# COURSE OUTLINE

## (1) GENERAL

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|---|---|---|---|
| **SCHOOL** | Engineering | | |
| **DEPARTMENT** | Electrical and Computer Engineering | | |
| **LEVEL OF STUDY** | Undergraduate | | |
| **COURSE UNIT CODE** | 8.024 | **SEMESTER** | 8th |
| **COURSE TITLE** | Television systems | | |

| **COURSEWORK BREAKDOWN** | **TEACHING WEEKLY HOURS** | **ECTS Credits** |
|---|---|---|
| Theory (Lectures) | 3 | 3 |
| Tutorial/Project | 1 | 0.5 |
| Laboratory | 1 | 0.5 |
| | | |
| **TOTAL** | **5** | **4** |

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|---|---|
| **COURSE UNIT TYPE** | Scientific area course / specialization / skill development |
| **PREREQUISITES** | |
| **LANGUAGE OF INSTRUCTION/EXAMS** | Greek |
| **COURSE DELIVERED TO ERASMUS STUDENTS** | Yes |
| **WEB PAGE (URL)** | https://eclass.hmu.gr/courses/ECE125/ |

## (2) LEARNING OUTCOMES

**Learning Outcomes**

The course is a compulsory elective course (CEC) of the 3rd Direction (Telecommunications and Information Technology) aiming to introduce the students the principles of linear and interactive digital television, by offering them with the necessary knowledge and skills to: a) design and plan the implementation of digital TV infrastructures b) analyze their overall performance as well as that of each individual component, c) supervise and optimize their performance, d) study techniques and technologies that will provide interactivity and will allow the development of interactive services, and e) develop architectures that will allow convergence and interoperability with other existing and emerging technologies.

Upon successful completion of the course the student will be able to:

1. Understand the principles of operation and organisation of television infrastructures and their exploitation for the provision of information and services through them.
2. Knows, recognise and be aware of the tools used for the implementation and management of television platforms, the development of linear and interactive services, as well as the principles of most widespread international standards.
3. Apply assessment methods, analysis tools for the performance evaluation of television systems and mechanisms for enhanced performance, towards optimal operation and robust/secure transfer of television services.
4. Analyse and calculate the principle transmission characteristics of services over television platforms, and the way they are provided over terrestrial infrastructures.
5. Propose solutions for the implementation and maintenance of television systems, and for the analysis of information that passes over them by utilising international standards.

**General Skills**

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Autonomous work
- Teamwork
- Work in an international environment
- Work in an interdisciplinary environment
- Promoting liberal, creative and inductive/deductive thinking

## (3) SYLLABUS

**Theoretical Lectures**

History and overview of television, principles image creation, luminance and chrominance, the camera, record and reproduction systems, digital television, linear and interactive systems, television standards and system architectures, multiplexing of TV programmes, fixed and mobile reception, system architectures and configurations for interactive TV services, convergence with contemporary and emerging networking technologies, heterogeneous infrastructures in the core/backbone and the access network segments, cross-layer management for guaranteed quality of service through resource optimisation.

- Review of analogue TV systems (PAL, SECAM, NTSC, NICAM)
- Introduction to digital TV standards (DVB, ISDB, ATSC, DMB)

- Principles of DVB T/S and its building modules
- Compression MPEG 2 and MPEG 4,
- Multiplexing and encapsulation mechanisms (MPE/ULE),
- Coding and error correction techniques (RS, FEC),
- Multi-carrier transmission and reception of digital TV signals (OFDM)
- Single frequency networks (SFN),
- Mobile reception (DVB-H),
- Security and encryption (scrambling)
- Middleware and services (EPG, IP broadcast, MHP),
- Interactivity, architectures and applications (Streaming on Demand, Video on Demand)
- Convergence with other technologies and architectures for networking (regenerative architectures, HBBTV),
- Spectrum dividend and dynamic spectrum access techniques for added-value services.

**Laboratory**

- Projects utilising the exploitation of software tools for the creation, transmission and reception of television signals.
- Video coding and Transport Stream (MPEG-2/4 TS)
- Multiplexing of television services and operation of the multiplexer
- Reception of multiplexed digital TV programmes and analysis of the received transport stream.

## (4) TEACHING METHODS - ASSESSMENT

<table>
<tr><td>MODE OF DELIVERY</td><td>In-Class Face-to-Face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs in lecturing<br>• Use of ICTs in laboratory-based training<br>• Use of ICTs for the communication with students via the e-class platform<br>• Specialised software tools for experimentation<br>• Actual/real interactive TV platform<br>• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING ORGANISATION</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Tutorials</td><td>13</td></tr>
<tr><td>Laboratory work</td><td>13</td></tr>
<tr><td>Project-based assignments</td><td>10</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>5</td></tr>
<tr><td>Non-guided personal study</td><td>40</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total Contact Hours</td><td>120</td></tr>
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<tr><td>ASSESSMENT METHODS</td><td>Language of Assessment<br>Greek</td></tr>
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|---|---|
| | **Description**<br>Written exams, laboratory evaluation and project evaluation<br><br>**Student assessment methods**<br>• Written examination with short answer questions (Concluding)<br>• Written exams with multiple choice questions (Concluding)<br>• Written assignment (Formative)<br>• Public presentation (Formative)<br>• Laboratory/project work (Formative)<br>For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work, as well as in the elaboration and public presentation of the project (theoretical study). The final grade of the course consists of:<br>• Final written examination in the entire course content (65%),<br>• Elaboration of theoretical project (10%)<br>• Public presentation of the project (5%),<br>• Elaboration of laboratory-based projects/work (20%).<br><br>The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform |

## (5) RECOMMENDED BIBLIOGRAPHY

***- Recommended Bibliography:***

- *Walter Fischer, "Digital Television: A Practical Guide for Engineers", Springer-Verlag, 2004, ISBN 3-540-01155-2.*
- *Ulrich Reimers, "Digital Video Broadcasting: The International Standard for Digital HDTV", Springer-Verlag, 2001.*
- *ETS 300-744: Digital Video Broadcasting; Framing structure, channel coding and modulation for digital Terrestrial television (DVB-T).*

***- Relevant Scientific Journals:***

- *IEEE Communications Magazine, ComSoc*
- *IEEE Transactions on Broadcasting*
- *International Journal of Digital Television, Intellect*
- *International Journal of Digital Multimedia Broadcasting, Hindawi*