STAT 523 - Forecasting
Term 242 Syllabus

Instructor: Dr. Mohammad H. Omar   **Office:** Bldg. 5-508.
E-mail: omarmh@kfupm.edu.sa. **(Not by Blackboard email)**   **Phone:** 2471
Office Hours: UTR: (12.30-1.40pm) or by appointment on MS Teams

Course Description: Time Series Basics; Autocorrelation; Modeling and forecasting with MA, AR, ARMA, ARIMA models; Seasonal and non-seasonal models; Model validation; Parameter selection; Smoothing and decomposition methods; Advanced forecasting methods, Multivariate models, State Space Models, ARCH and GARCH Models; projects using various software, toolboxes, and libraries like R, Scikit-Learn, and Statsmodels.

Prerequisite: STAT 503

Textbooks: *Main* **1**) Cryer, J. D. and Chan, K. (2009). Time Series Analysis with Applications in *R*, 2nd Edition, Springer, New York, USA.

2) Diebold, F. X. (2007). Elements of Forecasting. 4th Edition, Thomson, South-Western, Mason OH, USA.
References: handouts

Software: Main: *R* statistical language. Students are required to download *R* onto their laptop computers for assignments and practice. Instructions for downloading this free software is available on oneNote.
Also: Python's Statsmodels and SciKit-Learn.

Assessment
Assessment for this course will be based on homework and/or quizzes, term project, two major exams and a comprehensive final exam, as in the following:

Activity	Weight
Class Participation (Participation, Quizzes, and Assignments)	15%
Term Paper Project (Group of 3 – declare by 3rd week) **Due Tuesday (Apr 15 week 12)**	20%
MidTerm Exam (topics 1 through 3) **Tuesday (Feb 25 week 7), 6.45pm – 8.45pm**	30%
Final Exam (Comprehensive) **As announced by Registrar**	35%

IMPORTANT NOTE on GRADES: There is no quota on the number of students who can get an A+ grade.
Academic Integrity: All KFUPM policies regarding ethics and academic honesty apply to this course. KFUPM dress codes must also be observed whenever on campus.

Attendance: Students are expected to attend all class meetings.
- ➢ Attendance on time is very important. **More than 10 minutes late = Absence** (regardless of any excuse).
- ➢ If a student misses a class, he/she is responsible for any announcement made in that class.
- ➢ *Attendance* on time is *very* important. Mostly, attendance will be checked within the *first five minutes* of the class. Entering the class after that, is considered as late (**2 lates= 1 Absence**)
- ➢ According to University rules, after warned **twice** by the instructor, a DN grade will be awarded to any student who excessively accumulates
  - • 6 unexcused absences in lectures. (20%)
  - • 10 excused and unexcused absences in lectures. (33.3%)

➤ Only official excuse from KFUPM student affairs office will be accepted. All other excuses (medical centers, governmental offices, etc) are not.

The Usage of Mobiles in Class: Students are **not allowed** to use mobiles for any purpose during class time. Students who want to use electronic devices to take notes **must take permission** from their instructor. Violations of these rules will result in a **penalty** decided by the instructor.

Important Notes:
   ✓ Homework is due in class every Sunday a chapter is completely covered.
   ✓ A class quiz is often given at the end of the following week a chapter is completely covered.
   ✓ A formula sheet (check OneNote) and statistical tables will be provided for you in every exam.

Tentative weekly topical breakdown

week	start	end	topic	Diebold	CryerChan
1	12-Jan	16-Jan	1 Time Series Basics	Ch1: p.1-13	1.1 to 1.2
2	19-Jan	23-Jan	2 Autocorrelation		Ch 2
3	26-Jan	30-Jan	3 Modeling and forecasting with MA, AR, ARMA, ARIMA		Ch 4 & 5
4	2-Feb	6-Feb	(Continue) Forecasting with MA, AR, ARMA, ARIMA	Ch9	9.1,9.3-9.9
			Term paper data and topic due		
5	9-Feb	13-Feb	4.Seasonal and non-seasonal models;		Ch10
6	16-Feb	20-Feb	4. Seasonal and non-seasonal models; (Continue)		
7	25-Feb	25-Feb	5. Model validation		Ch 8
			Mid-Term (Feb 25 6.45pm- 8.45pm)		
8	2-Mar	4-Mar	6. Parameter selection		Ch7&S6.3
9	9-Mar	11-Mar	6. Parameter selection (Continue)		
10	16-Mar	18-Mar	7. Smoothing and decomposition methods	Ch10	
11	6-Apr	8-Apr	8. Multivariate models	Handout	
			Term paper due (Tues Apr 15)		
12	13-Apr	15-Apr	9. ARCH and GARCH Models		Ch 12
13	20-Apr	22-Apr	ARCH and GARCH (Continue)	Ch 14	
14	27-Apr	29-Apr	10. State Space Models	Handout	
15	4-May	6-May	State Space Models (Continue)		
16	11-May		Review		

Some tips to enhance your problem-solving skills:
   ❖ Do all homework assignments on time.
   ❖ Practice (but not memorize) more problems than those given in the above list.
   ❖ Solve some review exercises available at the end of each chapter.
   ❖ Solve the problems on your own before reading the solution or asking for help.
   ❖ If you find it difficult to handle a certain type of problems, you should try more problems of the same type.
   ❖ Try to make good use of the office hours of your instructor. Always bring your solution trials to discuss them with your instructor.

Homework

Hwk	questions		General Remark
1	CC Ch1: 1 and 4	Diebold Ch1: 1 and 4	Use package TSA
2	CC ch2: 5, 15, and 24		Use package TSA
3	CC ch4: 6, 14, and 19		Use package TSA
4	CC ch5: 2, 7 and 11		Use package TSA
5	CC ch9: 2, 12 and 22		Use package TSA
6	CC ch10: 2, 5, and 10		Use package TSA