

## SUBJECT DESCRIPTION FORM

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Subject title:     Advanced and Research Topics in Biometric Computing

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Subject code:    COMP 6827

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Credit value:    3

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Responsible staff and department:

David Zhang (COMP)

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Pre-requisite:

COMP419: Fundamentals of Multimedia Computing or equivalent  
COMP559: Information Security: Technologies and Systems

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Recommended background knowledge:

Basic knowledge in pattern recognition, image processing, probability theory, artificial intelligence, fuzzy logic.

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Mutual exclusions: Nil

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Learning approach:

In today's complex, geographically mobile, increasingly electronically wired information society, the problem of verifying an individual's identity continues to pose a great challenge. Conventional technology using Personal Identification Numbers (PIN) or passwords, often in conjunction with plastic cards, is neither convenient nor particularly secure. In the quest for a superior solution, it is necessary to develop information security. It covers many related technologies and systems, such as software and hardware security. Biometrics verification techniques are fast emerging as the most reliable and practical method of individual identity verification.

This is a guided reading course that requires covering research material and working on a specific problem in biometrics: technologies and systems. The primary requirement for the completion of this course will be a project which will include the survey and analysis of the problem domain, reporting the progress on a regular basis and presenting the methods and techniques for the possible solutions proposed. Meetings will be held with the instructor in order to discuss the direction of the project, the survey material, identify potential problems, solution, analysis and results. Students will give periodic oral presentations for the three stages of the course progress (1) background, problem identification and proposed direction of research, (2) midterm progress report and (3) final analysis and results. Students are expected to search and survey research papers, conduct analysis, and give oral presentations. Upon the completion of the course students will submit a written report on the project conducted and give an oral presentation.

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Assessment:

Continuous Assessment	45%
Examination	55%

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Objectives:

- Provide a basis for research work on biometrics.
  - Guidance and training for critical analysis of research papers.
  - Enhance technical writing and oral presentation skills.
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Keyword syllabus:

Current research topics include the following:

- Biometrics
- Personal Identification
- Information Fusion
- Combined classifiers
- Neural network

*Basic Concept: Biometrics*

Why biometrics? What is biometrics? Which support is biometrics based on? How is biometrics applied? Where will be biometrics used? Biometrics in living body, including human head & face, the mechanism of human eye, hand & skin characteristics, personal voice & sound, and habitual behaviors.

*Common Biometrics Techniques*

Biometrics data acquisition and biometrics database. The related image processing and pattern recognition technologies, including digital image and signal representation, pattern extraction and classification. Basic approaches of automated biometrics identification and verification.

*Typical Physical Biometrics*

Basic physical characteristics of biometrics, and some basic introduction of physical biometrics systems (such as fingerprint, palm-print, finger, hand, face, iris, and face, as well as dental, DNA, and retina recognition). Fingerprint system is given in detail.

*Typical Behavioral Biometrics*

Behavioral biometrics characteristics and basic introduction of basic behavioral biometrics systems (including voice, signature, gesture recognition, knowledge-based recognition, and keyboard-input-based recognition). Voice system is explained in detail.

Indicative reading list and references:

- D. Zhang (ed.), 2002, *Biometrics Solutions for Authentication in an e-World*, Kluwer Academic Publishers, USA, 449pp, 2002, ISBN 1-4020-7142-6.
- D. Zhang, 2000, *Automated Biometrics: Technologies & Systems*, Kluwer Academic Publishers, USA, 331pp, 2000, ISBN 0-7923-7856-3.
- IEEE Transactions on Pattern Analysis and Machine Intelligence
- IEEE Transactions on Image Processing
- IEEE Transactions on System Man and Cybernetic
- IEEE Transactions on Neural Networks
- IEEE Transactions on Signal Processing
- IEE Vision, Image and Signal Processing, IEE Proceedings
- Pattern Recognition and Pattern Recognition Letters
- Pattern Recognition and Artificial Intelligence
- Image and Vision Computing