Subject: Physiology of the Hearing Organs, Speech and Voice.

Module | Content | Year | Term | Credits | Type
---|---|---|---|---|---
Physiology | 1º | 2º | 6 | Obligatory

Professor(s)

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Department of Physiology

Contact information

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Tutoring and Meetings

Prof. Elena Mª Planells: Friday, 8.00h-14.00h

Degree within the subject is taught

Degree in Speech

Prerequisites and/or recommendations

Basic knowledge in biology
Basic knowledge in physics of the sounds.
Knowledge in neuroanatomy and anatomy of the hearing and respiratory systems and bucco-phonatory structures

Brief description of the subject programme

Physiology of the ear and of the bucco-phonatory organs. The respiratory process. Acoustic sound and voice study.

General and specific competencies

To know, understand, and integrate the scientific foundations and physiology bases that support the profession of the speech therapist. [nº9, 14].
To know the physiology of the hearing organs, the respiratory process, speech, and functional organization of the nervous system. [nº9, 14].
To apply and integrate the knowledge acquired in physiology to the comprehension of other course disciplines (hearing pathologies, speech and voice, general neurology and of the language, medical hearing pathology, speech and language evaluation and speech interventions, etc.) and in the development of its professional practice. [nº 9, 14].
To critically evaluate the scientific methodology and terminology and the scientific physiology methodology, and those related with the speech therapist career. [nº9].
To develop abilities such as auto-learning, problem resolution, brainstorming, adaptability to changes[nº13]and team work[nº 8].
To dominate the physiology and neuroscience terminology that will enable the student to effectively interact with other professionals[nº 4, 17].
To know and use the information and communication technologies related to the field of study [nº 20].
To be able to comprehensively translate (English to Spanish) basic and physiology specialized texts. Learning results.

**OBJECTIVES**

The objectives that are aimed in the "block I generalities of the nervous system" of this subject can be defined as follows:
- Learning the physiology integration and homeostasis concept.
- Knowledge of the nervous system functional characteristics.
- Knowledge of the excitable cells functional properties.
- Knowledge of the synapsis physiology

The objectives that are aimed in the "block II acoustic sound study. Hearing process" of this subject can be defined as follows:
- Knowledge of the general characteristics of the sound waves
- Identification and specific characterization of the sound waves related to the human voice.
- Integrated knowledge of the sound wave process performed by the external, mid and internal ear.
- Integrated knowledge of the functional organization of the hearing system, coding, and neural processes of the hearing process.

The objectives that are aimed in the "block III breathing and phonation" of this subject can be defined as follows:
- Integrated knowledge of the function of the pharyngeal function
- Integrated knowledge of the function of the respiratory system as a generator of the phonatory breath.
- Integrated knowledge of the glottal and bucco-pharyngeal function in the articulation and sound production related to speech
- Integrated knowledge of the nervous control over the phonatory and articulatory function.

**Expected results:**
- Acquisition of a comprehensive and integrated knowledge (theoretical-practical) of the organization and function of the nervous system, hearing, auditory system, respiratory system and phonatory system, as well as the acoustic characteristics of the sound waves.
- Practical knowledge of the spirometry fundamentals. Analysis of the aerodynamic characteristics of the vocal function.
- Rewarding self-independent learning, observation capacity, analysis and personal interpretation of the physiologic parameters related to hearing and speech areas.
- Initiation of group work techniques. Promoting topic discussion and information evaluation: integration of the investigation results with reading and elaboration of scientific projects (oral-written) and reports expressing them clearly and correctly.
- Initiation in the informatics use of specific simulation software in the study of acoustic characteristics of sound waves.

**DETAILED COURSE SYLLABUS**

**Theoretical units:**

**BLOCK I. GENERALITIES**

**BLOCK II. ACOUSTIC STUDY OF THE SOUND PHYSIOLOGY OF THE HEARING**
8. Functions of the external ear, pavilion, and hearing external conduct. Collection, focus and sound localization in the vertical axis. Tympanic membrane. Functions of the middle ear, ossicles chain and eustachian tube: Driving and amplification of the sound wave; atmospheric pressure adjustments. Reflection attenuation.
10. Mechanoelectric Transduction in inner and outer hair cells. Biphasic receptor potential. Encoding frequency and intensity of sound.

**BLOCK III. RESPIRATION AND PHONATION**

12. Sound and human voice. Functional organization of the phonatory system: structures involved
18. Nervous regulation of the phonatory function: autonomous and voluntary control

**PRACTICAL CLASSES**
1. Interactive Computer simulation of ion channels, transport across membranes. Resting membrane potential, action potential. Immunology.
2. Analysis of the physical properties of the sound waves. Calculation exercises
3. Study of the sound waves: frequency and amplitude analysis
5. Computer simulation of the process of hearing
6. Determination of lung volumes and capacities
7. Computer simulation of the respiratory system functioning
8. Functional aspects of the larynx during respiration and phonation, in normal and overactive state
9. Video about morphological functions of the larynx
10. Pathologies associated to the larynx: video of patients attending an otolaryngology consultation.

**BIBLIOGRAPHY**

**FUNDAMENTAL BIBLIOGRAPHY:**

2. Purves D, Augustine GJ, Fitzpatrick D, Katz LC, La Mantia A-S, McNamara J. Neurociencia. 3ª ed. Madrid: Panamericana, 2008. *Both are specially recommended for the study of the physiology of the nervous system and in particular, of the auditory perception*

**COMPLEMENTARY BIBLIOGRAPHY:**

Especially recommended for the study of this subject for including more applied and relevant contents to the speech therapist.

   General Manual Speech. In addition to including topics that summarize the essential contents of this course, it allows to clearly appreciate its relationship with other subjects in the curriculum.


RECOMMENDED LINKS

1. Management of Health Professions (BOE280-2003;LEY44/2003, November 21st)


3. Professional enabling. Verification requirements for the university degree for the practice of the profession of the Speech Therapist (BOE73-2009; Orden CIN/726/2009, March 18th)

4. ANECA White Paper. List of competencies
   http://www.aneca.es/media/155052/libroblanco_logopedia_def.pdf
   www.ugr.es/local/oapsico/Competencias%20Logopedia.doc

TEACHING METHODOLOGY

Teaching lessons using PowerPoint presentations and student collaboration.
Academic Practice Sessions, forming groups of students and active participation. Supported with audiovisual equipment.
Presentation and discussion of work modules prepared and presented by students.
Specialized tutorials, problem resolution of teaching lessons, practical or design classes and presentation project.

Activity Program

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<tr>
<th>Second Semester</th>
<th>Chapters</th>
<th>Classroom Activities</th>
<th>Non-contact Activities</th>
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<td>Theoretical lessons (hours)</td>
<td>Practical lessons (hours)</td>
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- Exam in which theoretical and practical contents are included 70%
- Practical classes 10%
- Active participation in theoretical and practical classes 10%
- Group work performed by searching online and presenting a personal PowerPoint presentation 10%