	VIETNAM NATIONAL UNIVERSITY OF HO CHI MINH CITY UNIVERSITY OF NATURAL SCIENCES **FACULTY OF INFORMATION TECHNOLOGY**

COURSE SYLLABUS

Course Code: TH304

Title: Pattern Recognition

Credits: 5

Workload:

Lecture hours:	**3** periods * **15** weeks = **45** periods
Laboratory hours:	**2** periods * **15** weeks = **30** periods
Preparative hours:	**3** periods * **15** weeks = **45** periods

Prerequisites: TH112 – Artificial Intelligence

TH109 – Computer Graphics

TH303 – Digital Image Processing

Probability and Statistics

Course Objectives:

This subject aims at providing the students with the basic knowledge of pattern recognition. The knowledge which the students will obtain in this stage is the foundation of reasoning as well as the practical applications in some particular recognition problems: on-line/off-line character recognition, speech recognition, digital signal processing, etc. Illustrated throughout the course is the use of mathematical apparatus of probability theory and mathematical statistics, optimal decision theory, heuristic algorithms and artificial intelligent principles.

Main Text: N/A

References:

- *Digital Image Processing*
  Rafael C. Gonzalet, Richard E. Woods, Addision – Wesley Publishing, 1994.
- Richard O. Duda, Peter E. Hart, and David G. Stork - *Pattern Classification 2nd Edition* - Wiley 2004
- David G. Stork, Elad Yom-Tov - *Computer Manual in MATLAB to Accompany Pattern Classification*, 2nd Edition, 2004

Course Outline:

Chapter 1 : Basic concepts about probability theory and statistics

1. Probability and conditional probability – Bayes formula
2. Distribution laws, distribution function, density probability function

3. Mode, median, expect, variant, and covariant

Chapter 2: Bayesian Decision Theory

1. Introduction
2. Minimum-Error-Rate Classification)
3. Classifiers), Discriminant Functions and Decision Surfaces
4. The Normal Density
5. Discriminant Function for the Normal Density
6. Discrete Features

Chapter 3: Maximum-Likelihood & Bayesian Parameter Estimation

1. Introduction
2. Maximum-Likelihood Estimation (MLE)
3. Bayesian Estimation - BE
    a. Bayesian Parameter Estimation: Gaussian Case
    b. Bayesian Parameter Estimation: General Estimation
4. Computational Complexity
5. Hidden Markov Model
6. Hidden Markov Model: Extension of Markov Chains

Chapter 4: Non-Parametric Classification

1. Introduction
2. Density Estimation
3. Parzen Window
4. K – Nearest Neighbor Estimation
5. The Nearest-Neighbor Rule

Chapter 5: Linear Discriminant Functions

1. Introduction
2. Linear discriminant functions and decision surfaces
3. Generalized linear discriminant functions

Chapter 6: Multilayer Neural Networks

1. Introduction
2. Feedforward Operation and classification
3. Backpropagation Algorithm

Grading Final exam :

Assignments: