

**COURSE DATA****Data Subject**

Code	35273
Name	Physiology of Language and Hearing Organs
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1203 - Degree in Speech Therapy	Faculty of Psychology and Speech Therapy	1	Second term

Subject-matter

Degree	Subject-matter	Character
1203 - Degree in Speech Therapy	2 - Physiology	Basic Training

Coordination

Name	Department
SALVADOR PALMER, MARIA ROSARIO	190 - Physiology

SUMMARY

The topic begins with the physical principles of sound and have the proper foundation to understand the development of the subject, both the physiology of the formation of sound and its perception. In the second part of the course the basics of electrophysiology study to understand how information through the nervous system and the role of Broca's and Wernike in the process of speech and hearing is transmitted.

Knowing what sound is and what are the physical and physiological variables that characterize enables students to understand the basic element in the degree in Speech Therapy is based, as it allows you to understand the process of phonation as vibration of the vocal cords are and the ear as sound receiver. The role of the diaphragm and breathing in the right voice projection, and the role of the mouth as a resonance system are elements of common use in clinical Phoniatics, concepts developed in this course.



PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

No hay.

OUTCOMES

1203 - Degree in Speech Therapy

- Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.
- Use the exploration techniques and instruments typical of the profession and record, synthesize and interpret the data provided by integrating them into the information set.
- Work in the school, healthcare and healthcare settings as part of the professional team. Advice on the development, implementation of care and education policies on topics related to speech therapy.
- Be able to develop skills such as regulating their own learning, solving problems, reasoning critically and adapting to new situations.
- Manage the technologies of communication and information.
- Knowledge of the physiology of the organs of speech, hearing and voice.

LEARNING OUTCOMES

Be able to define simple harmonic vibrations.

Be able to describe the energetic characteristics of vibration, free, forced vibrations, and complex vibrations.

To characterize waves depending on its wavelength, intensity and attenuation.

Understand and reason sound characteristics and its transmission between two media.

Define the subjective qualities of sound and its transmission in the ear.

Differentiate hearing thresholds.

Interpreting audiograms.



Describe the voice tract as a sound emitter.

Describe the neuron and its parts as well as the synapse and bioelectrical mechanisms of cellular rest and excitation.

DESCRIPTION OF CONTENTS

0. Introduction to the physiology of the organs of speech and hearing.

Introduction to the physiology of the organs of speech and hearing.

1. PHYSICAL BASIS OF SOUND

The physical characteristics of sound energy intensity and frequency depending on the characteristics of the vibration generated it are studied. The importance of the Fourier theorem to the study of sounds is explained.

- 1 - Simple harmonic vibrations. Energy characteristics of vibration.
- 2 - Free and forced vibrations: Damping and Resonance.
- 3 - Complex Vibrations: Fourier theorem.
- 4 - Equation of propagation of a wave. Wavelength.
- 5 - Intensity and attenuation of the waves.
- 6 - Features sound. Loudness and acoustic magnitudes.
- 7 - Transmission of sound between two media.

2. Bases of the hearing and phonation

The basis of the psychophysical law of hearing and the importance of each of the parts of the ear auditory processing are analyzed. Likewise phonation process is analyzed.

II.1 -. PHYSIOLOGICAL BASIS OF ACOUSTIC

- 8 - Subjective qualities of sound. Weber-Fechner law. Sensation level. The decibel.
- 9 - Decibel loss. Audiograms - Noise.. The fon.
- 10 - Ear as a sensory receptor. Biophysics of the external ear transmission.
- 11 - Biophysics of the middle ear. Amplification. Consequences.
- 12 - Biophysics of the inner ear. Transduction.
- 13 - Binaural Hearing: auditory orientation

II.2 - PHYSIOLOGY AND BIOPHYSICS VOICE

- 14 - Power Source:. Lungs.
- 15 - Oscillator: the vocal cords. Modes of vibration.
- 16 - Resonator: the system larynx, pharynx, mouth.
- 17 - Analysis of the human voice. Storage systems, transmission and reproduction of sounds.



3. Electrophysiology basis

The conditions of the rest of the cell membrane of excitable cells to understand how they can be produced and studied propagase the action potential and get the information to the auditory projection areas of Broca and Wernicke.

III.1 -. BASICS

- 18 -. Basic scheme of sensory organization. Concept of neurons and nerve.
- 19 -. Properties of the nerve cell. The cell membrane. The transport through the membrane.

III.2 -. BIOELECTRIC PHENOMENA OF CELL REST

- 20 -. The cell membrane potential. Broadcast stream. Concepts of concentration and permeability.
- 21 -. Ionic flow in solution. Equilibrium potential of an ion: ccuación Nernst. Gibbs-Donnan equilibrium. Resting potential in excitable cells.
- 22 - Concept of active transport. Sodium pump (Na-K ATPase).

III.3 -. BIOELECTRIC PHENOMENA OF CELL EXCITATION

- 23. Cellular excitability. The action potential: concept and phases. Act "all or nothing". Refractory period. Effect of stimulus intensity.
- 24. Types of ion channels. Channel proteins regulated voltage. Justification of the properties of the action potential.
- 25. Mechanisms driving. Unmyelinated fiber local currents. Myelinated fibers: saltatory conduction.
- 26. General aspects of synaptic transmission: electrical and chemical synapses. Basis of functional electrical synapses.
- 27. Functional basis of chemical synapses. Presynaptic events. Neurotransmission: concept and features.
- 28. Synaptic receptors. Channel proteins regulated by the neurotransmitter. Excitatory and inhibitory synaptic actions. Synaptic integration concept.
- 29. Bioelectric potentials. Evoked potentials.
- 30. Routes and nerve centers of phonation and hearing. Broca and Wernicke areas.

4. PRACTICES

- 1. Physical basis of sound: Vibrations and waves exercises.
- 2. Digital sound analysis: frequency determination.
- 3. Digital sound analysis: Fourier analysis.
- 4. Basis of hearing and phonation: Acoustic physiological exercises.
- 5. Experimental determination of the boundaries of the hearing.
- 6. Kahoots applied to 1-17.
- 7. Experimental verification of the Nernst equation.
- 8. Basis of electrophysiology: Electrophysiology exercises.
- 9. Study by simulation of the refractory period of a neuron.
- 10. Kahoots applied to 18-30.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Laboratory practices	15,00	100
Study and independent work	90,00	0
TOTAL	150,00	

TEACHING METHODOLOGY

- Lectures. The teacher will introduce the subject and its references using audio-visual methods, focusing primarily on the most important points and those that may be more difficult to understand for students.
- Laboratory. The students, under the direction of the teacher, will carry out experiences in the laboratory, specially designed to increase the understanding of some necessary concepts and techniques. Also, in some of them, exercises and problems will be solved in order to deepen the theoretical concepts and in others the Kahoot modality will be used for the feedback of the contents of the subjects.
- Student work in the follow-up of theoretical and practical classes.
- Preparation and realization of the final evaluation.
- Using the virtual classroom for exchange of information and reporting.

EVALUATION

Attendance at practical sessions is mandatory. You need to attend at least 80% of them in order to pass the course, and adequately justify the impossibility of attending the remaining sessions by the concurrence of a cause of force majeure.

The course is approved with a rating equal to or greater than 5

Evaluation system

Continuous assessment: two practical tasks with a pre-established fixed presentation date (assessment on 2 points). Non-recoverable evaluation activity. In second call, the grades will be kept.

Written exam consisting of short and test questions. 75% of the questions will correspond to theory (valuation on 6 points) and 25% to practices (valuation on 2 points).



REFERENCES

Basic

- Aurengo A, Petitclerc T. Biofísica. McGraw-Hill Interamericana, Madrid, 2008. ISBN: 9788448608552.
- Le Huche F, Allali A. La voz, tomo 1. Elsevier-Masson, Barcelona, 2004. ISBN: 8445812459.
- Stuart Ira Fox. Fisiología humana (15ª ed.). Mc Graw-Hill Interamericana Ediciones S.A., Madrid, 2021. ISBN 84-486-0553-5.
- Nájera A, Arribas E, Navarro JD, Jiménez L. Fundamentos de Física para Profesionales de la Salud. Elsevier España, Barcelona, 2015. ISBN 978-84-9022-859-3. (Disponible en formato electrónico en la Biblioteca UV).

Additional

- Salesa E, Perelló E, Bonavida A. Tratado de Audiología. Elsevier-Masson, Barcelona, 2005. ISBN: 9788445815540.
- Bernal J., Bobadilla J., Gómez, P. Reconocimiento de Voz y Fonética Acústica. Ra-Ma, Madrid, 2000, ISBN: 84-7897-398-2.