4541.836 Nonlinear Optical Engineering

Course coordinator: Yoonchan Jeong
Venue & time: 302-519, 14.00 – 15.15, Tue / Thu
Prerequisites: Physics (univ-level), mathematics (univ-level)
Credit points: 3

Course overview:
The objective of this course is to provide postgraduate students with a basic knowledge of nonlinear interactions of photons in the context of wave optics as well as with physical insights into nonlinear optics (with a particular focus on nonlinear fibre optics). Topics to be covered include wave optics, principle of lasers, guided waves and optical fibres, dispersion, nonlinear susceptibility, coupled-wave theory for nonlinear optical interactions, etc.

Syllabus:
Week 0: Introduction
Week 1: Wave optics: Basic principles
Week 2: Continued
Week 3: Guided waves and optical fibres
Week 4: Principles of lasers
Week 5: Dispersion / Midterm exam I
Week 6: Nonlinear susceptibility
Week 7: Coupled-wave theory for nonlinear optical interactions
Week 8: Second harmonic generation
Week 9: Electro-optic effect
Week 10: Acousto-optic effect / Midterm exam II
Week 11: Nonlinear pulse propagation in optical fibres
Week 12: Optical solitons
Week 13: Four-wave mixing
Week 14: Stimulated Brillouin scattering
Week 15: Stimulated Raman scattering / Final exam

Course-book:
There will be no main course-book.

References:
G. P. Agrawal, Nonlinear Fiber Optics, 3rd ed., Academic Press, San Diego, 2001.
R. W. Boyd, Nonlinear Optics, 2nd ed., Academic Press, Amsterdam, 2003.
A. Yariv and P. Yeh, Photonics-Optical Electronics in Modern Communications, 6th ed., Oxford University Press, New York, 2007.

Assessment methods:
Assignment (25%), midterm exam I (25%), midterm exam II (25%), final exam (25%)