جامعة: المنصـــورة
كـــلية : العلـــوم
قسم / الرياضيـــات

١ - بيانات المقرر		
كود المادة : Math 435	اسم المقرر : Time Series & Forecasting	المستوى: الرابع
التخصص : الإحصاء وعلوم الحاسب	عدد الوحدات الدراسية: ٢ ساعة معتمدة نظرى ٢: تمارين: ١ عملى: ٠	

٢ - هدف المقرر:	**For students undertaking this course, the aims are to:** - Introduce the principle of theory, methods and applications of analyzing time series data
٣ - المستهدف من التدريس المقرر:	
أ-المعلومات والمفاهيم:	**a- Knowledge and Understanding :** **On completing this course, students will be able to:** a1 - Understand the important features of a time plot. a2 - State the definitions of stationarity, the autocovariance and the autocorrelation functions for stationary time series models. a3 - Understand a time series model with deterministic trend and seasonality and a stochastic component, and know the methods for eliminating trend and seasonality. a4 - Understand autoregressive (AR), moving average (MA) and ARMA models, and evaluate their properties. a5 - Understand the parameter estimation methods for ARMA models. a6 - State the definition of an autoregressive integrated moving average model, evaluate its properties and understand the model-building steps
ب-المهارات الذهنية	**b- Intellectual Skills:** **On completing this course, students will be able to:** b1 - Distinguish between different types of time plot b2 -Distinguish between stationary and non-stationary time plot b3 - Apply the methods of elimination of trend and seasonality b4 - Distinguish between different types of ARMA models b5 - Apply the methods of forecasting
ج- المهارات المهنية الخاصة بالمقرر:	**c-Professional and Practical Skills:** **On completing this course, students will be able to:** c1 - Differentiate between different types of time series. c2 - Choose and classify ARMA models c3 - Critically calculate the autocovariance and autocorrelation for different models c4 - Apply the methods of forecasting
د- المهارات العامة :	**d-General and Transferable Skills:** **On completing this course, students will be able to:** d1 -Work effectively in a group d2 - Solve problems on a scientific basis d 3 - Collect and analyze the data d4 - Present the data in graphical form using IT methods d5 - management of self time, data knowledge d6 - Search for information
٤ - محتوى المقرر:	–Introductory definitions and examples. Simple descriptive techniques: time

plot; deterministic trend and seasonality –Time series as a stationary stochastic process: autocovariance and autocorrelation functions –Elimination of trend in the absence of seasonality: least squares estimation; smoothing by a moving average; differencing. Elimination of trend and seasonality: small trend method; classical decomposition; differencing at lag d –Development of AR(p) and MA(q) models in general and their detailed study for the case of p=1, q=1 . Introduction to ARMA models. –Estimation of the mean, and autocovariance and autocorrelation functions. Bartlett's formula . Approximate confidence bounds. –General ARMA process: Parameter redundancy; causality; invertibility –Model identification using the ACF and PACF. –Forecasting ARMA processes: one-step-ahead prediction ; m-step-ahead prediction –Estimation of parameters by moments, least squares and maximum likelihood methods. –Autoregressive integrated moving average (ARIMA) model: fitting ARIMA models; seasonal	
1-Lectures 2- Tutorial	٥- اساليب التعليم والتعلم:
The same as normal students, only skeletal disabilities are allowed in the Faculty of Science.	٦- أساليب التعليم والتعلم للطلاب ذوى القدرات المحدودة:
	٧- تقويم الطلاب :
1- Oral Exam. to assess a1-a6, b1-b5, c1-c4, d2 2- Final Exam to assess a1-a6, b1, b2, b4 3- Mid-Term Exam to assess a1-a3, b1-b3, c1	أ- الأساليب المستخدمة :
1- Oral Exam week 16 2- Final Exam week 16 3- Mid-Term Exam week 6	ب- التوقيت :
- Mid-Term Examination 10 - Final-Term Examination 80 - Oral Examination 10 - Practical Examination 0 Total 100%	ج- توزيع الدرجات :
	٨- قائمة الكتب الدراسية والمراجع :
1 - Department notes	أ- مذكرات:
1 - Brockwell, P.J and Davis, R.A, Time Series: Theory and Methods, 2nd edition, Springer, 1991 2 - Chatfield, C, The Analysis of Time Series: An Introduction, 6th edition, Chapman and Hall, 2004	ب- كتب ملزمة
1 - Brockwell, P.J and Davis, R.A, An Introduction to Time Series and Forecasting, 2nd edition, Springer, 2002	ج- كتب مقترحة :
	د- دوريات علمية أو نشرات..

مصفوفة المعارف والمهارات المستهدفة من المقرر الدراسى

المحتويات للمقرر	أسبوع الدراسة	المعارف الرئيسية	مهارات ذهنية	مهارات مهنية	مهارات عامة
Introductory definitions and examples. Simple descriptive techniques: time plot; deterministic trend and seasonality	1	a1	b1	c1	d2, d4, d5
Time series as a stationary stochastic process: autocovariance and autocorrelation functions	2	a2	b2	c1	d1, d6
Elimination of trend in the absence of seasonality: least squares estimation; smoothing by a moving average; differencing. Elimination of trend and seasonality: small trend method; classical decomposition; differencing at lag d	3-4	a3	b3	c1	d1, d2, d6
Development of AR(p) and MA(q) models in general and their detailed study for the case of p=1, q=1 . Introduction to ARMA models.	5-6	a4	b4	c2	d6
Estimation of the mean, and autocovariance and autocorrelation functions. Bartlett's formula . Approximate confidence bounds.	7	a4	b4	c2	d2, d6
General ARMA process: Parameter redundancy; causality; invertibility	8-9	a2, a4	b4	c2	d2, d6
Model identification using the ACF and PACF.	10	a4	b2, b4	c3	d1, d6
Forecasting ARMA processes: one-step-ahead prediction ; m-step-ahead prediction	11-12	a5	b5	c4	d1, d6
Estimation of parameters by moments, least squares and maximum likelihood methods.	13	a5	b5	c4	d1, d2, d6
Autoregressive integrated moving average (ARIMA) model: fitting ARIMA models; seasonal	14	a6	b5	c4	d6

أستاذ المادة : د/ فاتن عبد الله حافظ شيحه

رئيس مجلس القسم العلمي : ا.د.مجدى الياس فارس