國立東華大學

教學計畫表 Syllabus

課程名稱(中文) Course Name in Chinese	微積分 (一)			學年/學期 Academic Year/Semester	114/3
課程名稱(英文) Course Name in English	Calculus (I)			授課教師 Instructor	王承斌
科目代碼 Course Code		系級 Department	1	開課單位 Course-Offering Department	資訊工程學系
修別 Type	☐ 必修 Required ☐ 選修 Elective ■ 學程 Program	學分數/時數 Credit(s)/ Hour(s)		3/3	
先修課程 Prerequisite	None				
課程描述 Course Description	This course provides a comprehensive introduction to the fundamental concepts of single-variable calculus, tailored for students in Computer Science and Information Engineering. The curriculum covers limits, continuity, differentiation, and the foundations of integration. Beyond standard computational techniques, the course emphasizes the logical rigor and analytical thinking required for algorithmic complexity analysis and numerical methods. Students will explore how derivatives model change in dynamic systems and how integration serves as a tool for accumulation and probability. Special attention is given to transcendental functions and optimization problems, which form the mathematical backbone of modern AI, computer graphics, and signal processing.				

課程目標 Course Objectives	Upon successful completion of this course, students will be able to: **1. Master Algorithmic Differentiation** Develop high proficiency in differentiation rules (especially the **Chain Rule**). This is foundational for understanding **Backpropagation** in neural networks and gradient-based optimization in machine learning. **2. Apply Optimization to Real-World Problems** Utilize first and second-order derivatives to find optimal solutions. This objective prepares students for resource allocation problems, network flow optimization, and minimizing loss functions in data science. **3. Understand Rate of Change & Growth Rates** Analyze how functions behave at the limit. This provides the mathematical intuition for **Big O notation** and the analysis of algorithm efficiency, specifically how execution time scales with input size. **4. Bridge Continuous Math with Discrete Structures** Understand the **Fundamental Theorem of Calculus** as a way to relate summation (discrete) to integration (continuous). This is critical for students who will later work with digital signal processing (DSP) and continuous probability distributions. **5. Utilize Transcendental Functions** Master the properties of e^x, $\ln x$, and trigonometric functions. These are indispensable in computer graphics (rotation matrices), cryptography, and modeling the decay/growth of data in network traffic.

系專業能力 Basic Learning Outcomes	A. 資訊專業終身學習能力 Ability of lifetime learning in information profession B. 實驗驗證資訊科學能力 Ability of validate experimental result validation in information science field C. 資訊工具整合運用能力 Ability of integrated applications of information technology D. 資訊系統應用設計開發能力 Ability of information application system design and development E. 團隊合作溝通協調能力 Ability of teamwork, communication, and coordination F. 資通訊科技問題解決能力 Ability of problem solving regarding information and communication technology G. 瞭解資訊科技多元影響能力 Ability to understand information technology’ s multiple influences H. 肩負資訊人社會責任能力 Ability of bearing the social responsibilities being among information professionals.

課程目標與系專業能力相關性 Correlation between Course Objectives and Basic Learning Outcomes	A	B	C	D	E	F	G
	●		○			●	

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

授 課 進 度 表 Teaching Schedule & Content

週次 week	內容（Subject/Topics）	備註 Remarks
1	Functions & Limits	
2	Continuity & Introduction to Derivatives	
3	Differentiation Rules	
4	Advanced Differentiation (Chain Rule, Implicit Differentiation)	
5	Rates & Linearization	
6	Analysis of Functions (M.V.T, Curve Sketching)	
7	期中考試週 Midterm Exam	
8	L'Hôpital's Rule & Optimization	
9	Midterm Examination	
10	The Antiderivative and Summation	
11	The Fundamental Theorem of Calculus (FTC)	
12	Integration by Substitution	
13	Transcendental Integrals	
14	期末考試週 Final Exam	

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: Every week Exam.

學期成績計算及多元評量方式 Grading& assessme-nts	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 General Performance	40%								
	期中考成績 Midterm Exam	30%								
	期末考成績 Final Exam	30%								
	作業成績 Homework and/or Assignments									
	其他 Miscellaneous (_____)									

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.)
Calculus 12/e (Metric Version), Ron Larson, Bruce H. Edwards, Cengage Learning, 東華書局

課程教材網址（教師個人網址請列在本校內之網址）
Teaching Aids & Teacher's Website (Personal website can be listed here.)