



## Information about the subject

**Degree:** Bachelor of Science Degree in Speech and Language Therapy

**Faculty:** Faculty of Psychology

**Code:** 1171102 **Name:** Functional anatomy of the organs of speech and hearing II

**Credits:** 6,00 **ECTS Year:** 1 **Semester:** 2

**Module:** Basic Training

**Subject Matter:** Physiology **Type:** Basic Formation

**Field of knowledge:** Health sciences

**Department:** -

**Type of learning:** Classroom-based learning

**Languages in which it is taught:** Spanish

**Lecturer/-s:**

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## Module organization

### Basic Training

Subject Matter	ECTS	Subject	ECTS	Year/semester
Physiology	12,00	Functional anatomy of the organs of speech and hearing II	6,00	1/2
		Fundamentals of Neuroscience	6,00	1/1
Anatomy	6,00	Functional anatomy of the organs of speech and hearing I	6,00	1/1
Psychology	36,00	-	6,00	2/1
		Developmental psychology	6,00	1/1
		Language development	6,00	1/2
		Psycholinguistics	6,00	2/1
		Psychology of attention and perception.	6,00	1/2
		Research Methodology	6,00	2/1
Clinical linguistics	6,00	Linguistics applied to speech and language therapy	6,00	1/1

## Recommended knowledge

The students will have previously taken the subject "Functional anatomy of the organs of the language and hearing I", so they will already be familiar with the anatomical nomenclature and have acquired a broad and unitary knowledge of the organization and functioning of the human body, absolutely essential for the understanding of this subject.



## Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

- R1 To identify the different anatomical structures involved in hearing.
- R2 To know the respiratory system as a structure of fundamental importance for the elaboration of voice, speech and language.
- R3 To describe the functional anatomy of the oral and nasal cavities, larynx, and musculature involved in voice emission.
- R4 Describir la anatomía funcional de las cavidades bucal y nasal, la laringe y de la musculatura implicada en la emisión de la voz
- R5 Interpretar la integración funcional de las estructuras anatómicas implicadas en la audición y la producción de la voz, el habla y el lenguaje



## Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students must show that they have and understand knowledge in a field of study that is based on general secondary education on a level that, although supported by advanced textbooks, includes also some aspects that involve knowledge belonging to the vanguard of their field of study			X	
CB2	Students can apply their knowledge to their work or vocation in a professional manner and possess the skills typically demonstrated through devising and sustaining arguments and solving problems within their field of study				X
CB3	Students have the ability to gather and interpret relevant data usually within their field of study to inform judgments that include reflection on relevant social, scientific or ethical			X	
CB5	Capacity to develop those learning skills needed to undertake further studies with a high degree of autonomy				X
GENERAL		Weighting			
		1	2	3	4
CG1	Analysis and synthesis			X	
CG2	Organize a work plan being able to carry it out within a specified period			X	
CG3	Find, evaluate, organize and manage information systems			X	
CG4	Speaking and writing fluently, appropriately and with the necessary consistency to meet the academic standards of correctness in the language of instruction				X
CG5	Make decisions and being responsible for them				X



SPECIFIC		Weighting			
		1	2	3	4
CE1	Understand and integrate the biological foundations of Speech: Anatomy and Physiology				X
CE2	Understand and integrate the psychological foundations of Speech: language development, psychological development, Neuropsychology of language, basic processes and Psycholinguistics		X		
CE3	Understand and integrate the linguistic foundations of Speech: Phonetics and phonology, morphosyntax, semantics, pragmatics, and sociolinguistics		X		
CE4	Understand and integrate the educational foundations of speech therapy: teaching and learning processes		X		
CE29	To acquire practical training in individual, group, cooperative and mediation facilitator contexts			X	
CE32	Using information technology and communication			X	
CE33	Final project involving transversally applicable material; to be carried out in association with different subjects		X		
CE38	To design and carry out speech therapy treatments, both individual and collective, establishing objectives and stages, with the most effective and appropriate methods, techniques and resources, and taking into account the different evolutionary stages of the human being.			X	
CE48	Being familiar with communication disorders, language, speech, hearing, speech and nonverbal oral functions				X
CE51	Communicate orally and in writing one's observations and conclusions to the patient, their families and other professionals involved in treatment, adapting to the sociolinguistic characteristics of the environment				X
CE54	Manage communication technologies and information			X	



TRANSVERSAL		Weighting			
		1	2	3	4
CT1	Use the techniques of verbal and nonverbal communication in order to optimize relevant communicative situations			X	
CT2	Critically evaluate own job performance and that of other professionals to improve results				X
CT7	Having an open and flexible attitude to lifelong learning			X	



## Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3, R4, R5	75,00%	Oral and/or written tests: exams, reports, resolution of internships.
R1, R2, R3, R4, R5	5,00%	Attendance, participation, continued work.
R1, R2	10,00%	Performance and/or presentation of individual theoretical and practical activities.
R1, R2, R3, R4, R5	10,00%	Performance and/or presentation of theoretical and practical group activities.

### Observations

#### Evaluation methods:

#### 1. ORAL AND WRITTEN TESTS: EXAMS, MEMOIRS, RESOLUTION OF PRACTICES (75%).

##### 1.1. WRITTEN TEST (50%)

**1.1.1. Multiple choice tests (50%)** with one of the five possible correct answers. They provide a deeper understanding of the contents learned by the student and prepare him/her to deal with this evaluation model for the entrance exam for the specialty.

##### 1.2. EVALUATION OF PRACTICES (25%)

**1.2.1. Anatomical imaging tests (10%):** exam in which the student must identify the anatomical structures previously observed in class.

**1.2.2. Oral test (15%):** oral exam in which the student answers the questions asked by the teacher, explaining verbally the knowledge acquired and allowing interaction with the teacher.

#### 2. ATTENDANCE, PARTICIPATION AND CONTINUED WORK (5%)

##### 2.1. Class attendance (5%)

#### 3. COMPLETION AND EXPOSITION OF INDIVIDUAL THEORETICAL-PRACTICAL ACTIVITIES (10%)

**3.1. On-campus activities (10%):** the professor evaluates the participation and progress in the acquisition of knowledge and skills by the students during the lectures and practical classes.

#### 4. REALIZATION AND EXPOSITION OF GROUP THEORETICAL-PRACTICAL ACTIVITIES (10%)

**4.1. Final portfolio of the course (10%):** in groups, students design a document presenting it to be evaluated by the professor. It will consist of an anatomical atlas of the elements studied in class.



**CRITERIA FOR THE GRANTING OF HONORARY REGISTRATION:** In order to obtain it, it will be necessary a grade equal or higher than 9, participation in all class activities and final work of the course with the highest grade of the class. Likewise, and in accordance with the general regulations, only one honorary matriculation can be given for every 20 students, not per fraction of 20, with the exception of groups of less than 20 students in total, in which one matriculation can be given.

## Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

- M1 Participative lectures: strategies focused on the transmission of information from teachers to students. Student participation is promoted with hybrid methodologies, in order to consolidate knowledge and encourage critical thinking.
- M2 Practical Class. Classroom practice, laboratory practice and/or simulations: methodologies based on student interaction with problems, technologies, samples or analysis equipment, in order to incorporate experimentation to knowledge.





## IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
<p>THEORETICAL CLASSES. Lectures, expository and participative classes. They focus on the approach, analysis and development of competences: explanation and orientation towards the acquisition of the necessary knowledge, instruction in the derived skills and acquisition of professional aptitudes.</p> <p>M1</p>	R1, R2, R3, R4, R5	30,00	1,20
<p>PRACTICAL CLASSES. Individual or group work sessions supervised by the teacher. Analysis of materials related to the subjects: reports, statistics, scientific literature, tests and evaluation tests, problem solving, visualization of clinical histories, simulation of cases, etc.</p> <p>M2</p>	R1, R2, R3, R4, R5	10,00	0,40
<p>LABORATORY PRACTICES: Laboratory activities for obtaining, analyzing and interpreting samples. Learning of measurement techniques by means of instruments. Learning of safety measures.</p> <p>M2</p>	R1, R3, R4	8,00	0,32
<p>TUTORIALS: Individual or small group meetings to personalize any aspect of the teaching-learning process</p> <p>M1</p>	R1, R2, R4	3,00	0,12
<p>SEMINARS. Monographic sessions with the participation of students, teachers and professionals. They focus on specific aspects related to the competencies of the module, subject or subject. They can be held in the classroom, in other academic environments or in other different ones.</p> <p>M2</p>	R5	1,00	0,04



**EVALUATION:** Set of tests in oral, written, or other audiovisual media. It includes the final exams (exams and presentation of work) and all the elements of continuous evaluation that contribute in a weighted way to the final grade (presentation of work, scheduled activities, questionnaires, etc.) The public presentation of the Final Degree Project is included.

M1

R1, R2, R3, R4, R5 8,00 0,32

**TOTAL** 60,00 2,40

## LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
<b>GROUP WORK:</b> Group preparation of readings, essays, problem solving, seminars, papers, reports, etc. to be presented or delivered in theory classes, practical classes or small group tutorials. M2	R1, R2, R3, R4, R5	30,00	1,20
<b>AUTONOMOUS WORK:</b> Personal study of the student. Individual preparation of readings, essays, problem solving, seminar material, papers, reports, etc. to present or deliver in class, complete their training activity and prepare their evaluation tests. M2	R1, R2, R3, R4, R5	60,00	2,40
<b>TOTAL</b>		90,00	3,60



## Description of the contents

Description of the necessary contents to acquire the learning outcomes.

### Theoretical contents:

Content block	Contents
1.- ANATOMY OF HEARING. PHYSICAL STUDY OF SOUND. HEARING.	<ul style="list-style-type: none"><li>·<b>Topic 1: Outer and middle ear.</b> Pinna. Ear canal. Tympanic membrane. Tympanic cavity. Middle ear bones: malleus, incus and stapes. Joints, muscles. Eustachian tube. Mastoid cells. Inner ear. Cochlea. Vestibule and semicircular canals. Internal auditory canal</li><li>·<b>Topic 2: Physical study of sound.</b> Characteristics of sound waves. <b>The outer and middle ear.</b> Functions. Physiology of the eardrum-ossicular chain. The middle ear as impedance adapter. Air and bone transmission of sound</li><li>·<b>Topic 3: Transmission of sound waves,</b> mechanical vibration cochlea. Organ of Corti: morphofunctional aspects. Tonotopic organization. Auditory pathway. Information systems and acoustic vestibular. Auditory cortical areas. Acoustic tract injuries</li></ul>



## 2.- FUNCTIONAL ANATOMY OF RESPIRATION

·**Topic 4: The respiratory system:** general concepts on respiration. Organs of the respiratory system and their functional significance. Structure and morphology of the lower passageway: trachea, bronchi and bronchial tree. Contents of the thoracic cavity, pleura and pleural cavity. Lungs. Mediastinum.

·**Topic 5: Muscles of respiration.** Primary muscles of inspiration: the diaphragm. Anatomy of the diaphragm. Diaphragmatic mechanics. Accessory muscles of inspiration. Expiratory muscles: abdominal muscles. Expiration control. Accessory muscles of expiration.

·**Topic 6: Respiratory Physiology.** The measurement of respiration. Structure-function of the respiratory system. Respiratory cycle: pulmonary ventilation, pulmonary pressures and flows. Types of breathing: clavicular breathing, thoracic breathing, diaphragmatic breathing. Ventilation. Transport of respiratory gases. Control of breathing. Lung volumes and capacities. External and internal respiration.

## 3. - FUNCTIONAL ANATOMY OF PHONATION

·**Topic 7 - Anatomical elements of the larynx.** Hyoid bone and laryngeal cartilages. Ligaments and membranes. Intrinsic and extrinsic muscles.

·**Topic 8 - Anatomy of the vocal folds.** Body-cover model. Theories of phonation. Aero-elastic theory. Mechanism of phonation. Vocal cycle. Changes in the vocal folds by hormonal action throughout life.

·**Topic 9 - Laryngeal functions:** Role in speech: vocal attack, termination, sustained phonation. The classification of the voices. Vocal registers. The chest voice and the passage of the voice: glottal fry, falsetto. Frequency, tone and pitch changes. Vocal intensity and intensity changes. Clinical considerations.



## 4.- FUNCTIONAL ANATOMY OF ARTICULATION AND RESONANCE

### ·Topic 10 – Concept of resonance and articulation.

**Resonators and organs articulators (I).** Cavities of the vocal tract. Nasal passages and sinuses. External nose. Nasal cavities: Regions of the nasal cavities. Sense of smell

### ·Topic 11 - Resonators and articulator (II).

Oral cavity. Tongue. Muscles of the tongue. Muscles of facial expression

### ·Topic 12 - Resonators and articulators (III).

Pharynx. Division: rhino-pharynx, oropharynx, laryngopharynx. Pharyngeal wall. Muscles of the soft palate

### ·Topic 13 - Source-filter theory.

Physiology of articulation and resonation. Speech function: lips, mandible, tongue, velum. Development of articulatory ability. Development of the vocal tract. Coordinated articulation. The mouth as a resonant cavity: timbre, coverage and voice projection. The pharynx as a resonant cavity, *voce di gola*. The sinuses as a resonant cavity.

## 5.- FUNCTIONAL ANATOMY OF MASTICATION AND SWALLOWING

### ·Topic 14 - Anatomy and physiology of mastication

**and swallowing.** Temporo-mandibular joint. Masticatory muscles. Biomechanics of mastication. Dentition: dental development, dental occlusion. Salivary glands: parotid, submandibular and sublingual glands. Physiology of swallowing. Description of the three phases of swallowing.



## Temporary organization of learning:

Block of content	Number of sessions	Hours
1.- ANATOMY OF HEARING. PHYSICAL STUDY OF SOUND. HEARING.	7,00	14,00
2.- FUNCTIONAL ANATOMY OF RESPIRATION	6,00	12,00
3. - FUNCTIONAL ANATOMY OF PHONATION	6,00	12,00
4.- FUNCTIONAL ANATOMY OF ARTICULATION AND RESONANCE	8,00	16,00
5.- FUNCTIONAL ANATOMY OF MASTICATION AND SWALLOWING	3,00	6,00



## References

### BASIC BIBLIOGRAPHY

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- Gil-Carcedo, L. M. (2011).Otología. Ed Panamericana.
- Jackson- Menaldi, C. (2002).La voz patológica. Ed Panamericana.
- Jackson- Menaldi, C. (2005). La voz normal. Ed Panamericana
- Le Huche (2003).La Voz . Tomos I y II . Ed Manson
- Marco, J; Manrique, M. (2014).Audiología. Ponencia oficial de la SEORL. CYAN, Proyectos Editoriales, S.A. Madrid
- McCoy S., (2006).Your Voice: An Inside View. Multimedia Voice Science and Pedagogy. - Inside View Press, Princeton, NJ
- Torres Gallardo B., Gimeno Pérez, F. (2008). Anatomía de la voz. Editorial Paidotribo.

### RECOMMENDED BIBLIOGRAPHY

- Basterra, J. (2004).Otorrinolaringología y patología cervicofacial. Barcelona. Masson
- Hoit, JD; Weismer, G; Story, B. (2021) Foundations of Speech and Hearing: Anatomy and Physiology. Plural Publishing Inc.
- McFarland. (2008).Atlas de Anatomía en Ortofonía. Lenguaje y deglución. Edit. Elsevier-Masson. Barcelona
- Netter, FH. (2019).Atlas de Anatomía humana. Elsevier
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- Prado Calleros, H.; Arrieta Gómez, J.; Prado Abarca, A. (2012) Práctica de la otorrinolaringología y cirugía de cabeza y cuello. Editorial Médica Panamericana. Madrid
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- Seikel, AJ., (2010).Anatomy and Physiology for Speech, Language, and Hearing. Ed Singular
- Sobotta , Atlas de Anatomía.. Edit Panamericana, Madrid. Atlas de consulta.
- Thibodeau G.A., Patton K. T. (2007).Anatomía y Fisiología. Estructura y función del cuerpo humano. Editorial Mosby. 6ª ed.

### RESOURCES ON LINE

- <https://www.free-anatomy-quiz.com/es/>
- <http://www.innerbody.com/htm/body.html>
- <https://webanatomy.umn.edu/>
- <http://www.getbodysmart.com/index.htm>
- <https://bcs.wiley.com/he-bcs/Books?action=index&bcsId=1026&itemId=0471366927>



- <http://www.bartleby.com/107/>
- <http://www.meddean.luc.edu/lumen/meded/grossanatomy/dissector/mml/index.htm> MUSCLES
- <http://www.iqb.es/cbasicas/anatomia/musculos/musculos1.htm> MUSCLES IN SPANISH
- <http://www.ugr.es/~dlcruz/index.htm> IN SPANISH
- <http://www9.biostr.washington.edu/da.html> · <http://www.youtube.com/user/leonardocoscarelli>

**PROFESSOR LEONARDO COSCARELLI**

- <http://es.aclandanatomy.com/> CADAVERIC DISSECTIONS
- <http://www.uni-mainz.de/FB/Medizin/Anatomie/workshop/Klinisches/Clinic.html>
- <https://www.artnatomia.net/es/index.html>
- <http://www.otorrinoweb.com>