

# FLORIDA ATLANTIC UNIVERSITY™

## Graduate Programs—NEW COURSE PROPOSAL<sup>1</sup>

UGPC APPROVAL \_\_\_\_\_  
 UFS APPROVAL \_\_\_\_\_  
 SCNS SUBMITTAL \_\_\_\_\_  
 CONFIRMED \_\_\_\_\_  
 BANNER POSTED \_\_\_\_\_  
 CATALOG \_\_\_\_\_

DEPARTMENT: CEECS

COLLEGE: ENGINEERING AND COMPUTER SCIENCE

**RECOMMENDED COURSE IDENTIFICATION:**

PREFIX COT **6605** COURSE NUMBER ~~6605~~ LAB CODE (L or C) \_\_\_\_\_

(TO OBTAIN A COURSE NUMBER, CONTACT [MJENNIN@FAU.EDU](mailto:mjennin@fau.edu))

COMPLETE COURSE TITLE: MACHINE LEARNING FOR COMPUTER VISION

EFFECTIVE DATE \_\_\_\_\_  
 (This form course will be offered)

CREDITS<sup>2</sup>: 3

**TEXTBOOK INFORMATION:**

Prince [2012], *Computer Vision: Models, Learning, and Inference*, Cambridge University Press, ISBN: 978-1107011793

GRADING (SELECT ONLY ONE GRADING OPTION): REGULAR  SATISFACTORY/UNSATISFACTORY \_\_\_\_\_

**COURSE DESCRIPTION, NO MORE THAN THREE LINES:** Introduction to machine learning techniques and their application in computer vision problems. Discussion of image processing principles, techniques, and algorithms. Discussion of selected machine learning concepts, techniques, and algorithms. Use of MATLAB® for lab assignments and projects.

PREREQUISITES\*: Programming skills.

COREQUISITES\*: N/A

REGISTRATION CONTROLS (MAJOR, COLLEGE, LEVEL)\*:

\* PREREQUISITES, COREQUISITES AND REGISTRATION CONTROLS WILL BE ENFORCED FOR ALL COURSE SECTIONS.

MINIMUM QUALIFICATIONS NEEDED TO TEACH THIS COURSE: PhD

Faculty contact, email and complete phone number:  
 Oge Marques - [omarques@fau.edu](mailto:omarques@fau.edu) - 561.297.3857

Please consult and list departments that might be affected by the new course and attach comments.<sup>3</sup>

**Approved by:**

Department Chair: Nurgun Ersoel  
 College Curriculum Chair: Wesley T. O'Neil  
 College Dean: [Signature]  
 UGPC Chair: [Signature]  
 Graduate College Dean: [Signature]  
 UFS President: \_\_\_\_\_  
 Provost: \_\_\_\_\_

**Date:**

11/27/13  
11/27/13  
1/29/14  
1-29-14

1. Syllabus must be attached; see guidelines for requirements: [www.fau.edu/provost/files/course\\_syllabus.2011.pdf](http://www.fau.edu/provost/files/course_syllabus.2011.pdf)
2. Review Provost Memorandum: **Definition of a Credit Hour** [www.fau.edu/provost/files/Definition\\_Credit\\_Hour\\_Memo\\_2012.pdf](http://www.fau.edu/provost/files/Definition_Credit_Hour_Memo_2012.pdf)
3. Consent from affected departments (attach if necessary)

Email this form and syllabus to [UGPC@fau.edu](mailto:UGPC@fau.edu) **one week before** the University Graduate Programs Committee meeting so that materials may be viewed on the UGPC website prior to the meeting.

6605  
COT ~~6605~~ – Machine Learning for Computer Vision

Syllabus

<b>Instructor:</b>	Dr. Oge Marques	<b>Dept:</b>	CEECS
<b>Office:</b>	EE 441	<b>Phone:</b>	(561) 297-3857
<b>Email:</b>	omarques@fau.edu	<b>Web:</b>	<a href="http://faculty.eng.fau.edu/omarques/">http://faculty.eng.fau.edu/omarques/</a>
<b>Office Hours:</b>	TBA		

**Course description:**

Introduction to machine learning techniques and their application in computer vision problems. Discussion of image processing principles, techniques, and algorithms. Discussion of selected machine learning concepts, techniques, and algorithms. Use of MATLAB® for lab assignments and projects.

**Prerequisites:** Programming skills.

**Course objectives:**

To introduce selected contemporary machine learning techniques and their application in computer vision problems, with an implementation-oriented focus, using MATLAB®.

More specifically, by the end of the course students will be able to:

- Explain the main challenges behind selected contemporary image processing and computer vision problems.
- Demonstrate theoretical and practical understanding of the principles and applications of contemporary machine learning techniques.
- Implement machine learning algorithms and apply them to image- and video-related problems.

**Textbook combo (required):**

- A. Prince [2012], *Computer Vision: Models, Learning, and Inference*, Cambridge University Press, ISBN: 978-1107011793
- B. Theodoridis and Koutroumbas [2009], *Pattern Recognition*, 4<sup>th</sup> ed., Academic Press, ISBN: 978-1-59749-272-0
- C. Theodoridis, Pkrakis, Koutroumbas, and Cavouras [2010], *Introduction to Pattern Recognition: A MATLAB Approach*, Academic Press, ISBN: 978-0-12-374486-9

**Reference books:**

- D. Marques [2011], *Practical Image and Video Processing Using MATLAB*, Wiley/IEEE Press, ISBN: 978-0470048153
- E. Szeliski [2011], *Computer Vision: Algorithms and Applications*, Springer, ISBN: 978-1-84882-934-3

**Syllabus**

**Course outline** (number of 1.5 h lectures per topic in parentheses)

1. Fundamentals of image processing and computer vision (1)
2. Image processing using MATLAB (3)
3. Feature extraction, description, and matching (3)
4. Fundamentals of machine learning (2)
5. Probability (1)
6. Learning and inference in vision (2)
7. Modeling complex data densities (3)
8. Regression models (2)
9. Classification techniques (5)
10. Feature selection and dimensionality reduction (4)
11. Clustering (1)
12. System evaluation (1)
13. Case studies and applications (2)

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**Assessment summary:**

- |   |      |
|---|------|
| • Participation (reading assignments, class discussions): | 10 % |
| • Research (survey) paper:                                | 15 % |
| • MATLAB-based hands-on assignments (5 × 10%):            | 50 % |
| • Project:  | 25 % |

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**Important notes:**

- The research (survey) paper will focus on the principles, mathematical foundations, state of the art, and applications of a particular (subset of) machine learning technique(s) in the context of a specific (subset of) computer vision problem(s). More details will be provided in class.
- The project will consist of selecting a contemporary computer vision problem and implementing a solution that uses some of the image processing and machine learning techniques learned during the course. More details will be provided in class.
- Students should have access to MATLAB (R2010a or later) and the following toolboxes: Image Processing Toolbox, Statistics Toolbox, Optimization Toolbox, Computer Vision System Toolbox.
- Additional materials and resources will be posted on the Web throughout the course.

## Syllabus

### Policy for Late Assignments

Late assignments will be graded with a penalty of 10% of the grade for each day after the assignment's due date, up to a maximum of 3 days late (i.e., 30% penalty), beyond which the assignment will receive a grade 0 (zero).

### MATLAB access

This course is MATLAB-oriented and you are expected to have frequent access to a computer running MATLAB and some of its toolboxes for your assignments and projects.

Here are some **options** to consider:

1. **Purchase your own copy** of the student version of MATLAB. It costs \$99, is fully functional, and comes with several toolboxes, including the IPT. For more details, go to: [http://www.mathworks.com/academia/student\\_version/](http://www.mathworks.com/academia/student_version/)
2. **Use FAU's MATLAB licenses.** Follow the instructions posted on <http://tsg.eng.fau.edu/software/genie/> and send TSG (the College of Engineering and Computer Science's *Technical Services Group*) a help ticket if you run into any difficulties.
3. **Consider a free alternative to MATLAB.** The two most popular are GNU Octave (<http://www.gnu.org/software/octave/>) and SciLab (<http://www.scilab.org/>). SciLab contains at least two image processing toolboxes (<http://sivp.sourceforge.net/> and <http://siptoolbox.sourceforge.net/>). I have used both of them and I know they are "work in progress" and are not 100% compatible with MATLAB and its IPT. So please use them at your own risk.

### Grading Scale:

92-100 = A  
88-91 = A-  
84-87 = B+  
80-83 = B  
77-79 = B-  
73-76 = C+  
70-72 = C  
66-69 = C-  
61-65 = D+  
56-60 = D  
50-55 = D-  
0-49 = F

6603  
**COT ~~6603~~ - Machine Learning for Computer Vision**  
**Syllabus**

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**Technical Problem Resolution Procedure (for remote students)**

In the online environment, there is always a possibility of technical issues (e.g., lost connection, hardware or software failure). Many of these can be resolved relatively quickly, but if you wait to the last minute before due dates, the chances of these glitches affecting your success are greatly increased. Please plan appropriately. If a problem occurs, it is essential you take immediate action to document the issue so your instructor can verify and take appropriate action to resolve the problem. Please take the following steps when a problem occurs:

1. If you can, make a Print Screen of the monitor when the problem occurs. Save the Print Screen as a .png file.
2. Complete a Help Desk ticket at <http://www.fau.edu/helpdesk>. Make sure you complete the form entirely and give a full description of your problem so the Help Desk staff will have the pertinent information in order to assist you properly. This includes:
  - a. Select "Blackboard (Faculty)" for the Ticket Type.
  - b. Enter the Course ID.
  - c. In the Summary/Additional Details section, include your operating system, browser, and Internet service provider (ISP).
  - d. Attach the Print Screen file, if available.
3. Send an email to your instructor to notify him of the problem. Include all pertinent information of the incident (2b-d above).
4. If you do not have access to a computer, call your instructor with all pertinent information of the incident. If he is not available, make sure you leave a detailed message.
5. If you do not hear back from the Help Desk or your instructor within a timely manner (48 hours), it is your responsibility to follow up with the appropriate person until a resolution is obtained.

**Disability Policy Statement**

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodation due to a disability to properly execute coursework must register with the *Office for Students with Disabilities* (<http://osd.fau.edu/>):

- in Boca Raton, SU 133, (561) 297-3880;
- in Davie, MOD 1, (954) 236-1222;
- in Jupiter, SR 117, (561) 799-8585;
- at the Treasure Coast, CO 128, (772) 873-3305;

and follow all OSD procedures.

*URL to be added.*

**Code of Academic Integrity**

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see the Code of Academic Integrity in the University Regulations at

<http://www.fau.edu/regulations/chapter4/4.001 Code of Academic Integrity.pdf>.

## Syllabus

### **Instructor's policies on academic integrity and plagiarism**

- Students are expected to sign an *electronic form* (available through Blackboard) indicating that they have read and understood Florida Atlantic University's *Code of Academic Integrity*.
- The instructor reserves the right to use any necessary tools -- e.g., SafeAssign (<http://www.safeassign.com/>) and MOSS (<http://theory.stanford.edu/~aiken/moss/>) -- to enforce these policies.
- Any evidence of cheating, plagiarism, or other forms of academic dishonesty will be prosecuted to the fullest extent.

### **Religious Accommodation**

In accordance with rules of the Florida Board of Education and Florida law, students have the right to reasonable accommodations from the University in order to observe religious practices and beliefs with regard to admissions, registration, class attendance and the scheduling of examinations and work assignments. Students who wish to be excused from coursework, class activities or examinations must notify the instructor in advance of their intention to participate in religious observation and request an excused absence. The instructor will provide a reasonable opportunity to make up such excused absences. Any student who feels aggrieved regarding religious accommodations may present a grievance to the director of Equal Opportunity Programs. Any such grievances will follow Florida Atlantic University's established grievance procedure regarding alleged discrimination. For further information, please see FAU's *Academic Policies and Regulations* (<http://www.fau.edu/academic/registrar/catalog/academics.php>).

### **University Approved Absence and Make-up Policy**

Students are responsible for arranging to make up work missed because of legitimate reasons, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons to request make up work include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any such event, whenever possible. The instructor will then provide opportunities to prepare and submit make up work, without any reduction in the student's final course grade as a direct result of such events.

## Syllabus

### Incomplete Grade Policy Statement

A student *who is passing a course*, but has not completed all work due to exceptional circumstances, may, with consent of the instructor, temporarily receive a grade of incomplete ("I"). The assignment of the "I" grade is at the discretion of the instructor, but is allowed **only if the student is passing the course**. The specific time required to make up an incomplete grade is at the discretion of the instructor. However, FAU policies stipulate that all work required to satisfy an incomplete ("I") grade must be completed within a period of time not exceeding one calendar year from the assignment of the incomplete grade.

### Grade Appeal Process

A student may request a review of the final course grade when s/he believes that one of the following conditions apply: (i) There was a computational or recording error in the grading; (ii) Non-academic criteria were applied in the grading process; (iii) There was a gross violation of the instructor's own grading system. See [http://www.fau.edu/regulations/chapter4/4.002 Student Academic Grievance Procedures for Grade Reviews.pdf](http://www.fau.edu/regulations/chapter4/4.002%20Student%20Academic%20Grievance%20Procedures%20for%20Grade%20Reviews.pdf) for additional information.

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### Important final remarks:

- Reading assignments will be posted on the Web on a regular basis. Students are expected to keep up with the required reading pace.
  - Submission of assignments, problem sets and projects will be done electronically via Blackboard. **Do not submit anything by fax or email or any other means.**
  - All work in this course must be **INDIVIDUAL** effort unless otherwise specified.
  - Changes in class logistics and/or office hours may be necessary during the semester and if so the changes will be announced in the course home page. It is the student's responsibility to be aware of any such changes.
  - Please check the announcements page on Blackboard at least twice a week.
  - Email is the best way to contact the instructor.
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**Course Home Page:** A home page containing relevant information, materials, downloadable files, and useful links for the course will be available on Blackboard: <http://bb.fau.edu/>