**Department of Statistics & Operation Research**
**King Saud University**
**First Semester 1442**
**Stat 436 – Time Series Analysis**


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**Catalog Description**

| Week | Subjects |
|---|---|
| **1** | Meeting students, Course goals, expected knowledge after completing the course, explain methods of evaluating the student's performance |
| **2** | Introduction-examples of time series data- goals of time series analysis- measuring forecasting errors-choosing the appropriate method for forecasting- types of change in time series |
| **3** | Covariance function-autocorrelation function (importance – estimation)- form of the ACF for some cases (non-stationary series , oscillating series, seasonal series)- partial autocorrelation function- estimating the PACF |
| **4** | Time series operators (backshift operator, difference operator), using the difference operator for non-stationary series in the mean- variance stabilizing transformations-Box-Cox transformations |
| **5** | Stochastic time series models- meaning of linearity in regression models and in time series models-white noise process- stationarity of W.N. process- general linear process- invertibility formula- white noise formula- autoregressive processes (AR)- autoregressive process of order one (stationarity condition, ACF, PACF) |
| **6** | AR(2) (stationarity conditions, ACF, PACF)- general AR(p)- moving average processes (MA)- MA(1) (invertibility condition, ACF, PACF) |
| **7** | MA(2) (invertibility condition, ACF, PACF)- general MA(q)- ARMA(p,q) models- ARMA(1,1) model (stationarity condition, invertibility condition ACF, PACF)- integrated ARIMA(p,d,q) models |
| **8** | **Midterm exam** |
| 9 | Parameter estimation- moments method - estimating white noise variance- least squares method |
| 10 | Forecasting – minimum mean square error forecast- forecasting for AR(1), MA(1) , some results for the general ARMA(p,q), forecast error variance- constructing confidence limits for the forecasts-updating the forecasts |
| 11 | Box-Jenkins methodology- design and construction of forecasting model- model identification- choosing difference order- choosing model order- checking model validity- diagnostics- residual analysis- criteria for choosing the best model (AIC, BIC)- analysis of higher (lower) order models |
| 12 | Seasonal models- seasonal autoregressive models- moving average models- mixed seasonal models- multiplicative seasonal models |
| **Midterm exam 2/4/1442H from 7:00 to 8:30 PM** | |
| 13 | Applications of time series analysis in the lab. Handing over the data analysis project |
| 14 | Applications of time series analysis in the lab |
| 15 | Applications of time series analysis in the lab. Last date to hand over the project. |
| **Final exam 7/5/1442H at 13:00** | |

**Textbooks**

1- **Time Series Analysis, by J. Cryer and k. Chan (2008). Springer**
2- **The Analysis of Time Series, by C. Chatfield (2003). Chapman and Hall.**

**Grading**

Tutorial 10%
(attendance, participation, homework, short exams)
Midterm 20%

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|---|---|
| Homework and data analysis reports | 10% |
| Data analysis exam | 20% |
| Final Exam | 40% |

**Homework and exam policy**

Collaboration on homework assignments is encouraged. You may consult outside reference materials, other students, the instructor, or anyone else. There is one restriction: you must write, type, or otherwise record your answers yourself, alone, so that your homework reflects your understanding. No late homework or make-up exams without prior approval; penalties may apply. For the data analysis exam, every student should work separately, any two reports the look alike will be dismissed.