


**國立東華大學**  
**教學計劃表 Syllabus**

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| 課程名稱(中文)<br>Course Name in Chinese                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 時間序列AB                                                                                                                                       |                             |    | 學年/學期<br>Academic Year/Semester    | 115/1                                                                                    |
| 課程名稱(英文)<br>Course Name in English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Series                                                                                                                                  |                             |    |                                    |                                                                                          |
| 科目代碼<br>Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | AM_3260AB                                                                                                                                    | 系級<br>Department & Year     | 學三 | 開課單位<br>Course-Offering Department | 應用數學系                                                                                    |
| 修別<br>Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 學程 Program                                                                                                                                   | 學分數/時間<br>Credit(s)/Hour(s) |    | 3.0/3.0                            |                                                                                          |
| 授課教師<br>Instructor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | /黃灝勻                                                                                                                                         |                             |    |                                    |                                                                                          |
| 先修課程<br>Prerequisite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | /#統計學                                                                                                                                        |                             |    |                                    |                                                                                          |
| 課程描述 Course Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                              |                             |    |                                    |                                                                                          |
| This course delves into the fundamental principles and advanced techniques of time series analysis, aiming to equip students with the ability to analyze, forecast, and interpret time series data. By combining theoretical learning with practical application, students will gain a comprehensive understanding of time series analytical methods. The course integrates theoretical lectures with case study analyses, aiming to enhance students' critical thinking abilities and problem-solving skills. It is suitable for students or professionals in the fields of statistics, economics, and finance. Through this course, students will be able to independently conduct analysis and forecasting of time series data and apply the knowledge in various practical applications. |                                                                                                                                              |                             |    |                                    |                                                                                          |
| 課程目標 Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                              |                             |    |                                    |                                                                                          |
| 介紹時間序列統計分析方法及相關應用<br>Introduction of the linear time series models and their applications to the modeling and prediction of data collected sequentially in time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                              |                             |    |                                    |                                                                                          |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 具備基本數學知識及邏輯推理能力。Have well-founded background in mathematics and be capable of logical reasoning.                                             |                             |    |                                    | ●                                                                                        |
| B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 具備學習數學相關領域的預備知識。Be knowledgeable about fields related to mathematics.                                                                        |                             |    |                                    | ●                                                                                        |
| C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 具備軟體應用與科學計算能力。<br>Be able to use mathematics software and scientific computation skill in problem-solving.                                   |                             |    |                                    | ●                                                                                        |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Introduction                                                                                                                                 |                             |    |                                    |                                                                                          |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Autocorrelation and Partial Autocorrelation Functions                                                                                        |                             |    |                                    |                                                                                          |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Autocorrelation and Partial Autocorrelation Functions<br>Estimation in Stationary Time Series                                                |                             |    |                                    |                                                                                          |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Estimation in Stationary Time Series (Autoregressive Moving Average Model)<br>Parameter Estimation and Central Limit Theorem for AR(p) Model |                             |    |                                    |                                                                                          |

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| 5  | Estimation in Stationary Time Series (Autoregressive Moving Average Model)<br>Parameter Estimation and Central Limit Theorem for AR(p) Model |  |
| 6  | Nonstationary process<br>Autoregressive-integrated Moving Average Model (ARIMA)<br>Seasonal ARMA Models                                      |  |
| 7  | Nonstationary process<br>Autoregressive-integrated Moving Average Model (ARIMA)<br>Seasonal ARMA Models                                      |  |
| 8  | Autoregressive Conditionally Heteroscedastic Model<br>Threshold Models, Vector ARIMAX                                                        |  |
| 9  | 期中考試週 Midterm Exam                                                                                                                           |  |
| 10 | Midterm Exam Review                                                                                                                          |  |
| 11 | State Space Models (I)                                                                                                                       |  |
| 12 | State Space Models (II)                                                                                                                      |  |
| 13 | State Space Models (III)                                                                                                                     |  |
| 14 | Other topics: Recurrent Neural Network Model                                                                                                 |  |
| 15 | Other topics: Long Short-Term Memory                                                                                                         |  |
| 16 | Presentation                                                                                                                                 |  |
| 17 | 期末考試週 Final Exam (Presentation)                                                                                                              |  |

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| 彈性<br>教學<br>規劃<br>Flexible<br>Teaching<br>Plan | <p>請勾選(至少需勾選1 個項目):<br/>Please tick the box(es). (At least one item is required.):</p> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><input type="checkbox"/> 問題討論 Problem-based Discussion</div> <div><input checked="" type="checkbox"/> 翻轉教學 Flipped Classroom</div> <div><input type="checkbox"/> 展演實作 Performance / Practical Presentation</div> <div><input type="checkbox"/> 校外參訪 Off-campus Visit</div> <div><input type="checkbox"/> 講座活動 Lecture / Seminar</div> <div><input type="checkbox"/> 線上作業 Online Assignments</div> <div><input checked="" type="checkbox"/> 自主學習 Self-directed Learning</div> <div><input checked="" type="checkbox"/> 課業輔導 Academic Support</div> <div><input type="checkbox"/> 實驗操作 Experiment Operation</div> <div><input type="checkbox"/> 遠距教學(同步) Distance Learning (Synchronous)</div> <div><input type="checkbox"/> 遠距教學(非同步) Distance Learning (Asynchronous)</div> <div><input type="checkbox"/> 其他(請填寫) Others (Please specify.):</div> </div> <p style="margin-top: 10px;">備註: 本校學期週數自115 學年度起調整為17 週, 為符合1學分18 小時之原則, 請教師規劃安排彈性教學。<br/>Note: From the 115th academic year, the semester will be 17 weeks. Please include flexible teaching activities to meet the required 18 hours per credit.</p> |
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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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |                    |          |          |          |          |          |          |    |
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| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 40%                | ✓                  |          |          |          |          |          |          |    |
| 期末考成績 Final Exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 60%                |                    | ✓        |          | ✓        |          |          |          |    |
| 作業成績 Homework and/or<br>Assignments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |                    |          |          |          |          |          |          |    |
| 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.) <p>Analysis of Financial Time Series, by Ruey S. Tsay Publisher: Wiley Time Series Analysis : Univariate and Multivariate Methods Author: William W.S. Wei Publisher: Pearson Addison Wesley Reference: The Econometrics of Financial Markets, by Campbell, Lo and MacKinlay Publisher: Princeton University Press Time Series Analysis, by James D. Hamilton Publisher: Princeton University Press Time Series: Theory and Methods, 2nd ed., by Brockwell and Davis Publisher: Springer-Verlag Time Series Analysis and Its Applications: with R examples Authors: R. H. Shumway and D. S. Stoffer Publisher: Springer</p> |                    |                    |          |          |          |          |          |          |    |
| 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)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                    |          |          |          |          |          |          |    |