Acoustics (30 H)

***General objectives***

At the end of this course, the student will be able to:

* State the physical properties of the sound.
* Study the sound reproduction.
* Study the different types of microphones and loud-speakers.
* Study the acoustic architectural
* Capture the professional sound
* Determine the constitution and the principle of operation of laser heads.
* Explain the recording and reading principles of CD players.

#### Chapter 1*:* Physical acoustics (2H)

* 1. Sound wave propagation in air
  2. Definition of physical quantities and units
  3. Acoustic measures
  4. Pure and complex sounds
  5. Pressure and power levels
  6. Exercises

**Chapter 2:The sound reproduction (4 H)**

2.1 Mono reproduction

* Principle
* Speaker arrangement in a single channel system

2.2 Stereo reproduction

* Principle
* Speaker arrangement in a two-channel system

2.3 Quadraphonic reproduction

* Principle
* Speaker arrangement in a four-channel system
* Ping pong effect
* Discrete system:
* principle
* diagram of discrete sound using 4-channel open reel tapes and role of each part
* diagram of 4-channel eight-track tape cartridges for discrete sound and role of each part
* Regular matrix:
* principle
* regular matrix decoder
* principle of operation of the decoder
* SQ matrix:
* principle
* SQ matrix decoder
* principle of operation of the decoder
* Differences between regular and SQ matrices
* The SQ decoder:
  + principle
  + SQ decoder connections for existing 4-channel setup
  + SQ decoder system for use with two-channel setup

#### Chapter 3*:* The microphones (4 H)

3.1 Principle and characteristics of different types of microphones

3.2 Electrostatic microphone (condenser)

3.3 Electrodynamic microphone

3.4 Piezo-electric microphone

3.5 Emitter microphone

3.6 Ribbon microphones: Constitution, role of each element, principle of operation,

advantages, disadvantages, characteristics, efficiency and utilization.

3.7 Principle of sound reproduction: Monophony, Stereophony and Quadra phony

### Chapter 4*:* The loudspeakers (4H)

4.1 Principle and characteristics of different types of loud-speakers

4.2 Electrodynamic loudspeaker

4.3 Electrostatic loudspeaker

4.4 Piezo-electric loudspeaker: Constitution, role of each element, principle of

operation, advantages, disadvantages, characteristics, efficiency, directivity

and utilization.

4.5 Separator filters

4.6 Acoustic enclosures at high fidelity and high power

4.7 Acoustics columns

# Chapter 5: Acoustic architectural (4H)

5.1 Hearing

5.2 Regulation

5.3 Protection against the noise

5.4 Reverberation time

5.5 Acoustic processing of halls

5.6 Acoustic of different categories of conference halls

* Meeting hall
* Theaters

5.7 Calculation of necessary power

### Chapter 6*:* The capture of professional sound (4H)

6.1 The capture of sound

6.2 The sound plan

6.3 The capture of stereophonic sound:

* Capture of sound settled at AB
* Capture of sound settled at XY
* Capture of sound at the middle of artificial head
* Capture of tetra phonic sound with one microphone
* Capture of stereophonic sound at the middle of many microphones

6.4 The capture of sound in open air

### Chapter 7: The low frequency amplifiers (2H)

7.1 General characteristics of amplifiers

7.2 The amplifier and loudspeakers coupling

* Coupling at low impedance
* Coupling at high impedance
* Calculation of coupling cables
* Ground coupling

#### Chapter 8: CD player (6H)

8.1 Recording principle:

* Review analog to digital conversion
* Audio distortion and correction in digital systems
* Digital signal storing and process
* Necessity of laser beam

8.2 Digital recording:

* Signal multiplexing: stereo, code, correction and control
* Disk constitution
* Recording procedure
* Copying (duplication)

8.3 CD reading principle:

* CD player block diagram
* Optical reading head
* Audio digital signal conversion: decoding, de-multiplexing.
* Digital and audio signal band and frequency

8.4 Digital disk types:

* CD ROM
* CD recording
* CD video

8.5 Digital versatile disc:

* DVD ROM
* DVD recording
* DVD rewritable