


**國立東華大學**  
**教學計劃表 Syllabus**

|                                                                                                                       |                                                                                                                                |                             |    |                                    |                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----|------------------------------------|------------------------------------------------------------------------------------------|
| 課程名稱(中文)<br>Course Name in Chinese                                                                                    | 應用隨機過程                                                                                                                         |                             |    | 學年/學期<br>Academic Year/Semester    | 114/1                                                                                    |
| 課程名稱(英文)<br>Course Name in English                                                                                    | Applied Stochastic Processes                                                                                                   |                             |    |                                    |                                                                                          |
| 科目代碼<br>Course Code                                                                                                   | AM__74100                                                                                                                      | 系級<br>Department & Year     | 博士 | 開課單位<br>Course-Offering Department | 應用數學系                                                                                    |
| 修別<br>Type                                                                                                            | 選修 Elective                                                                                                                    | 學分數/時間<br>Credit(s)/Hour(s) |    | 3.0/3.0                            |                                                                                          |
| 授課教師<br>Instructor                                                                                                    | /謝思民                                                                                                                           |                             |    |                                    |                                                                                          |
| 先修課程<br>Prerequisite                                                                                                  |                                                                                                                                |                             |    |                                    |                                                                                          |
| 課程描述 Course Description                                                                                               |                                                                                                                                |                             |    |                                    |                                                                                          |
| Discrete and continuous time Markov chains, including Poisson process, birth and death process as special cases.      |                                                                                                                                |                             |    |                                    |                                                                                          |
| 課程目標 Course Objectives                                                                                                |                                                                                                                                |                             |    |                                    |                                                                                          |
| 此為應用機率模型的後續課程 介紹較為深入的隨機過程模式<br>A continuation of applied probability models. Selected topics on stochastic processes. |                                                                                                                                |                             |    |                                    |                                                                                          |
| 系專業能力<br>Basic Learning Outcomes                                                                                      |                                                                                                                                |                             |    |                                    | 課程目標與系專業能力相關性<br>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。<br>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。<br>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                                                |                                                                                                                                |                             |    |                                    |                                                                                          |
| 授課進度表 Teaching Schedule & Content                                                                                     |                                                                                                                                |                             |    |                                    |                                                                                          |
| 週次Week                                                                                                                | 內容 Subject/Topics                                                                                                              |                             |    |                                    | 備註Remarks                                                                                |
| 1                                                                                                                     | Discrete time Markov chains. Definitions and basic properties.                                                                 |                             |    |                                    |                                                                                          |
| 2                                                                                                                     | Examples. Class structure.                                                                                                     |                             |    |                                    |                                                                                          |
| 3                                                                                                                     | Hitting times and absorption probabilities.                                                                                    |                             |    |                                    |                                                                                          |
| 4                                                                                                                     | Strong Markov property. Recurrence and transience, random walks.                                                               |                             |    |                                    |                                                                                          |
| 5                                                                                                                     | Invariant distributions.                                                                                                       |                             |    |                                    |                                                                                          |
| 6                                                                                                                     | Convergence to equilibrium.                                                                                                    |                             |    |                                    |                                                                                          |
| 7                                                                                                                     | Time reversal.                                                                                                                 |                             |    |                                    |                                                                                          |
| 8                                                                                                                     | Ergodic theorem.                                                                                                               |                             |    |                                    |                                                                                          |

|    |                                                                                            |  |
|----|--------------------------------------------------------------------------------------------|--|
| 9  | 期中考試週 Midterm Exam                                                                         |  |
| 10 | Exponential races.                                                                         |  |
| 11 | Poisson process.                                                                           |  |
| 12 | Poisson process.                                                                           |  |
| 13 | Birth process. Birth and death process.                                                    |  |
| 14 | Jump chain and holding times.                                                              |  |
| 15 | Forward and backward equations.                                                            |  |
| 16 | Class structure. Hitting times and absorption probabilities.<br>Recurrence and transience. |  |
| 17 | Invariant distributions. Convergence to equilibrium. Time reversal.<br>Ergodic theorem.    |  |
| 18 | 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:

### 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 Industry-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:

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| 學期成績計算及多元評量方式 Grading & Assessments                                                                                                                                                                                                                                                                              |                    |                    |          |          |          |          |          |          |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|----------|----------|----------|----------|----------|----------|----|
| 配分項目<br>Items                                                                                                                                                                                                                                                                                                    | 配分比例<br>Percentage | 多元評量方式 Assessments |          |          |          |          |          |          |    |
|                                                                                                                                                                                                                                                                                                                  |                    | 測驗<br>會考           | 實作<br>觀察 | 口頭<br>發表 | 專題<br>研究 | 創作<br>展演 | 卷宗<br>評量 | 證照<br>檢定 | 其他 |
| 平時成績(含出缺席)<br>General Performance<br>(Attendance Record)                                                                                                                                                                                                                                                         |                    |                    |          |          |          |          |          |          |    |
| 期中考成績 Midterm Exam                                                                                                                                                                                                                                                                                               | 20%                |                    |          |          |          |          |          |          |    |
| 期末考成績 Final Exam                                                                                                                                                                                                                                                                                                 | 30%                |                    |          |          |          |          |          |          |    |
| 作業成績 Homework and/or<br>Assignments                                                                                                                                                                                                                                                                              | 50%                |                    |          |          |          |          |          |          |    |
| 其他 Miscellaneous<br>(_____)                                                                                                                                                                                                                                                                                      |                    |                    |          |          |          |          |          |          |    |
| 評量方式補充說明<br>Grading & Assessments Supplemental instructions                                                                                                                                                                                                                                                      |                    |                    |          |          |          |          |          |          |    |
|                                                                                                                                                                                                                                                                                                                  |                    |                    |          |          |          |          |          |          |    |
| 教科書與參考書目(書名、作者、書局、代理商、說明)<br>Textbook & Other References (Title, Author, Publisher, Agents, Remarks, etc.)                                                                                                                                                                                                       |                    |                    |          |          |          |          |          |          |    |
| Main references:<br>1. "Markov chains" by J.R.Norris, Cambridge University Press.<br>2. "Stochastic processes" by S.M.Ross, John Wiley & Sons<br>3. "Introduction to probability models" by S.M.Ross, Academic Press.<br>4. 'A first course in stochastic processes" by S.Karlin and H.M.Taylor, Academic Press. |                    |                    |          |          |          |          |          |          |    |
| 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)<br>Teaching Aids & Teacher's Website(Including online teaching information.<br>Personal website can be listed here.)                                                                                                                                                            |                    |                    |          |          |          |          |          |          |    |
|                                                                                                                                                                                                                                                                                                                  |                    |                    |          |          |          |          |          |          |    |
| 其他補充說明 (Supplemental instructions)                                                                                                                                                                                                                                                                               |                    |                    |          |          |          |          |          |          |    |
|                                                                                                                                                                                                                                                                                                                  |                    |                    |          |          |          |          |          |          |    |