



**King Fahd University of Petroleum & Minerals**  
College of Computer Sciences and Engineering  
Information and Computer Science Department

**ICS 583: Pattern Recognition (3-0-3)**

Syllabus – Spring Semester 2012-2013 (122)  
(Levels: Doctorate, Graduate-G1, Graduate-G2, Graduate, Pre-Graduate)

Website: Blackboard (WebCT) <http://webcourses.kfupm.edu.sa>

**Class Time, Venue and Instructor Information:**

Time	Venue	Instructor	Office Hours
UT 6:30-7:45pm	24/146	<b>Dr. EL-SAYED EL-ALFY</b> Office: 22-108 Phone: 03-860-1930 E-mail: <a href="mailto:alfy@kfupm.edu.sa">alfy@kfupm.edu.sa</a> , <a href="http://faculty.kfupm.edu.sa/ics/alfy">http://faculty.kfupm.edu.sa/ics/alfy</a>	Announced on Blackboard

**Course Catalog Description**

Various methods of pattern recognition, extraction methods, statistical classification, minmax procedures, maximum likelihood decisions, data structures for pattern recognition, case studies.

**Pre-requisites:** Consent of the Instructor

The course is designed to be self-sufficient. However, some previous experience with linear algebra, probabilities, programming in MATLAB or any other programming language is desirable.

**Course Objectives**

- Provide students with the fundamentals of pattern recognition to solve real-world problems.
- Expose students to hands-on experience and research skills to effectively apply pattern recognition techniques to real-world problems.

**Course Learning Outcomes**

Upon completion of the course, you should be able to:

1. Recognize the nature and inherent difficulties of the pattern recognition problems.
2. Explain concepts, principles, trade-offs, and techniques of major topics in pattern recognition.
3. Select suitable pattern recognition technique and effectively apply it to solve real-world problems.
4. Design and implement pattern recognition algorithms using a programming language (e.g. MATLAB, C/C++/C#, and Java).
5. Properly interpret and communicate the results clearly and concisely using pattern recognition terminology.

**Required Material**

- R. O. Duda, P. E. Hart, and D. G. Stork, Pattern Classification, 2/E. Wiley, 2001.  
» [Download the Pattern Classification Toolbox software](#)
- Lecture Handouts



## Other Recommended References

- C. M. Bishop. Pattern Recognition and Machine Learning, Springer, 2006.
- S. Theodoridis, K. Koutroumbas and K. Koutroumbas. Pattern Recognition, 4/E, Academic Press, 2008.
- S. Theodoridis, A. Pikrakis, K. Koutroumbas and D. Cavouras. Introduction to Pattern Recognition: A Matlab Approach, Academic Press, 2010.
- Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press 2012.
- For some topics, research papers, tutorials, etc. will be used.

## Assessment Plan

Assessment Tool	Weight
<b>Class work:</b>	<b>25%</b>
Homework assignments	8
Quizzes	10
Presentations	4
Active participation in Blackboard discussions/blogs	3
<b>Term Project</b>	<b>35%</b>
Project proposal	3
Survey and review of related work	7
Project report + Presentation + Prototype demo	25
<b>Midterm</b> (8th Week, Tues.)	<b>15%</b>
<b>Final Exam</b>	<b>25%</b>

## Tentative Topics

#	Topics	Ref. selected topics	Additional Activities
1	Introduction to pattern recognition	Ch. 1	
2	Review of probability theory and linear algebra	Notes, App. A	
3	Statistical pattern recognition and Bayesian decision theory	Ch.2	
4	Maximum likelihood and Bayesian parameter estimation	Ch. 3	
5	Nonparametric techniques	Ch. 4	
6	Decision trees	Ch. 8	
7	Linear discriminant functions	Ch. 5	
8	Machine learning: Neural networks	Ch. 6	
9	Classifier combination	Ch. 9	
10	Feature selection	Notes	
11	Unsupervised machine learning: Clustering and K-means	Ch. 10	
12	Other techniques and case studies (as time permits)	Notes	

## Course Policies

- **Course website & participation:** Students are required to periodically check the course website and download course material as needed. Several resources will be posted through the website as well. Blackboard will be used for communication and interaction, posting and submitting assignments, posting grades, posting sample exams, etc. It is expected that you get benefit from the discussion board by raising questions or answering questions put by others.
- **Attendance:** Attendance is a university requirement; hence it will be checked at the beginning of each lecture. Late arrivals will disrupt the class session. Hence, two late attendances will be considered as one absence. Missing more than 6 unexcused lectures will result in a DN grade without prior warning. To avoid being considered as absent, an official excuse must be shown no later than one week of returning to classes.
- **No makeup of any assessment activity including homework, quizzes or exams.**
- **Re-grading policy:** If you have a complaint about any of your grades, discuss it with the instructor no later than a week of distributing the grades (except for the final which should be before disclosing grades on the announced date). Only legitimate concerns on grading should be discussed.
- **Term project:** More information will be posted in WebCT later.
- **Office hours:** Students are encouraged to use the office hours to clarify any part of the material that is not clear; however the instructor will only provide hints if it is an assigned task but not solve it.
- **Academic honesty:** Students are expected to abide by all the university regulations on academic honesty. Cheating will be reported to the Department Chairman and will be severely penalized. Although collaboration and sharing knowledge is highly encouraged, copying others' work without proper citation, either in part or full, is considered plagiarism. Whenever in doubt, review the university guidelines or consult the instructor. Cheating in whatever form will result in F grade.
- **Courtesy:** Students are expected to be courteous toward the instructor and their classmates throughout the duration of this course. Talking while someone else is speaking will not be tolerated. Furthermore, all cell phones must be turned off during class and exams. In addition, students are expected to be in class on time. More importantly, you are not allowed to leave the class unless it is an urgent matter. To contact your instructor, please use email through Blackboard whenever possible and avoid using phone calls or written notes.

☺☺☺ **Best luck!!** ☺☺☺