370513 - MOTILITAT - Binocular Motility and Perception

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 Compulsory)
ECTS credits: 6  
Teaching languages: Catalan

Teaching staff

Coordinator: JOSE LUIS ALVAREZ MUÑOZ (http://futur.upc.edu/JoseLuisAlvarezMunoz)
MONTSERRAT TÀPIAS ANTON (http://futur.upc.edu/MontserratTapiasAnton)

Degree competences to which the subject contributes

Specific:
1. Anatomy, histology, physiology, biochemistry and neurophysiology of the visual system and the process of vision
2. Technical english applied to optics and optometry
3. Understanding the mechanism of imaging and information processing in the visual system.
4. Do properly binocular and accommodative tests.
5. Know interpret functional and health test results of the visual system.
6. Being able to take, treat, represent and interpret experimental data. "Use basic laboratory equipment and techniques"
7. Being able to perform literature searches.
8. Value the effects (perceptual changes) caused by the glasses, optical aids and protection elements in the visual system.
9. Value the need to realize complementary tests. Realize and interpret correctly the results of these tests (visual field, layouts,...)

General:
10. Acquire communication techniques appropriate to ensure the success of teamwork
11. Define the general objectives and to carry out a specific group
12. Display information orally and in writing of reasonably and coherent.
13. Extract the main points of a text or any source of information (oral or written)
14. Encourage methodical work, rigorous, consistent and innovative
15. Reflect and be able to make a critic of the knowledge and developed skills and the level of achievement.
16. Synthesize and organize information to convey it effectively orally and / or written
17. Locate new information and the interpretation of it in its context.
18. Working with evidence, methodology and rigour.
Teaching methodology

On the one hand the controlled learning hours consist of lectures (large group) in which the teachers make a brief introduction to the general learning objectives related to the basic concepts of matter. On the other hand, also consist of take classes of practice exercises and / or problems (group average) related to specific learning objectives of the content of the subject. It works, generally in groups of 3 or 4 students.

Through practical exercises we try to motivate and engage students to participate actively in their learning.

The support material to work the concepts of the course will be available on the platform Atenea.

In lab activities, presentation and exhibition of a specific subject and class exercises and problems are useful to incorporate some generic skills such as teamwork and cooperative learning, among others.

The lab can develop basic instrumental skills, and students started the application of scientific method in solving problems in the laboratory.

Usually after each proposed theoretical session and laboratory are proposed some tasks outside the classroom, to be working either individually or in groups.

Learning objectives of the subject

At the end of the course Binocular motility and perception, the student should be able to:

- Deduct the actions of all the extra ocular muscles from any position of gaze.
- Know the different types of monocular and binocular movements.
- Understand all parameters related to binocular vision, in motor and perceptual level.
- Understand and manage equipment, instruments and techniques for the analysis of a binocular visual system.
- Understand the operation of any system of dissociation and properly interpret the perception of a patient with any heterophoria or heterotropia.
- Measuring and representing the relationship between convergence and accommodation of a healthy binocular visual system.
- Know all the systems for obtaining stereoscopic perception from flat images, and their use to obtain the stereoscopic acuity of a patient.
- Identify the different degrees of fusion.
- Describe the binocular summation models.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 144h</th>
<th>Hours large group:</th>
<th>0h</th>
<th>0.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>48h</td>
<td>33.33%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>12h</td>
<td>8.33%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>84h</td>
<td>58.33%</td>
</tr>
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</table>
### 1. INTRODUCTION TO THE BINOCULAR VISION

<table>
<thead>
<tr>
<th>Description:</th>
<th>This content is worked:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related activities:</td>
<td>It carried out activities 1, 9, 11 and 12.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>12 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>2 h 30 m</td>
</tr>
<tr>
<td>Practical classes:</td>
<td>0 h 30 m</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>2 h</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0 h</td>
</tr>
<tr>
<td>Self study :</td>
<td>7 h</td>
</tr>
</tbody>
</table>

### 2. MONOCULAR AND BINOCULAR MOTILITY

<table>
<thead>
<tr>
<th>Description:</th>
<th>This content is worked:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related activities:</td>
<td>TYPES OF EYE MOVEMENTS: Functions of eye movements. Eye movements to maintain the look. Eye movements to shift gaze. Eye movements of fixation.</td>
</tr>
<tr>
<td>Related activities:</td>
<td>We carried out the activities 2, 9, 11 and 12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>17 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>5 h 30 m</td>
</tr>
<tr>
<td>Practical classes:</td>
<td>0 h 30 m</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>2 h</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0 h</td>
</tr>
<tr>
<td>Self study :</td>
<td>9 h</td>
</tr>
</tbody>
</table>
3. HETEROPHORIA AND ASTIGMATISM

**Learning time:** 12h
- Theory classes: 3h 30m
- Practical classes: 2h 30m
- Laboratory classes: 0h
- Guided activities: 0h
- Self study: 6h

**Description:**
This content is worked:


ASTIGMATISM: Definition and classification of astigmatism. Detection of strabismus. Measure the angles of primary and secondary deviation. Effect of prisms in the binocular visual system.

**Related activities:**
It carried out activities 9 and 11.

4. BINOCULAR CONVERGENCE AND ACCOMMODATION

**Learning time:** 27h 30m
- Theory classes: 4h
- Practical classes: 3h 30m
- Laboratory classes: 4h
- Guided activities: 0h
- Self study: 16h

**Description:**
This content is worked:

Distance interpupil up and baseline. Notations of convergence. Line demand. ACA Value: gradient method, the method of straight Foris. Value CPA. Zone Vision Binocular Simple and clear. Anomalies of convergence and divergence.

**Related activities:**
It carried out activities 3, 4, 10, 11 and 12.
5. VISUAL DIRECTIONS

Description:

Del:
Al:

3. PROVES INDIVIDUALS D'AVALUACIÓ CONTÍNUA (CONTINGUT 1) volumetries acid-base Realització individual d'exercicis del contingut de bioquímica general que cobreixin part dels objectius específics d'aprenentatge del contingut. Exercicis de preguntes d'enunciat curt. Correcció per part del professorat. Guia d'apunts teòrics disponibles a través del campus virtual ATENEA i bibliografia recomanada (no utilitzables durant el moment de les proves). Resolució dels exercicis per part de l'estudiant, que el professor avaluarà. El conjunt de tots els exercicis representa una part de l'avaluació de l'assignatura (15%). En finalitzar l'activitat, l'estudiant ha de ser capaç de: - Definir i explicar en concepte de glicíd i les seves principals funcions biològiques. - Classificar els diferents grups de glicíd. - Descriure la estructura i les característiques dels principals grups de glicíd i els seus derivats. - Definir el concepte d'aminoàcid. - Descriure l'estructura i les propietats dels diferents grups d'aminoàcids. - Definir i diferenciar entre el concepte de peptid i el de proteïna. - Explicar els principis estructurals de les proteïnes i els factors que determinen el seu plegament tridimensional. Descriure les principals propietats físic-químiques de les proteïnes i explicar el concepte de desnaturalització. - Enumerar les principals funcions biològiques de les proteïnes. - Enumerar les modificacions postraduccionals mes comunes de les proteïnes. - Descriure l'estructura, els tipus i les funcions dels col·làgens. - Definir el concepte de proteïnas enzimàticas. - Explicar les característiques funcionals dels enzims. - Classificar els diferents tipus d'enzims. - Explicar i diferenciar entre el concepte de coenzim i el de cofactor - Descriure la influència de les concentracions del sostrat, del producte i de l'enzim, junt amb la temperatura i el pH, sobre la velocitat de les reaccions enzimatiques. - Explicar els principals mecanismes moleculars d'inhibició enzimàtica. - Descriure el concepte i les característiques estructurals dels diferents grups de lípids. - Descriure la importància biològica dels diferents grups de lípids i els seus derivats. - Explicar i esquematitzar l'estructura bàsica de les biomembranes. - Explicar els principis bàsics del funcionament del metabolisme oxidatiu. - Descriure el significat biològic de la cadena respiratòria cel·lular i la utilització de l'energia metabòlica. - Descriure el significat fisiològic de la degradació de la glucosa per la via de la glucolisí i per la via de les pentoses fosfat. - Descriure el destí metabòlic del piruvat i el seu significat fisiològic. - Calcular el balanç energètic de la degradació total o parcial d'una molècula de glucosa. - Descriure el significat fisiològic de la via del sorbitol. - Descriure el significat fisiològic del cicle dels àcids tricarboxílics.

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5. VISUAL DIRECTIONS

This content is worked:


Related activities:
### 6. DISTANCE AND VISUAL STEREOPSIS

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>23h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>4h 30m</td>
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<tr>
<td>Practical classes:</td>
<td>3h 30m</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>2h</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
</tr>
<tr>
<td>Self study:</td>
<td>13h</td>
</tr>
</tbody>
</table>

**Description:**

**Related activities:**
It carried out activities 5, 10, 11 and 12.

### 7. ANISOMETROPIA AND ANISEIKONIA

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>23h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>4h 30m</td>
</tr>
<tr>
<td>Practical classes:</td>
<td>3h 30m</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>2h</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
</tr>
<tr>
<td>Self study:</td>
<td>13h</td>
</tr>
</tbody>
</table>

**Description:**

**Related activities:**
It carried out activities 6, 11 and 12.
<table>
<thead>
<tr>
<th>8. MERGER AND SUMMATION BINOCULAR</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: This content is worked:</td>
<td>Theory classes: 2h 30m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 0h 30m</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
</tr>
<tr>
<td></td>
<td>Self study: 7h</td>
</tr>
</tbody>
</table>

**Description:**

**Related activities:**
The activities carried out 8, 11 and 12.
### Planning of activities

| 1. LABORATORY. VISUAL FIELD AND BINOCULARS FIXING FIELD (CONTENTS 1) | Hours: 2h  
Laboratory classes: 2h |
|---|---|
| **Description:** Practice should be done in the laboratory in groups of up to 3 guests, lasting 2 hours. The laboratory has carried out the experimental and data collection. As a self-directed learning are planned two activities: a pre-experiment, in which the student has a reading of the script in order to answer a series of oral questions which arise the teacher to identify learning prelaboratori (identification objectives) and the other after the experiment, in which the student must do a data processing and a summary report to identify learning postlaboratori (drawing of conclusions).  
**Support materials:** All materials for the realization of the experiment is specified in the script of practice available to Atenea.  
**Descriptions of the assignments due and their relation to the assessment:** Register by the teachers check the students' independent learning prelaboratori and laboratory work, checking with the experimental data. Delivery, the next meeting, in memory of practical conclusions and data processing. Be corrected and returned with feedback for the teachers in the same session. It represents half of the lab note.  
**Specific objectives:** At the end of practice the student or student should be able to:  
- Distinguish between the concepts of visual field and binocular field binocular fixation.  
- Become familiar with the different methodologies for measuring the binocular field.  
- Mastering the graphic representation of data. |
| 2. LABORATORY. OCULAR MOTILITY (CONTENT 2) | Hours: 2h  
Laboratory classes: 2h |
|---|---|
| **Description:** Practice should be done in the laboratory in groups of up to 3 guests, lasting 2 hours. The laboratory has carried out the experimental and data collection. As a self-directed learning are planned two activities: a pre-experiment, in which the student has a reading of the script in order to answer a series of oral questions which arise the teacher to identify learning prelaboratori (identification objectives) and the other after the experiment, in which the student must do a data processing and a summary report to identify learning postlaboratori (drawing of conclusions).  
**Support materials:** All materials for the realization of the experiment is specified in the script of practice available to Atenea.  
**Descriptions of the assignments due and their relation to the assessment:** Register by the teachers check the students' independent learning prelaboratori and laboratory work, checking with the experimental data. Delivery, the next meeting, in memory of practical conclusions and data processing. Be corrected and returned with feedback for the teachers in the same session. It represents half of the lab note. |
### Specific objectives:
- At the end of practice the student or student should be able to:
  - Understand the methodology used to obtain eye records.
  - Identify the different types of eye movements obtained from the records.
  - To clear the angle of false twisting.

### 3. LABORATORY. ACA RELATION (CONTENT 4)

<table>
<thead>
<tr>
<th>Hours</th>
<th>Laboratory classes: 2h</th>
</tr>
</thead>
</table>

#### Description:
Practice should be done in the laboratory in groups of up to 3 guests, lasting 2 hours. The laboratory has carried out the experimental and data collection. As a self-directed learning are planned two activities: a pre-experiment, in which the student has a reading of the script in order to answer a series of oral questions which arise the teacher to identify learning prelaboratori (identification objectives) and the other after the experiment, in which the student must do a data processing and a summary report to identify learning postlaboratori (drawing of conclusions).

#### Support materials:
All materials for the realization of the experiment is specified in the script of practice available to Atenea.

#### Descriptions of the assignments due and their relation to the assessment:
Register by the teachers check the students' independent learning prelaboratori and laboratory work, checking with the experimental data.
Delivery, the next meeting, in memory of practical conclusions and data processing. Be corrected and returned with feedback for the teachers in the same session.
It represents half of the lab note.

#### Specific objectives:
- Understand the routine measurement of horizontal heterofòries.
- To show the relation between the parameters convergence and binocular accommodation.
- Justifying abnormal responses of the patient.
- Mastering the calculation of linear regression.

### 4. LABORATORY. SHARP AND SIMPLE BINOCULAR VISION AREA (CONTENT 4)

<table>
<thead>
<tr>
<th>Hours</th>
<th>Laboratory classes: 2h</th>
</tr>
</thead>
</table>

#### Description:
Practice should be done in the laboratory in groups of up to 3 guests, lasting 2 hours. The laboratory has carried out the experimental and data collection. As a self-directed learning are planned two activities: a pre-experiment, in which the student has a reading of the script in order to answer a series of oral questions which arise the teacher to identify learning prelaboratori (identification objectives) and the other after the experiment, in which the student must do a data processing and a summary report to identify learning postlaboratori (drawing of conclusions).

#### Support materials:
All materials for the realization of the experiment is specified in the script of practice available to Atenea.
### 5. LABORATORY. VISUAL DIRECTIONS (CONTENT 5)  
**Description:**  
Practice should be done in the laboratory in groups of up to 3 guests, lasting 2 hours. The laboratory has carried out the experimental and data collection. As a self-directed learning are planned two activities: a pre-experiment, in which the student has a reading of the script in order to answer a series of oral questions which arise the teacher to identify learning prelaboratori (identification objectives) and the other after the experiment, in which the student must do a data processing and a summary report to identify learning postlaboratori (drawing of conclusions).

**Support materials:**  
All materials for the realization of the experiment is specified in the script of practice available to Atenea.

**Descriptions of the assignments due and their relation to the assessment:**  
Register by the teachers check the students' independent learning prelaboratori and laboratory work, checking with the experimental data.  
Delivery, the next meeting, in memory of practical conclusions and data processing. Be corrected and returned with feedback for the teachers in the same session. It represents half of the lab note.

**Specific objectives:**  
At the end of practice the student or student should be able to:  
- Understand the routine measurement area binocular vision simple and clear.  
- Decide what data correctly correspond to different lines limiting the area of binocular vision simple and clear.  
- Justifying abnormal responses of the patient.  
- Mastering the calculation of linear regression.

| Hours: 2h |
| Laboratory classes: 2h |

### 6. LABORATORY. STEREOPSIS (CONTENT 6)  
**Hours:** 2h  
**Laboratory classes:** 2h
7. LABORATORY. ANISOIKONIA (CONTENT 7)

Hours: 2h
Laboratory classes: 2h

Description:
Practice should be done in the laboratory in groups of up to 3 guests, lasting 2 hours. The laboratory has carried out the experimental and data collection. As a self-directed learning are planned two activities: a pre-experiment, in which the student has a reading of the script in order to answer a series of oral questions which arise the teacher to identify learning prelaboratori (identification objectives) and the other after the experiment, in which the student must do a data processing and a summary report to identify learning postlaboratori (drawing of conclusions).

Support materials:
All materials for the realization of the experiment is specified in the script of practice available to Atenea.

Descriptions of the assignments due and their relation to the assessment:
Register by the teachers check the students' independent learning prelaboratori and laboratory work, checking with the experimental data.
Delivery, the next meeting, in memory of practical conclusions and data processing. Be corrected and returned with feedback for the teachers in the same session.
It represents half of the lab note.

Specific objectives:
At the end of practice the student or student should be able to:
- Confirm the distortion of perception of space in the presence of anisoiconia.
- Differentiate the perspective of the anisoiconia anisoiconia luminance.
8. LABORATORY. MERGER (CONTENT 8)  

**Hours:** 2h  
Laboratory classes: 2h  

**Description:**  
Practice should be done in the laboratory in groups of up to 3 guests, lasting 2 hours. The laboratory has carried out the experimental and data collection. As a self-directed learning are planned two activities: a pre-experiment, in which the student has a reading of the script in order to answer a series of oral questions which arise the teacher to identify learning prelaboratori (identification objectives) and the other after the experiment, in which the student must do a data processing and a summary report to identify learning postlaboratori (drawing of conclusions).  

**Support materials:**  
All materials for the realization of the experiment is specified in the script of practice available to Atenea.  

**Descriptions of the assignments due and their relation to the assessment:**  
Register by the teachers check the students' independent learning prelaboratori and laboratory work, checking with the experimental data.  
Delivery, the next meeting, in memory of practical conclusions and data processing. Be corrected and returned with feedback for the teachers in the same session.  
It represents half of the lab note.  

**Specific objectives:**  
At the end of practice the student or student should be able to:  
- To demonstrate the phenomena of fusion, suppression and binocular retinal rivalry.  
- Measure width of fusion.  

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9. CONTINUOUS ASSESSMENT TEST 1  
(CONTENTS 1 TO 4)  

**Hours:** 1h  
Practical classes: 1h  

**Description:**  
Individual written test conducted in the classroom, an hour, worked on the theoretical concepts to the contents 1, 2 and 3.  

**Support materials:**  
Provided by the Centre.  

**Descriptions of the assignments due and their relation to the assessment:**  
Resolution of the test. Represents 40% of the final grade for the course.  

**Specific objectives:**  
Assess the level of student learning.  

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10. CONTINUOUS ASSESSMENT TEST 2  
(CONTENTS 5 TO 8)  

**Hours:** 1h  
Practical classes: 1h  

**Description:**  
Individual written test conducted in the classroom, an hour, worked on the theoretical content to 4 and 5.  

**Support materials:**  
Provided by the Centre.
### Descriptions of the assignments due and their relation to the assessment:
Resolution of the test. Represents 40% of the final mark for the course.

### Specific objectives:
Assess the level of student learning.

### 11. LABORATORY TEST

<table>
<thead>
<tr>
<th>Description:</th>
<th>Hours: 1h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual written test conducted in the classroom, one hour, the concepts studied in the lab sessions.</td>
<td>Practical classes: 1h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Support materials:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Provided by the Centre.</td>
<td></td>
</tr>
</tbody>
</table>

### Descriptions of the assignments due and their relation to the assessment:
Resolution of the test. Represents 20% of the final grade for the course.

### Specific objectives:
Assess the level of student learning.

### Qualification system

The final mark is the weighted sum of the following partial marks:

\[ QF = 0.4 \times \text{PAC1} + 0.4 \times \text{PAC2} + 0.2 \times \text{PAL} \]

- **QF**: final results
- **PAC1**: first test of continuous assessment
- **PAC2**: second test of continuous assessment
- **PAL**: laboratory test

### Regulations for carrying out activities

- In case that PAC1's mark is < 4, it will be able to be recovered in the day of PAC2.
- It is an essential requirement that, previous to the laboratory sessions, the students read the practicals script. The lecturer will check it by means an oral or written test. This positive evaluation of this issue does not score any mark while the negative will reduce the PAL mark. The attendance to the practicals is mandatory and each unattendance day will subtract LA/n to the PAL’s mark, being n the total amount of laboratory sessions.
- If any of the evaluation activities is not done it will be considered as non-rated.
- We control the attendance and student participation in the lectures.
Bibliography

Basic:


Complementary:


