國立東華大學

課　　綱　Course Outline

應用數學系博士班

中文課程名稱 Course Name in Chinese	數值分析				
英文課程名稱 Course Name in English	Numerical Analysis				
科目代碼 Course Code	AM__71300	班 別 Degree	博士班 Ph.D.		
修別 Type	選修 Elective	學分數 Credit(s)	3.0	時 數 Hour(s)	3.0
先修課程 Prerequisite					

課程目標
Course Objectives

介紹解決非限制最佳化問題及限制最佳化問題的進階數值方法，並探討在非線性系統、函數近似、整數規劃、及混合整數規劃之相關應用
The course objective is to introduce advanced numerical approaches for unconstrained optimization and constrained optimization and explore applications for solving nonlinear systems, function approximation, integer programming and mixed integer programming.

系教育目標
Dept.'s Education Objectives

1	訓練嚴謹思考與推理能力。 To provide a solid training in rigorous thinking and reasoning ability.
2	奠定理論與應用數學的基礎知識。 To establish well-founded background knowledge in pure and applied mathematics.
3	具備跨領域學習能力。 To prepare the students for interdisciplinary study in the future.

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	具備專業知識及邏輯推理能力 Have well-founded expertise and be capable of logical reasoning.	○
B	具備學習其它學科的能力，以期能邁向跨領域研究。 Be able to study other fields of science so as to conduct interdisciplinary research in the future.	●

C	具備獨立思考與解決問題的能力。 Be capable of independent thinking and have the problem-solving skills.	●

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

課程大綱
Course Outline

1.MATLAB 程式設計與基礎數值方法介紹
2.Newton法與非線性系統
3.梯度法、Newton-Gauss法及Levenberg-Marquardt法與非限制最佳化
4.半徑基底函數近似
5.投影基底函數近似
6.平均場近似理論與整數規劃
7.Kullback-Leibler divergence 最小化與限制最佳化
8.期望最小化與混合整數規劃
9.物理退火模擬

Course Outline
1.MATLAB programming and reviews on fundamental numerical methods
2.Newton method and nonlinear system solving
3.Unconstrained optimization using gradient method, Newton-Gauss method and Levenberg-Marquardt method
4.Radial basis function approximation
5.Projective basis function approximation
6.Mean field approximation for integer programming
7.Kullback-Leibler divergence minimization for constrained optimization
8.Expectation maximization for mixed integer programming
9.Numerical simulations for physical-like annealing

資源需求評估（師資專長之聘任、儀器設備的配合・・・等）
Resources Required (e.g. qualifications and expertise, instrument and equipment, etc.)

1.一人一機電腦教室、C語言軟體、MATLAB軟體
2.本系專、兼任教師

Computer room, C compiler, MATLAB package and toolboxes

課程要求和教學方式之建議
Course Requirements and Suggested Teaching Methods

演講、電腦實習、習題、考試
Lectures, programming exercises, homework and tests

其他
Miscellaneous

撰寫人：應用數學系 吳建銘
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