COURSE DATA

DATA SUBJECT

Code: 34318
Name: Vision of movement and depth
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1207 - Degree in Optics and Optometry	Facultat de Física	4	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1207 - Degree in Optics and Optometry	Visual perception: mechanisms and clinical applications	ELECTIVES

COORDINATION

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SUMMARY

The subject presents the basic description of the movement as a variation of the irradiance in the image plane (speed as optical flow) and the dependence of it with the three-dimensional (depth) structure of the scene. The functioning of the physiological mechanisms in V1 and MT that allow the estimation of the speed in the human visual system is analyzed. Likewise, the consequences of binocular vision (for example binocular correspondences) are analyzed in the perception of the depth structure of the scenes, as well as the physiological basis for the realization of such calculations and their similarity with the estimation mechanisms of speed.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

There are no strict restrictions

It is convenient having attended to Psychophysics in 2nd year and Mechanisms and Models of Vision in 3rd year

COMPETENCES / LEARNING OUTCOMES

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Being able to gather and interpret relevant data to make judgments.

Being able to transmit information, ideas, problems and solutions to both a specialized and non-specialized audience.

Development of learning skills necessary to undertake further studies with a high degree of autonomy.

Knowing how to apply the knowledge acquired to professional activity, knowing how to solve problems and develop and defend arguments.

To know and to handle advanced vision models (non-linear and / or integrated by elements belonging to the extra striated cortex).

To know the way in which the information of the various perceptual dimensions is integrated to make judgments about the scene.

DESCRIPTION OF CONTENTS

1. Movement perception

Introduction. Uses of movement information.
Limits of vision in the spatio-temporal domain.
Spectrum of a moving scene. The optical flow equation.
Graphic representation and motion vision models (single channel vs multichannel).
Apparent movements.
On the physiological mechanisms of motion perception.

2. dDepth perception

Interaction and binocular summation.
The perception of space. Relationship between perceived space and real space.
Physiological and psychophysical mechanisms for depth detection: disparity and correspondence between images.
Stereopsis abnormalities.

3.

Generation of moving sequences.
Filtering of sequences with the spatio-temporal CSF.
Responses of spatio-temporal neurons in V1 and MT.
Optical flow in depth navigation.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	7,50
Theory	30,00
Laboratory	7,50
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	7,50
Independent study and work	60,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**67,50**

TEACHING METHODOLOGY

The methodology includes (1) master class, (2) demonstration professorship experiments using simulation tools such as Vistalab (http://isp.uv.es/code/visioncolor/vistalab.html), and (3) practical sessions in the classroom of computer science where these tools are used to reinforce the learning of the concepts.

The work of the students has character:

• In person consisting of:

o Theory classes (exhibition and chair experiments)

o Practical classes in computer room designed to illustrate the models treated by solving exercises using simulation and calculation tools designed for the subject. This type of exercises is the core of the subject

and therefore the assistance and completion of the exercises is mandatory

• Non-contact, formed by:

o Voluntary extension of the simulations presented in the demonstration sessions

o Preparation of the alternative exam if you decide not to attend the practical sessions (with the delivery of exercises).

• Individual and / or collective tutorials to monitor the evolution of the exercises.

EVALUATION

The first-evaluation can be carried out according to one of these two options:

OPTION 1: Assessment based primarily on the completion of the proposed practical exercises and an additional (voluntary) examination of theoretical and practical questions to raise the grade. Therefore, in this option 1, the grade consists of two parts:

A.- For the delivery of the practical exercises proposed in both the theoretical and practical sessions (69% of the final mark).

B.- For the voluntary examination of theoretical-practical questions (31% of the final grade).

TThe mandatory compliance conditions to be evaluated for this modality are:

1.-Attendance at practical sessions (seminars and laboratory,80% attendance).

2.-Achieve a minimum grade of 5 in the exercises presented.

OPTION 2: For students who choose not to regularly attend practical sessions or do not submit exercises, an assessment based exclusively on the theoretical and practical exam will be proposed (which will count for 100% of the final grade).

For the second call, the same rules will apply as for the first call.
It will be possible to opt for option 1, if the attendance criterion has been met. In this case, the grade of the exercises and/or works that have reached the cut-off mark will be maintained and the exercises/works that were not handed in at the time or that had not passed the cut-off mark may be handed in.
Otherwise, it will be evaluated according to option 2.

REFERENCES

- Apuntes de clase y software de generación de estímulos proporcionadas por el profesor (disponibles en el aula virsual) Howard & Rogers. Binocular Vision & Stereopsis. Oxford UNiversity Press. B. Wandell. Foundations of Vision

- Artículo Watson & Ahumada, JOSA A 1985 Artículo Heeger, JOSA A 1987 Artículo Heeger & Simoncelli, Vision Research 1998