



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Svetloba, vid, barve</b>
<b>Course title:</b>	<b>Light, vision, colour</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA		1. ali 2.	1., 2. ali 3.
PHYSICS		1. or 2.	1., 2. or 3.

**Vrsta predmeta / Course type**

Izbirni za module Biofizika 3, Fizika 1, 2, 3 in Izobraževalna fizika 1, 2

**Univerzitetna koda predmeta / University course code:**

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
5					145	5

**Nosilec predmeta / Lecturer:**

Nataša Vaupotič

**Jeziki /**

**Languages:**

**Predavanja /** slovenski/Slovenian

**Lectures:**

**Vaje / Tutorial:**

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Osnove klasične in moderne fizike

**Prerequisites:**

Basic course of classical and modern Physics

**Vsebina:**

1. Geometrijska in valovna optika
2. Oko: nastanek slike, občutljivost in odzivnost
3. Barva: barvni sistemi, fizikalni opis barvnega stimula

**Content (Syllabus outline):**

1. Geometrical and wave optics
2. Eye: Imaging in the eye, sensitivity and response
3. Colour: colour order systems, the physics of colour stimuli

4. Modeli barvnega vida
5. Optične lastnosti materialov: barva zaradi odboja, loma, disperzije, barva atomov, ionov, molekul, luminescence, barva pri kovinah, polprevodnikih, izolatorjih

4. Models of colour vision
5. Optical properties of materials: colour due to refraction, reflection, dispersion, scattering, colour from atoms, ions and molecules, colour from charge transfer and luminescence, colour in metals, semiconductors and insulators

#### Temeljni literatura in viri / Readings:

- 1) A. Valberg, *Light Vision Color* (John Wiley and Sons, Chichester, 2005).
- 2) R. Tilley, *Colour and the optical properties of materials* (John Wiley and Sons, Chichester, 2005).
- 3) D. Falk, D. Brill, and D. Stork, *Seeing the Light, Optics in Nature, Photography, Color, Vision and Holography* (John Wiley & Sons, New York, 1986).
- 4) D Božič in sod., *Interdisciplinarnost barve* (Društvo koloristov Slovenije, Maribor, 2001, 2003).
- 5) Raziskovalni članki s področja projektne naloge

#### Cilji in kompetence:

Predmet je namenjen učiteljem ter raziskovalcem na področju poučevanja fizike in naravoslovja.

Cilj predmeta je povezati temeljna fizikalna znanja in jih nadgraditi v razumevanje kompleksnosti barvnega vida ter razumevanje fizikalnih pojavov, zaradi katerih predmete vidimo v barvah.

#### Objectives and competences:

The course is primarily addressed to teachers and researchers in the physics and science education.

The main goal is to connect the basic physics principles in order to understand the complexity of colour vision and relationship between light and the optical properties of materials.

#### Predvideni študijski rezultati:

Znanje in razumevanje:

Razumevanje kompleksnosti človeškega vida ter zveze med svetlobo, optičnimi lastnostmi materialov in barve.

Prenesljive/ključne spretnosti in drugi atributi:

- Integrirana uporaba fizikalnih znanj
- Prenos znanja v poučevanje fizike in drugih naravoslovnih predmetov.

#### Intended learning outcomes:

Knowledge and understanding:

Understanding of the complexity of human colour vision and the relationship between light and the optical properties of materials.

Transferable/Key Skills and other attributes:

- integrated use of physical principles
- transfer of knowledge into the physics and natural science education

#### Metode poučevanja in učenja:

#### Learning and teaching methods:

Predavanja konzultacije projektno delo (vključuje laboratorijsko telo, teoretično delo, modeliranje, programiranje)	Lectures consultations project work (includes lab work, theoretical work, modelling and computer programming)
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Delež (v %) /

**Načini ocenjevanja:**

Weight (in %)

**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Projektna naloga	<b>75%</b>	Project work
Predstavitev projektne naloge	<b>25%</b>	Presentation of the project

**Reference nosilca / Lecturer's references:**

1. VOGRIN, Martin, VAUPOTIČ, Nataša, WOJCIK, M. M., MIECZKOWSKI, Jozef, MADRAK, Karolina, POCIECHA, Damian, GÓRECKA, Ewa. Thermotropic cubic and tetragonal phases made of rod-like molecules. *PCCP. Physical chemistry chemical physics*, ISSN 1463-9076, 2014, vol. 16, issue 30, str. 16067-16074, doi: [10.1039/C4CP01641F](https://doi.org/10.1039/C4CP01641F). [COBISS.SI-ID [27813671](#)]
2. GORNIK, Kristina, ČEPIČ, Mojca, VAUPOTIČ, Nataša. Effect of a bias electric field on the structure and dielectric response of the ferroelectric smectic-A liquid crystal in thin planar cells. *Physical review. E, Statistical, nonlinear, and soft matter physics*, ISSN 1539-3755, 2014, vol. 89, no. 1, str. 012501-1-012501-9, doi: [10.1103/PhysRevE.89.012501](https://doi.org/10.1103/PhysRevE.89.012501). [COBISS.SI-ID [27378983](#)]
3. VAUPOTIČ, Nataša, ČEPIČ, Mojca, OSIPOV, Mihail A., GÓRECKA, Ewa. Flexoelectricity in chiral nematic liquid crystals as a driving mechanism for the twist-bend and splay-bend modulated phases. *Physical review. E, Statistical, nonlinear, and soft matter physics*, ISSN 1539-3755, 2014, vol. 89, no. 3, 030501-1-030501-5, doi: [10.1103/PhysRevE.89.030501](https://doi.org/10.1103/PhysRevE.89.030501). [COBISS.SI-ID [27591975](#)]
4. SZCZYTKO, Jacek, VAUPOTIČ, Nataša, MADRAK, Karolina, SZNAJDER, Paweł, GÓRECKA, Ewa. Magnetic moment of a single metal nanoparticle determined from the Faraday effect. *Physical review. E, Statistical, nonlinear, and soft matter physics*, ISSN 1539-3755, 2013, vol. 87, no. 3, 033201-1-033201-6, doi: [10.1103/PhysRevE.87.033201](https://doi.org/10.1103/PhysRevE.87.033201). [COBISS.SI-ID [26612519](#)]
5. PAVLIN, Jerneja, VAUPOTIČ, Nataša, GLAŽAR, Saša A., ČEPIČ, Mojca, DEVETAK, Iztok. Slovenian pre-service teachers' conceptions about liquid crystals. *Eurasia*, ISSN 1305-8223, 2011, vol. 7, no. 3, str. 173-180. [http://www.ejmste.com/v7n3/EURASIA\\_v7n3\\_Pavlin.pdf](http://www.ejmste.com/v7n3/EURASIA_v7n3_Pavlin.pdf). [COBISS.SI-ID [8876361](#)]