**General Information:**

**Name of Course: Advanced Image Processing (MSc)**

**Course Code: IVM202ANMI**

**Semester: Spring 2017/2018 II**

**Number of Credits: 6**

**Allotment of Hours per Week:** 2 Practical Lessons + 2 Lectures/Week

**Evaluation:** Signature (with grade)

**Prerequisites: Signal Processing**

**Instructors: Dr Adam SCHIFFER, assistant professor**

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**Introduction, Learning Outcomes:**

This course provides the student with the theoretical background to allow them to apply state of the art image processing techniques. The course teaches students to solve practical problems involving the processing of color and grayscale images. The teach tools used in solving the problems include a variety of feature extraction methods, filtering techniques, segmentation techniques, and transform methods. Students will use the techniques covered in the course to solve practical problems in projects. The course also discusses the basics of the SIFT algorithm, like Gaussian pyramids, Lagrange of Gaussians (LoG), mosaicking, feature detection.

**The objectives of this course are to:**

* to provide an introduction to the exciting and rapidly advancing fields of image processing and computer vision;
* Cover the basic theory and algorithms that are used in modern digital image processing;
* Expose students to current technologies and issues that are specific to image processing systems;
* Develop hands-on experience in using computers to process images;
* Familiarize with MATLAB Image Processing Toolbox;
* Develop critical thinking about shortcomings of the state of the art in image processing.

**Schedule:**

The rough outline of the schedule is as follows:

Week 1-2: Array handling in Python, Python basics, PILLOW Library modules

Week 3-6: Image processing basics (point processing, neighbourhood processing, morphology)

Week 7: Consultancy on homeworks 1 and 2

Week 8: Calculation of the Gaussian pyramid

Week 9: Spring Holiday

Week 10: Example lections for Gaussian pyramids (mosaicking)

Week 11: Homework 3., Challange1, Challenge 2, Consultancy

Week 12: Lagrange of Gaussian Pyramids 1.

Week 13: Lagrange of Gaussian Pyramids practical lection, Homework 4.

Week 14: Consultancy

Week 14: Personal discussion about homeworks for grade

**Attendance:**

Attending is required all classes, and will impact the grade (max. 10%). Unexcused absences will adversely affect the grade, and in case of absence from more than 30% of the total number of lesson will be grounds for failing the class. To be in class at the beginning time and stay until the scheduled end of the lesson is required, tardiness of more than 20 minutes will be counted as an absence. In the case of an illness or family emergency, the student must present a valid excuse, such as a doctor's note.

The highest possible grade on the late project (in two weeks) is ‘2’. The Final Project cannot be turned in late.

**Evaluation + Grading**

Grading will follow the course structure with the following weight:

Homework 1-4: 90%

Challenges: 40% (extra percent!)

Participation, progress, effort and attitude : 10%

Please note that attendance will adversely affect one's grade, both in direct grade reduction and in missing work in the development of a project. The final grade will be based on the following guidelines:

5. Outstanding work. Execution of work is thoroughly complete and demonstrates a superior level of achievement overall with a clear attention to detail in the production of homeworks. The student is able to synthesize the course material with new concepts and ideas in a thoughtful manner, and is able to communicate and articulate those ideas in an exemplary fashion in.

4. High quality work. Student work demonstrates a high level of craft, consistency, and thoroughness throughout homeworks and challanges. The student demonstrates a level of thoughtfulness in addressing concepts and ideas, and participates in group discussions. Work may demonstrate excellence but less consistently than an ‘5’ student.

3 Satisfactory work. Student work addresses all of the project and assignment objectives with few minor or major problems. Homeworks are complete and satisfactory, exhibiting minor problems in craft and detail.

2. Less than satisfactory work. Homeworks are substandard, incomplete in significant ways, and lacks craft and attention to detail.

1. Unsatisfactory work. Work exhibits several major and minor problems with basic conceptual premise, lacking both intention and resolution. Physical representation in homeworks is severely lacking, and is weak in clarity, craft and completeness.

Grading Scale:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Numeric Grade: | 5 | 4 | 3 | 2 | 1 |
| Evaluation in points: | 89%-100% | 77%-88% | 66%-76% | 55%-645% | 0-54% |

**Students with Special Needs:**

Students with a disability and needs to request special accommodations, please, notify the Deans Office. Proper documentation of disability will be required. All attempts to provide an equal learning environment for all will be made.

**Readings and Reference Materials:**

**Required:**

1. Aubert, G., Kornprobst, P. (2002) Mathematical Problems in Image Processing. Springer, New York.
2.Bernd Jahne: Digital Image Processing, Berlin, Springer, 2005.
3. Tony Lindeberg: Edge detection and ridge detection with automatic scale selection. Technical report, 1998.
4. Hamid R. Tizhoosh: Fuzzy-Bildverarbeitung, Berlin, Springer, 1998.