Eunice EUROPEAN UNIVERSITY

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EUROPEAN UNIVERSITY FOR CUSTOMISED EDUCATION

STUDY GUIDE

DIGITAL IMAGE AND VIDEO CODING AND COMMUNICATION

Organised by

UPHF & BTU

b-tu Brandenburg University of Technology Cottbus - Senftenberg · UC Universidad de Cantabria · Università di Catania · Université Polytechnique HAUTS-DE-FRANCE · UMONS University of Mons · University of the Peloponnese · Vaasan yliopisto University of Vaasa · Politécnico de Viseu

1. IDENTIFYING DATA.	
· Course Name.	Digital Image and Video Coding and Communication
· Coordinating University.	UPHF, France
· Partner Universities Involved.	BTU, Germany
· Course Field(s).	Electrical Engineering, Computer science
· Related Study Programme.	Audiovisual and Multimedia Master Program (UPHF)
· ISCED Code.	0211: Audio-visual techniques and media production (03.4 - 213) 0688: Information and Communication Technologies (ICTs), inter-disciplinary programmes
· SDG.	SDG9, SDG12
· Study Level.	Master
· EUNICE Key Competencies	[Indicate the Key Competencies required for the course.] • Green – strongly • Orange- moderately • Red – partially • Blank cell - not at all

Problem solving	
Teamworking	
Communication	
Self-management	
Cognitive flexibility	
Digital competence	

	Technical competence	
	Global intercultural competence	

· Number of ECTS credits allocated.	2 (this course is a first part of two-parts complete course)
· Mode of Delivery.	Online
· Language of Instruction.	English
· Course Dates.	Semester 2 : February - June
· Precise Schedule of the Lectures.	18h (this course is a first part of two-parts complete course)
· Key Words.	Digital signal processing ; video compression; video communication; image quality
· Catchy Phrase.	Be Ready for the Future of Visual Communications!

· Prerequisites and co-requisites.	- Basics on digital signal processing; basic skills on Matlab - Signals and Systems - Master level
· Number of EUNICE students that can attend the Course.	24 students.
· Course inscription procedure(s).	standard EUNICE process

2. CONTACT DETAILS.	
· Department.	Department of Electrical Engineering/ Department of Computer Engineering
· Name of Lecturer.	François-Xavier Coudoux (UPHF)
· E-mail.	Francois-Xavier.Coudoux@uphf.fr, christian.herglotz@b-tu.de
· Other Lecturers.	Christian Herglotz (BTU)

3. COURSE CONTENT.
Video delivery has evolved considerably over the last 30 years, leading to a huge increase in media consumption. Advances in microelectronics technology mean that digital video can be captured, broadcast, and displayed anytime, anywhere, making video a ubiquitous part of our lives.

This course (1st part) covers digital image and video coding and communications technologies that enable video delivery to consumers. It first addresses the theoretical bases of digital image and video coding, as well as visual quality aspects. Then the main still image and video compression standards are presented in detail, as well as their use in current video content distribution solutions.

4. LEARNING OUTCOMES.

- Know the basic principles of data compression.
- Get an overview of how traditional video delivery systems (television) and video-on-demand platforms work.
- Understand the basic concepts of the human visual system and its capabilities
- Learn about the environmental impact of video communications

5. OBJECTIVES.

The course shall enable students to tackle latest problems visual communication. They will basics on the human visual system, how to represent video data efficiently, and how video technology can be used in a more sustainable way. This knowledge will allow them to learn quickly the challenges of upcoming visual technology including AI-based techniques and visual representations within complex environments such as the metaverse.

6. COURSE ORGANISATION.

UNITS (3h per unit)

1.	Introduction: Basic principles of image and video / image and video compression (BTU+FXC)
2.	The compression toolbox (decorrelation: quantization, DCT, codage entropy, PCM, motion estimation, lossless vs. lossy, quality metrics, …) (FXC)
3.	Video representations for the human visual system (video classic, 360, point cloud, immersive video, metaverse…) (BTU) (I HVS, II video representations)
4.	The JPEG still image compression (FXC)
5.	The MPEG video coding family + future codecs (VCM, NN, ECM…) (FXC+BTU)
6.	Sustainability in Video Communications (BTU)

LEARNING RESOURCES AND TOOLS.

Software tools: Matlab, ffmpeg

PLANNED LEARNING ACTIVITIES AND TEACHING METHODS.

- Lectures

7. ASSESSMENT METHODS, CRITERIA AND PERIOD.
Written exam? Project? Written exam is fine for me.
OBSERVATIONS.

8. BIBLIOGRAPHY AND TEACHING MATERIALS.
D. Bull, F. Zhang, *Intelligent Image and Video Compression – Communicating Pictures*, Academic Press, 2021. Z. Li, M. Drew, J. Liu, *Fundamentals of Multimedia*, 3rd Edition, Springer, 2021. DVB Scene: https://dvb.org/dvb-scene/ Netflix Technology Blog: https://netflixtechblog.medium.com/