**Module Title:** Digital Media Systems

**Code:** EE5C1

**Level:** Year 5 of the MAI

**Credits:** 5

**Prerequisites:** EE4C08

**Lecturer(s):** Prof. Anil Kokaram

**Terms:** Semester 2

**Duration (weeks):** 11

**Lectures/week:** 2

**Labs/week:** 3

**Total:** 12

**Total:** 33

**AIMS/OBJECTIVES**

Television has revolutionised communications in the 20th century and Digital Video as a medium has completely changed that landscape. Research and development in this area has generated completely new industries in digital media creation and online video streaming and video media sharing. Industrial Light and Magic, The Foundry, YouTube, Netflix, Vimeo, Skype, Sky Digital are just a few of the well known large companies that now successfully operate in this space.

This module prepares the student for a career in digital video engineering by concentrating on the advanced technologies that enable online video streaming and video analysis for cinema post-production. This means both work in statistical video processing and video coding. Statistical Signal Processing facilitates the formulation of advanced frameworks to solve common tasks in video processing such as segmentation and motion estimation. The module will also revisit topics in video compression first encountered in 4C8 and will investigate modern compression standards such as H.264, VP8 and VP9 with guest lectures from industry experts in Youtube and Google.

The module also aims to develop practical skills in research, plugin development and testing that are common practice in companies developing tools for digital media. Students will be required to independently investigate leading research papers in the field and develop video processing plugins for Nuke (www.thefoundry.co.uk), a leading video-processing platform in the Cinema Post-Production industry.

**SYLLABUS**

- **Objective Video Quality Measurement** – state of the art objective quality metrics such as VQM and SSIM and their application to rate distortion analysis for video compression systems.

- **Optimisation** – introduction to well-known optimisation strategies for image/video processing applications such as image/video segmentation and motion estimation. There will be a focus on strategies that are based on MRF representation of images which enables the concept of smoothness to be incorporated into optimisation.

- **Video Compression** – an introduction to state of the art compression standards such as HEVC and VP9 and the business landscape shaping the future of this industry.
**RECOMMENDED TEXT(S)**


There are many other text books on Image and Video Processing and Computer Vision available in the library which you may wish to consult.

Google scholar and IEEE Xplore are essential resources for the research papers you will access over the duration of the module. The library also has paper versions of many relevant journals.

**LEARNING OUTCOMES**

At the end of the module, students will be able to

1. Design plugins for a commercial video processing platform,
2. Design and execute unit and end-to-end tests for visual algorithms,
3. Choose an appropriate energy minimisation framework for an Image Segmentation Problem.
4. Evaluate objective video quality assessment techniques for video compression standards,
5. Design a methodology for a subjective image/video quality assessment.
6. Assess critically the contribution of a research paper to the state of the art.
7. Assess critically the relative performance of competing video compression standards.
8. Write a scientific research paper that presents their work and applies scientific method to their findings and those of others in that field

**TEACHING STRATEGIES**

The module is mostly lab-based containing a mixture of tutorials and conventional lab sessions where students will be able to seek assistance on their development assignments. There will be approximately 12 lecture hours which will be run twice a week from the start of the semester. Students will be required to spend considerable time outside scheduled class/lab hours to complete their assignments. The guideline for a 5 ECTS module is for 125 hours of student effort including class hours.

**ASSESSMENT MODE(S)**

Assessment for 5C1 will be 100% based on Continuous Assessment. Assessment will be a mixture of plugin development assignments and in-class tests. There will also be a major assignment in the second half of the semester which will require submission of a 4-page conference paper due at the end of the semester.