370548 - AUDIOLOG - Introduction to Audiology

Coordinating unit: 370 - FOOT - Terrassa School of Optics and Optometry
Teaching unit: 731 - OO - Department of Optics and Optometry
Academic year: 2019
Degree: BACHELOR'S DEGREE IN OPTICS AND OPTOMETRY (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: Catalan, English

Teaching staff
Coordinator: Cardona Torreadeflot, Genis

Opening hours
Timetable: Ask for an appointment through genis.cardona@upc.edu

Prior skills
Basic knowledge of Physics and Physiology

Requirements
Basic knowledge of Physics and Physiology

Degree competences to which the subject contributes

Specific:
0. Applying the scientific basis needed for the development of the profession.
0.9. Being able to perform literature searches.
1.1.2. Knowing how to do clinical examinations and interpret the results
1.2.4. Communicate and inform the patient of all the tests to be performed and the results of clinical evaluation
2.2.6. Individualize treatment planning.
3a.0.4. Provide tracking service that best suits each patient.

General:
T1. Ethical and social commitment and sustainability.
T2. Effective communication (oral and written). (in Catalan, Spanish and English)
T2.1.2. Develop empathy with people

Teaching methodology
Lectures (large group), with guest experts if necessary, and practical lab sessions (small group)

Learning objectives of the subject
370548 - AUDIOLOG - Introduction to Audiology

- Nature of sound and its parameters
- Ear anatomy and physiology
- Audiometric techniques
- Interpretation of audiometric graphs
- Hearing loss, causes and typology
- Hearing aids, types and selection
- Programming digital hearing aids
- Fitting hearing aids and follow-up

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours medium group: 21h</th>
<th>28.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group: 9h</td>
<td>12.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 45h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
# 370548 - AUDIOLOG - Introduction to Audiology

## Content

<table>
<thead>
<tr>
<th>Sound: definition and properties</th>
<th>Learning time: 9h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> In this preliminary section, we will review the main characteristics of the waves, with particular attention to the sound waves, as different from light waves. We will describe the properties and phenomena related to sound.</td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td><strong>Related activities:</strong> Lab session 1. Use of apps to analyze frequency and amplitude of different sound sources.</td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong> -To know the characteristics of sound. -The understand sound as a longitudinal wave requiring a medium of propagation. -To know the basic properties of sound propagation (reflection, interference, doppler effect...). -To know the dynamic range of human hearing (frequency and amplitude).</td>
<td>Self study : 4h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ear anatomy and physiology</th>
<th>Learning time: 7h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> In this section we will describe briefly the anatomy of the ear: external ear, middle ear and internal ear. Besides, we will describe how each part functions and the contribution towards the complete hearing process.</td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td><strong>Related activities:</strong> This section does not have any activities.</td>
<td>Self study : 4h</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong> -To know the parts of the human ear. -To understand how each of these parts leads to a complete sense of hearing. -To follow a sound wave from the outside of the ear to its interpretation at the central nervous system.</td>
<td></td>
</tr>
</tbody>
</table>
### Audiometry

**Description:**
Description of the classical audiometric test, i.e., audiometry. Introduction to the audiometer and to the methodology related to air and bone audiometry, with or without masking. Approach to the threshold of pain as a supraliminal test. Interpretation of audiometric graphs.

**Related activities:**
- Lab session 2: Air and bone tone audiometry
- Lab session 3: Masking and supraliminal audiometry
- Task 1

**Specific objectives:**
- To know how to operate an audiometer.
- To gain proficiency to perform air and bone audiometries, with or without masking.
- To gain proficiency to perform supraliminal tests.
- To provide a correct interpretation to audiometries.

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>15h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>3h</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>4h</td>
</tr>
<tr>
<td>Self study:</td>
<td>8h</td>
</tr>
</tbody>
</table>

### Complementary audiometry tests

**Description:**
Description of several additional tests to better understand the hearing perception and discrimination of the patient (logoaudiometry), and to assess the health of the middle ear (impedance measurement), amongst others.

**Related activities:**
- Lab session 4: Logoaudiometry and other complementary tests

**Specific objectives:**
- To know the basis of logoaudiometry, and to be able to administer this test and correctly assess the results.
- To know the fundamentals of impedance measurement.
- To have a basic understanding of other objective tests commonly employed to diagnose hearing disorders.

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>10h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>3h</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>3h</td>
</tr>
<tr>
<td>Self study:</td>
<td>4h</td>
</tr>
</tbody>
</table>
### Hearing loss

**Description:**
The various conditions leading to hearing loss will be described, highlighting age-related hearing loss, followed by the correct interpretation of the results provided by tonal audiometry and by other complementary tests. Classical syndromes (such as Ménière syndrome) will be described, as well as tinnitus.

**Related activities:**
- Lab session 2: Air and bone tone audiometry
- Lab session 3: Masking and supraliminal audiometry
- Lab session 4: Logoaudiometry and other complementary tests

**Specific objectives:**
- To know the main ear pathologies leading to hearing loss.
- To know the presentation and symptoms of some of the syndromes with highest incidence which cause hearing loss (such as Ménière syndrome).
- To acquire the required skills to correctly interpret the results of audiograms and other complementary tests.
- To know the main etiology, characteristics and treatment of tinnitus.

### Hearing aids

**Description:**
Description of the different types of hearing aids, highlighting the benefits and pitfalls of each modality. Fitting a hearing aid, and posterior follow-up. Technology and programming of hearing aids. Selection of the available hearing aids according to type and severity of hearing loss.

**Related activities:**
- Tasks 2 and 3

**Specific objectives:**
- To know the different types of hearing aids.
- To acquire a basic understanding of the technology and programming of hearing aids.
- To determine the best type of hearing aid for each patient according to hearing loss typology and severity.
- To know the different steps required to successfully fit a hearing aid and the posterior follow-up.
### Planning of activities

| Lab session 1. Sound parameters | Hours: 2h  
Laboratory classes: 2h |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>In this lab session students will explore the parameters of sound waves from different sources. The session shall start with an introduction and practical demonstration in the lab, followed by field work in groups of 3 or 4 students.</td>
</tr>
</tbody>
</table>
| **Support materials:**          | Several phone apps to measure sound frequency and amplitude.  
Lab workbook. |
| **Descriptions of the assignments due and their relation to the assessment:** | The corresponding section of the lab workbook will be revised at the following lab session. |
| **Specific objectives:**        | -To know and to experiment with the different sound parameters.  
-To be aware and use phone apps to determine the characteristics of sound. |

| Lab session 2. Air and bone tone audiometry | Hours: 2h  
Laboratory classes: 2h |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Introduction to air and bone audiometry. Familiarization with the audiometer as the classical device to determine hearing thresholds. Record and interpretation of audiometries.</td>
</tr>
</tbody>
</table>
| **Support materials:**                     | Lab workbook.  
Audiometer and complementary resources. |
| **Descriptions of the assignments due and their relation to the assessment:** | The corresponding section of the lab workbook will be revised at the following lab session. |
| **Specific objectives:**                   | -To understand the operation of an audiometer.  
-To gain proficiency in the determination of air and bone hearing thresholds.  
-To gain basic knowledge in the interpretation of the most common types of audiometries. |

| Lab session 3. Masking and supraliminal audiometry | Hours: 3h  
Laboratory classes: 3h |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Introduction to masking in air and bone audiometry. When is masking necessary? Definition and use of supraliminal audiometry in terms of pain threshold which, jointly with the hearing threshold, determines the auditory range of the patient, required to know the operation field of the hearing aid.</td>
</tr>
</tbody>
</table>
| **Support materials:**                             | Lab workbook.  
Audiometer and complementary resources. |
| **Descriptions of the assignments due and their relation to the assessment:** | The corresponding section of the lab workbook will be revised at the following lab session. |
Specific objectives:
- To understand the need and procedure of masking in audiometry.
- To know how to provide the correct interpretation of an audiometry under masking.
- To gain proficiency in the administration of supraliminal audiometries.

Lab session 4. Logoaudiometry and other complementary tests

| Description: |
| Description and practice of the logoaudiometry technique as a complementary test of auditory processing and perception. Introduction to other complementary techniques: measurement of acoustic impedance, otoscopy, etc. |

| Support materials: |
| Lab workbook. |
| Audiometer and complementary resources. |
| List of words to conduct logoaudiometry. |

| Descriptions of the assignments due and their relation to the assessment: |
| The corresponding section of the lab workbook will be revised at the end of the session. |

Specific objectives:
- To gain proficiency in the administration of logoaudiometries.
- To know the basic concepts related to acoustic impedance and to otoscopy.

Final test

| Description: |
| Final test, multiple choice |

| Specific objectives: |
| To show the corresponding successful knowledge and skills acquisition |

Task 3. Review of commercially available hearing aids

| Description: |
| In this group activity students will review the different options of hearing aid commercially available. Each group will work on a particular manufacturer and the results will be shared with the class afterwards. |

Task 2. Perusal of videos related to hearing aids

| Description: |
| In this activity students will view several videos describing modalities of hearing aids. This may be followed with a short auto-assessment questionnaire. |
Task 1. Edition of Wikipedia in Catalan or Spanish

<table>
<thead>
<tr>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>In this task student will review the information currently available in the Catalan or Spanish Wikipedia related to the contents of the course and will edit and expand this information.</td>
</tr>
</tbody>
</table>

**Qualification system**

Final exam (50%)
Compulsory tasks to be conducted in group (30%)
Attendance and successful performance in lab sessions (20%)

**Regulations for carrying out activities**

The final exam will consist in multiple choice questions (4 responses, with penalization of the errors). The examen may contain questions related to the ressolution of practical cases, interpretation of graphs, etc.

**Bibliography**

**Basic:**


**Complementary:**