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**Department of Statistics**

**College of administration and Economics**

**University of Salahaddin-Hawler**

**Subject: Time Series**

**Course Book – 3st Year**

**Lecturer's name: Amira Wali Umer**

**Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | **Time Series**  |
| **2. Lecturer in charge** | **Dr. Nabeel George Nacy** |
| **3. Department/ College** | **Statistics and informatics/Administration and Economics** |
| **4. Contact** | **e-mail:** **nabeel.sulaiman@su.edu.krd** |
| **5. Time (in hours) per week**  | **Theory: 3****Practical: N/A**  |
| **6. Office hours** | **Monday: 8:30-10:30 & Monday:10:30-12:30** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **I obtained a bachelor’s degree (1976), a master’s degree (1991) and a doctorate (2001) in statistics from the University of Baghdad, in addition to a higher diploma in applied statistics from the Arab Institute for Statistical Research (1979). I supervised two masters’ and one doctoral theses in statistics. I discussed more than 30 master's theses and 20 Ph.D. I has evaluated more than 50 scientific research and participated in several local and Arab scientific conferences** |
| **9. Keywords** | **Stationary , AR , MA , ARIMA**  |
| **10. Course overview:**  **Data obtained from observations collected sequentially over time are extremely common. In business, we observe weekly interest rates, daily closing stock prices, monthly price indices, yearly sales figures, and so forth. In meteorology, we observe daily high and low temperatures, annual precipitation and drought indices, and hourly wind speeds. In agriculture, we record annual figures for crop and livestock production, soil erosion, and export sales. In the biological sciences, we observe the electrical activity of the heart at millisecond intervals. In ecology, we record the abundance of an animal species. The list of areas in which**[**time series**](http://moodle.su.edu.krd/adminecon/mod/resource/view.php?id=870)**are studied is virtually endless. The purpose of**[**time series**](http://moodle.su.edu.krd/adminecon/mod/resource/view.php?id=870)**analysis is generally twofold: to understand or model the stochastic mechanism that gives rise to an observed series and to predict or forecast the future values of a series based on the history of that series and, possibly, other related series or factors** |
| **11. Course objective:** **There are two main goals of time series analysis: identifying the nature of the phenomenon represented by the sequence of observations, and forecasting (predicting future values of the time series variable)** |
| **12. Student's obligation****Students should be follow these requirement sin the class:** **They have to come to the class on time.****They have to bring their lectures to the class every day.****If any student misses the quiz, he or she will get zero.****They have to bring their homework on time.** |
| **13. Forms of teaching** **This lessons use several methods of teaching such as PowerPoint presentation to show the underline headings and using white board as well. Sometimes, student will be asking to discuss and share their ideas on this filed during the lecture with participating his/her classmates. From the beginning of the course, a hand out of the lecture will be given to the students to see what they are studying during this course.** |
| **14. Assessment scheme****Midterm exam: 20 % marks.****Class assignments & quizzes: there will be weekly class assignments and quizzes;20 % marks.****There will be extra assignments, which give the students extra marks.****Final exam: 60 % marks**.**The examination schedule will be announced by the exam board of the department of statistics**. |
| **15. Student learning outcome:*** **Stationary.**
* **Explain differencing**
* **Explain trend, seasonality, cyclical irregularity .**
* **Durbin Watson test.**
* **Describe and use difference and lag operators.**
* **Explain and interpret AR models.**
* **Explain and interpret MA models.**
* **Explain and interpret ARMA models**
* **evaluate stationary in time series.**
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| **16. Course Reading List and References‌:****Box, G.E.P. Jenkins G.M.(2014): “ Time Series Analysis Forecasting and Control ”, San Francisco, Holden day, U.S.A.****Hamilton, James. D. (2018): “ Time Series Analysis ”, published by prniction university press, U.S.A.****Montgomery, Douglas C. ; Jennings, Cheryl L. ; Kulahci, Murat (2008): “ Introduction to time series Analysis and Forecasting”, Hoboken, New jersey , U.S.A.** |
| **17. The Topics:** | **Lecturer's name** |
| **Chapter one:** **1.1 Stationary** **1.2** **Strict stationary or strong stationary process:****1.3 Weakly stationary****1.4 Non-stationary****Chapter two:** **2.1** **Auto regressive model (AR(p))****2.2** **Moving average model MA(q)****2.3** **Moving Average Integrated MAI(q,d)****2.4** **Auto Regressive\_ Moving Average Model (ARMA(p,q))****2.5 Properties of Autoregressive-Moving Average (ARMA) models****Chapter three**:**3.1 Auto-Regressive Integrated Moving Average (ARIMA)****3.2 Some of the types of nonseasonal ARIMA models****3.3 ARIMA Modelling****Chapter four**:**4.1 Seasonal Auto-Regressive Integrate Moving average****4.1.1 Differencing****4.1.2 Seasonal ARIMA Model****4.1.3 Identifying a Seasonal Model** | Dr. Nabeel G. Nacy**Weeks 1 – 2****Weeks 3-7****Weeks 8-11****Weeks 11-15** |
| **18. Practical Topics (If there is any)** |  |
| **Q1//** Discuss the **stationary** of $$z\_{t}=e\_{1}+e\_{2}+e\_{3}+…+e\_{t}=\sum\_{j=1}^{t}e\_{j}$$Where ($e\_{j}$) is a sequence of uncorrelated random variable with mean zero and variance $δ^{2}$.**Q2//** A series of air temperature measured on different days of the month.

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| $$Y\_{t}$$ | **35** | **38** | **42** | **41** | **40** | **39** | **40** | **41** | **40** | **42** |

Find $r\_{1}$ for the values of air temperature data.**Q3//** what are properties (mean and variance) for **AR (2)?** |
| **20. Extra notes:****Final exam will be determined by the exam board of the college.****Notice that, this syllabus may be subject to changes; we may take either longer or shorter time to finish them.** |
| **21. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ**   |