Course title:	**Applied Optics**
Institute/Division:	Institute of Materials Engineering, Faculty of Materials Engineering and Physics
Number of contact hours:	45 hours
Course duration:	1 semester
ECTS credits:	6

Course description:

This course is an introduction to geometrical and wave optics for undergraduate and graduate students in Mathematics, Computer Science, Physics or Engineering with no previous knowledge of the subject.

Topics covered include: common of topics in optics:

1. Light as an electromagnetic wave
2. Basic laws of light propagation
3. Optical properties of materials
4. Basics of geometrical optics. Refraction and dispersion of light on the glass and the spherical surface. Total internal reflection.
5. Structures of optical systems
6. Image construction in optical systems (telescopes, microscopes etc.)
7. Spectrometers and prismatic monochromators
8. Aberrations in optical systems.
9. Elements of wave optics. Light wave equation, interference and diffraction of Light, resolution of optical devices, Examples of interference and diffraction phenomena 66
10. Polarization of light. Types of polarization. Optical birefringence
11. The use of polarization. Interference of partially coherent waves
12. Michelson interferometer, Fabry-Perot 90 interferometer
13. Van Zitter theorem - Zernike
14. Holography, Color holography, Digital holography. Holographic applications
15. Light sources, . Spectral characteristics of light sources. Photometric characteristics of light sources
16. Thermal radiation Luminescent Light sources LED diodes, Laser light sources
17. Scattering of Light, Absorption in the medium Optical filters.
18. Reflection from the surface. Reflection from perfectly smooth surface Reflection from surfaces with low and hight roughness.
19. Colors of reflecting surfaces.The mechanism of vision. Eye structure. The formation of colors in nature. Subtractive and additive color mixing. The XYZ system system L* a * b. Color cataloging.
20. Linear transformations in optics,Fourier transform in optics. Image formation after passing through the optical system.The function of transferring contrast through optical systems. Optical spatial filtering Imaging in CCD devices

Literature:

1. B. Neuroth, *The properties of optical gasses*, Springer – Velag, Berlin, Heidelberg, New York 1998.
2. R. Józwicki, *Podstawy inżynierii fotonicznej*, Wydawnictwo Politechniki Warszawska Warszawskiej, 2006.
3. E. D. Palik, *Handbook of Optical Constants of Solids*, Academic Press, New York, 1998.
4. W. T. Welford*, Useful Optics*, University of Chicago Press, 1991.

5. M Born, E.Wolf, *Principles of optics*, Pergamon Press, London New York-Paris, Los Angeles (1959).
6. K. K. Sharma, *Optics: Principles and Applications,* Academic Press 2006 London, Los Angeles.
7. R.M.A. Azzam, N.M. Bashara, *Ellipsometry and polarized light*, North-Holland, Amsterdam (1987).
8. J.M. Gerrard, *Introduction to Matrix Methods in Optics*. John Wiley and Sons Ltd., 1975.

Course type:	lectures (30 hours), problem sessions (15 hours)
Assessment method:	two tests during the semester, final exam
Prerequisites:	at least one college level math course
Primary target group:	Majors in Engineering
Lecturer:	Janusz Jaglarz, PhD, DSC
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