系
修別 Type	選修 Elective	學分數/時間 Credit(s)/Hour(s)	3.0/3.0		
授課教師 Instructor	/陳世文				
先修課程 Prerequisite					

課程描述　Course Description

This course is designed to equip beginners with fundamental statistical analysis skills, with a focus on applications in science educational research. The curriculum covers descriptive statistics, t-tests, regression analysis, analysis of variance (ANOVA, MANOVA), exploratory factor analysis (EFA), and covariance analysis (ANCOVA, MANCOVA). Students will learn to use SPSS for data analysis. The course combines theoretical lectures and hands-on practice, gradually building students' understanding and application of statistical methods, providing a solid foundation for advanced quantitative research.

本課程旨在幫助初學者掌握基礎的統計分析技能，特別是針對科學教育研究的應用。課程涵蓋描述性統計、t考驗、迴歸分析、變異數分析（ANOVA、MANOVA）、因素分析（EFA）以及共變數分析（ANCOVA、MANCOVA）的基礎理論與實作操作。學生將學習如何使用SPSS進行數據分析。本課程採用理論與實作相結合的教學方式，逐步建立學生對統計方法的理解與應用能力，為後續進階量化研究打下堅實基礎。

課程目標　Course Objectives

1. 能夠明瞭統計學是什麼、統計分析在作什麼。
2. 了解如何進行正確統計決策。
3. 了解並能充分運用電腦及電腦軟體（主要是SPSS），進行統計分析。
4. 瞭解測驗編制的分析技術。

	系專業能力 Basic Learning Outcomes	課程目標與系專業能力相關性 Correlation between Course Objectives and Dept.'s Education Objectives
A	瞭解科學教育專業理論及內涵。To comprehend the theories and implementations of science education	
B	具備科學教學專業素養。To possess the professional competencies of science teaching	
C	具有科學教育研究基礎素養。To have the basic abilities of science education research	
D	具備科學素養與人文關懷。To integrate scientific literacy with humanistic concer	
E	具備科學教育推廣與傳播素養。To possess the abilities of science popularization and communicate	
F	具備主動探究之態度與熱愛自然的情操。To express the positive attitude toward inquiry and the sentiment adoring the nature	
G	具備多面相的科學觀。To understand the science with multidimensional viewpoints	

圖示說明Illustration ：● 高度相關 Highly correlated ○中度相關 Moderately correlated

週次Week	內容 Subject/Topics	備註Remarks
	授課進度表 Teaching Schedule & Content	
1	Introduction to Statistics and SPSS Basics: Introduction to roles of statistics in education research; types of data and variables; SPSS interface introduction and data entry.	SPSS data entry and basic operations practice.
2	Take off for the national holiday	take off one week
3	Test Theory: Reliability and Validity: Concepts of reliability and validity; Cronbach's alpha; types of validity and their applications.	Design simple test items and perform reliability and validity analysis.
4	Descriptive Statistics and Data Visualization: Descriptive Statistics and Data Visualization: Central tendency (mean, median, mode); dispersion (standard deviation, variance); creating histograms and boxplots.	Generate descriptive statistics tables and charts in SPSS.
5	One-Sample and Independent-Sample t-Tests: Concepts of one-sample and independent-sample t-tests; hypothesis testing basics.	Conduct t-tests in SPSS and write a short report.
6	Paired-Sample t-Tests and Chi-Square Tests: Application of paired-sample t-tests; assumptions and use of Chi-Square tests for categorical data.	Analyze paired-sample data and perform Chi-Square tests in SPSS.
7	Take off for the national holiday	take off one week
8	Correlation Analysis and Simple Regression: Pearson and Spearman correlation coefficients; building and interpreting simple linear regression models.	Analyze correlation and build simple regression models in SPSS.
9	Multiple Regression Analysis: Applications of multiple regression; variable selection strategies; evaluating model fit.	Build and interpret multiple regression models in SPSS.
10	One-Way ANOVA: Assumptions and use of One-Way ANOVA; interpretation of results and post-hoc tests (e.g., Tukey).	Analyze One-Way ANOVA data in SPSS.
11	Multivariate ANOVA (MANOVA): Introduction to multivariate design; interpretation and application of MANOVA.	Perform MANOVA on sample datasets using SPSS.
12	Factor Analysis (FA): Concepts of FA; KMO and Bartlett test; eigenvalues and factor loadings.	Conduct EFA in SPSS and interpret results.
13	Analysis of Covariance (ANCOVA): Basics of ANCOVA; importance of covariates; interpreting results.	Perform ANCOVA in SPSS and write a brief report.
14	Multivariate Analysis of Covariance (MANCOVA): Introduction to MANCOVA; understanding applications and interpreting basic model results.	Analyze a basic MANCOVA model in SPSS.
15	Take off for the national holiday	take off one week
16	Final Exam	Online Assessment
17	Self learning and practice	Work for your thesis
18	Self learning and practice	Work for your thesis

教 學 策 略 Teaching Strategies

☑ 課堂講授 Lecture　　　　☑ 分組討論Group Discussion　　　☐ 參觀實習 Field Trip

☐ 其他Miscellaneous:

教 學 創 新 自 評 Teaching Self-Evaluation

創新教學(Innovative Teaching)

☑ 問題導向學習(PBL)　　　☐ 團體合作學習(TBL)　　　☐ 解決導向學習(SBL)

☐ 翻轉教室 Flipped Classroom　　　☐ 磨課師 Moocs

社會責任(Social Responsibility)

☐ 在地實踐Community Practice　　　☐ 產學合作 Industy-Academia Cooperation

跨域合作(Transdisciplinary Projects)

☐ 跨界教學Transdisciplinary Teaching　　　☐ 跨院系教學Inter-collegiate Teaching

☐ 業師合授 Courses Co-taught with Industry Practitioners

其它 other:

學期成績計算及多元評量方式 Grading & Assessments									
配分項目 Items	配分比例 Percentage	多元評量方式 Assessments							
		測驗 會考	實作 觀察	口頭 發表	專題 研究	創作 展演	卷宗 評量	證照 檢定	其他
平時成績(含出缺席) General Performance (Attendance Record)	50%								
期中考成績 Midterm Exam	0%								
期末考成績 Final Exam	50%								
作業成績 Homework and/or Assignments	0%								
其他 Miscellaneous (_____)	0%								

評量方式補充說明
Grading & Assessments Supplemental instructions

教科書與參考書目（書名、作者、書局、代理商、說明）
Textbook & Other References (Title, Author, Publisher, Agents, Remarks, etc.)

課程教材網址(含線上教學資訊,教師個人網址請列位於本校內之網址)
Teaching Aids & Teacher's Website(Including online teaching information.
Personal website can be listed here.)

其他補充說明 (Supplemental instructions)