Course Approval Form

For approval of new courses and deletions or modifications to an existing course.

More information is located on page 2.

Action Requested:

- [X] Create new course
- [ ] Delete existing course
- [ ] Modify existing course (check all that apply)
  - [ ] Title
  - [ ] Prereq/coreq
  - [ ] Credits
  - [ ] Schedule Type
  - [ ] Repeat Status
  - [ ] Restrictions
  - [ ] Grade Type

Course Level:

- [ ] Undergraduate
- [X] Graduate

College/School: College of Science
Department: Forensics Science Program
Submitted by: Jason Kinser
Ext: 3-3785
Email: jkinser@gmu.edu

Subject Code: FRSC
Number: 580
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term:

- [ ] Fall
- [ ] Spring
- [X] Summer

Year 2011

Title:
Current:
Banner (30 characters max including spaces):
New: Image Analysis for Forensic Science

Credits: (check one)

- [X] Fixed: 3 or
- [ ] Variable: to

Repeat Status: (check one)

- [ ] Not Repeatable (NR)
- [X] Repeatable within degree (RD)
- [ ] Repeatable within term (RT)

Total repeatable credits allowed:

Grade Mode: (check one)

- [X] Regular (A, B, C, etc.)
- [ ] Satisfactory/No Credit
- [ ] Special (A, B C, etc. +IP)

Schedule Type Code(s): (check all that apply)

- [X] Lecture (LEC)
- [ ] Lab (LAB)
- [ ] Recitation (RCT)
- [ ] Internship (INT)
- [ ] Independent Study (IND)
- [ ] Seminar (SEM)
- [ ] Studio (STU)

Prerequisite(s):
Familiarity with linear algebra, complex numbers and spreadsheets.

Corequisite(s):

Special Instructions: (restrictions for major, college, or degree; cross-listed courses; hard-coding; etc.)

Catalog Copy for NEW Courses Only (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)
This course begins with an introduction to digital images, formats, and some pertinent processing techniques. Methods presented will include image enhancement, noise removal and frequency processing. The course will then explore modern techniques applied to several fields including: fingerprints, face images, tire treads, shoe prints, and other applications. Advanced topics in 3D imagery, tampering, and steganography will be explored.	

Indicate number of contact hours: Hours of Lecture or Seminar per week: 3 Hours of Lab or Studio:
When Offered: (check all that apply) [ ] Fall [X] Summer [ ] Spring

Approval Signatures

Department Approval Date

College/School Approval Date

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

For Graduate Courses Only

Graduate Council Member

Provost Office

Graduate Council Approval Date

Course Proposal Submitted to the COS Curriculum Committee

1. COURSE NUMBER AND TITLE:

FRSC 580 – Image Analysis for Forensic Science.

Course Prerequisites:

Familiarity with linear algebra, complex numbers and spreadsheets.

Catalog Description:

This course begins with an introduction to digital images, formats, and some pertinent processing techniques. Methods presented will include image enhancement, noise removal and frequency processing. The course will then explore modern techniques applied to several fields including: fingerprints, face images, tire treads, shoe prints, and other applications. Advanced topics in 3D imagery, tampering, and steganography will be explored.

2. COURSE JUSTIFICATION:

Course Objectives:

The objectives of this course are to introduce the students to digital images and the proper use of formats. Students will then learn several image processing techniques and apply them to several applications. Students will also be introduced to several modern techniques that will be beyond the ability of the class to implement.

Course Necessity:

Forensic science is a burgeoning field and images is just one of the manners in which evidence can be collected. Digital cameras have become cheap and the near future will see a dramatic increase in the use of surveillance cameras and digital photographs used in court. Mismanagement of images can destroy information and therefore it is necessary to understand the nature of digital images. Furthermore, processing techniques will become common place in the forensic sciences and it is necessary to understand what these techniques are and how they affect the images.

Course Relationship to Existing Programs:

The new Forensics program is rapidly growing with tremendous student interest. There is no course that emphasizes the proper use of images and the analysis of images. This course adds to the increasing number of information based forensic courses such as Forensic DNA and Biometrics.

Course Relationship to Existing Courses:

There are a few courses at GMU with overlapping topics. However, none of these courses are dedicated to the problems experienced in the forensic science field. Furthermore, these courses perform an in-depth study of certain topics but none of the courses cover a majority of the topics to be in the new course.

CS 482 - Computer Vision: This course considers basic image processing techniques and advanced topics in image analysis.

CS 682 - Computer Vision. Advanced version of CS 482

CS 686 - Image Processing and Applications: image enhancement, restoration, and encoding.

ECE 744 - Computer Vision and Expert Systems: Vision architectures, pattern recognition, and learning algorithms.

3. APPROVAL HISTORY: new course

4. SCHEDULING AND PROPOSED INSTRUCTORS:

Semester of Initial Offering:
Summer 2011

Proposed Instructors:
Jason Kinser

5. TENTATIVE SYLLABUS: See attached.

FRSC 580
Image Analysis for Forensic Science

-- SYLLABUS --

Prerequisites: Linear algebra, complex numbers, and a familiarity with spreadsheets
Credits: 3

Instructor: Jason M. Kinser

Office Hours: Since the course and the instructor's office are on different campuses office hours can be made by appointment.

Course Description:
This course is an introduction to methods used to manipulate images and to extract information from images within the context of forensic analysis.

Students will receive an introduction to digital image formats, color representation, and standard operators. Once the basics are reviewed the course will then consider several types of applications. Such applications include:

- Surveillance images
- Fingerprint images
- Face images
- Crime scene images (splatter, tire treads, shoe prints, etc.)

The course will end with advanced topics as time allows. Such topics include:

- Image tampering
- Steganography
- CBIR (Content based image retrieval)

Lecture Content: (Based on one lecture per week format)

1. Digital Images and Formats
2. Noise
3. Color
4. Photogrammetry
5. Frequency Based Analysis
6. Surveillance and Image Rectification
7. MIDTERM
8. Fingerprints
9. Face Images
10. Crime Scene Images: blood splatter, tire treads, shoe prints
11. Advanced Topic on Image Tampering
12. Advanced Topic on Steganography
13. Advanced Topic on CBIR
14. Advanced Topic on Virtual Crime Scenes

Homework:
The homework will be in two formats. When possible the students will be asked to analyze images either manually or through the use of a computer. In the latter case the students will be asked to perform analysis in a spreadsheet or provided software. When analysis is not feasible, homework will be in the form of questions and answers.

Project: NA

Exams:

The Midterm exam will be an in-class, closed book exam that will cover the topics in the previous weeks. The Final will be comprehensive and in the same format.

Grades:

30% Final

30% Midterm

20% Homework

20% Class Participation

Required Texts:

The material for this course is varied. While there are texts that are dedicated to traditional image analysis none have been identified that are dedicated to forensic problems with sufficient depth. Therefore, course material will consist of lecture notes, software written for this course, and examples from dedicated websites.