Module Code	EE5C01
Module Name	MOTION PICTURE ENGINEERING
ECTS Weighting[2]	10 ECTS
Semester taught	Semester 2
Module Coordinator/s	PROF ANIL KOKARAM
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: LO1. Design tools in a commercial video processing platform, LO2. Design visual algorithms using motion and texture LO3. Describe, explain and assess methodologies for subjective image/video quality assessment. LO4. Describe and explain the fundamental building blocks in current motion estimation and video segmentation algorithms. LO5 Describe and explain the algorithmic tools in current video compression standards LO6. Assess critically the relative performance of competing video compression standards. LO7. Analyse the performance of tools within video compression standards LO8. Design and deploy transcoding strategies for video LO9 Describe aspects of the business landscape and industrial ecosystem in video technology **Graduate Attributes: levels of attainment** To act responsibly - Not embedded To think independently - Enhanced To develop continuously - Attained To communicate effectively - Enhanced

[1] An Introduction to Module Design from AISHE provides a great deal of information on designing and re-designing modules.
[2] TEP Glossary

Module Content	Motion Pictures in the form of Digital Video account for more than 70% of all internet traffic today. R&D in this area has inspired new industries in digital media creation, 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. Motion Picture Engineering prepares the student for a career in these industries including post-production tool development and video streaming. The first part (before the reading week) introduces the underlying ideas in motion estimation, object segmentation and statistical video processing in general. The second part after the reading week will investigate modern compression standards such as H.264/5, VP9, AV1/2. The module also considers aspects of Deep Learning as they apply to Video. The module incorporates a bi-weekly seminar program with guest lectures from domain experts e.g. Netflix and Google. Students develop practical skills in research, plugin development and testing that are common in companies developing tools for digital media. Students will be introduced to 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.
Teaching and Learning Methods	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 30 lecture hours. The module also includes 1 guest lecture a week from leading industry experts in post production and video compression as well the business landscape. The guideline for a 10 ECTS module is for 250 hours of student effort including class hours. Assessment for 5C1 will be 100% based on Continuous Assessment. Assessment will be a mixture of algorithm design assignments and in-class tests. The students on the course will be guided through adapting assignments to complement their chosen project if possible. Syllabus Objective Video Quality Measurement – state of the art objective quality metrics such as VQM and SSIM Motion Estimation – state of the art frameworks and implementations Optimisation – introduction to well-known optimisation strategies for image/video processing applications such as image/video segmentation and motion estimation. These include, Graph Cuts, ICM, Belief Propagation Deep Learning in Video – Recent topics in Deep Learning for motion estimation

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.

Assessment Details[3]
Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Class Test	In class test	2-4	5	4
Assignment	Developing plugins	1,2	20	6
Class Test	In class test	5-7	10	9
Laboratory	Transcoding	7,8	15	12
Self Directed	Multiple choice quiz	all	10	12

Reassessment Requirements

No reassessment is possible

Contact Hours and Indicative Student Workload[3]

Contact hours: 66 (33 Lecture hours, 11 Guest lectures, 22 Laboratory hours)
Independent Study (preparation for course and review of materials): 66
Independent Study (preparation for assessment, incl. completion of assessment): 118

Recommended Reading List

- Markov Random Fields for Vision and Image Processing. Edited by A. Blake, P. Kohli and C. Rother, MIT Press, 2011. ISBN: 978-0-262-01577-6
- The Essential Guide to Video Processing. A. Bovik, Academic Press, 2009. ISBN: 978-0-12-374456-2

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, arxiv.org 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.

Module Pre-requisite

An introduction to DSP and Image Processing would be useful

Module Co-requisite

None.

Module Website

www.motionpictureengineering.org

[3] TEP Guidelines on Workload and Assessment

Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	
Approved by	Anil Kokaram
Academic Start Year	2019
Academic Year of Date	2020