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**CSE 402: Biometrics and Pattern Recognition**  
**Fall 2021**  
**Department of Computer Science and Engineering**  
**Michigan State University**

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**Note:**

1. Some lectures will be conducted online while others will be in-person at the designated classroom
2. In-person lectures will be announced at least two days in advance of the lecture
3. Online lectures will be conducted using Zoom: <https://msu.zoom.us/j/92405512229> (cse402)
4. Exams will be conducted in-person
5. D2L Link for the course: <https://d2l.msu.edu/d2l/home/1383935>

**Prerequisites:**

CSE 331 and STT 351: A basic knowledge of statistics, linear algebra, and programming is expected. A background in image processing will be helpful, but not required. Please contact the instructor if you have any questions.

**Lecture Details:**

Time: Monday and Wednesday, 12:40pm – 2:00pm

Some lectures will be online, and others will be in-person

For online lectures, use the following link: <https://msu.zoom.us/j/92405512229> (cse402)

**Instructor and Office Hours:**

Dr. Arun Ross ([rossarun@cse.msu.edu](mailto:rossarun@cse.msu.edu))

Office Hours:

- Thursdays 11:00am – 12:00pm or by appointment only
- Office Hours Zoom Link: <https://msu.zoom.us/j/94084102289> (cse402)

**Textbook:**

**Introduction to Biometrics**, Jain et al, Springer 2011. ISBN: 978-0-387-77325-4.

**Recommended Reading:**

- **Handbook of Biometrics**, Jain et al., Springer
- **Guide to Biometrics**, Bolle et al., Springer.
- **Biometric Systems: Technology, Design and Performance Evaluation**, Wayman et al., Springer.
- **Handbook of Fingerprint Recognition**, Maltoni et al., Springer.
- **Handbook of Face Recognition**, Li and Jain, Springer.
- **Handbook of Multibiometrics**, Ross et al., Springer.

**Description:**

Biometrics refers to the science of recognizing humans by utilizing the physical (e.g., fingerprint, face, iris) or behavioral (e.g., gait, signature) traits of an individual. This course will discuss several of these traits and the automated techniques used for feature extraction and matching. The focus will be on automated face, fingerprint and iris recognition. The error metrics used to evaluate the performance of a biometric system will be discussed. Topics related to multimodal biometrics, protecting biometric templates, and biometric data privacy will also be presented. The programming projects will be geared toward implementing basic feature extraction and matching algorithms.

**Objectives:**

To equip students with a good knowledge of: (a) the design and working of a generic biometric system; (b) the features used to represent and match individual biometric traits; (c) the performance metrics used to evaluate a biometric system; (d) the socio-legal implications of biometrics. The concepts will be explained from a pattern recognition and image processing perspective.

**Course Topics:**

## (a) Introduction:

- What is Biometrics?
- History of Biometrics
- Applications
- Biometrics as a Pattern Recognition System
- Characteristics of a Biometric System

## (b) Performance Evaluation:

- Error Rates
- ROC, DET, CMC Curves

## (c) Feature Extraction and Matching:

- Fingerprint Recognition
- Face Recognition
- Iris Recognition

## (d) Other topics:

- Multibiometrics
- Security
- Privacy

**Grading:**

The tentative weight associated with each grading component is as follows:

- a. Homework – 30%
- b. Project – 45%
- c. Lab Exercise – 5%
- d. Exam/Quiz – 20%

Assignments and tests will be based on (a) topics covered during lectures, (b) PowerPoint files used in lectures, (c) contents of the textbook, and (d) reading material assigned by the instructor. Students are expected to take down notes during the lecture.

**Grading Policy:**

- Assignments have to be turned in D2L before lecture begins on the due date. Late assignments will not be accepted.
- Make-up for exams will only be granted under exceptional circumstances. Instructor reserves the right to deny requests for make-up.

## Grade Assignment:

The grading scheme will be as follows:

▪ 90-100	: 4.0
▪ 85-89	: 3.5
▪ 80-84	: 3.0
▪ 70-79	: 2.5
▪ 60-69	: 2.0
▪ 0-59	: 1.0

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## Academic Integrity:

Article 2.III.B.2 of the Academic Freedom Report states that "The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards." In addition, the Department of Computer Science and Engineering adheres to the policies on academic honesty as specified in General Student Regulations 1.0, Protection of Scholarship and Grades; the all-University Policy on Integrity of Scholarship and Grades; and Ordinance 17.00, Examinations. (See [Spartan Life: Student Handbook and Resource Guide](#))

Therefore, unless authorized by your instructor, you are expected to complete all course assignments, including homework, projects, quizzes, tests and exams, without assistance from any source. You are expected to develop original work for this course; for example, you may not submit course work you completed for another course to satisfy the requirements for this course. Students who violate MSU academic integrity rules may receive a penalty grade, including a failing grade on the assignment or in the course. Contact your instructor if you are unsure about the appropriateness of your course work. (See also the [Academic Integrity](#) webpage.)

Examples of academic dishonesty include (but are not limited to):

- Copying another student's code, assignment solutions or quiz/exam answers
- Using code implemented by someone else intended to solve this class's assignments (i.e., don't get someone else to do your assignment for you)
- Using code independently implemented by someone else without attributing credit (i.e., you can use tools, libraries, or code snippets from the web, but only with proper citation and with permission of the instructor where appropriate)
- Using websites and sources, whose purpose is to provide assignment solutions
- Distributing course content without instructor permission
- Providing false information to the instructor about matters related to the course.
- Facilitating another student in any of these activities.

## The Spartan Code of Honor Academic Pledge

*As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing that honor in ownership is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do.*

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