Nonlinear Optical Engineering

Course coordinator: Yoonchan Jeong
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Office hours: 15: 30 – 17:00 Mon/Wed
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Venue & time: 301-612 & 11:00 – 12:15, Mon/Wed
Prerequisites: Physics, Mathematics, Electromagnetics, Quantum Electronics
Credit points: 3
Level of difficulty: High & Very High

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 fiber optics. Topics to be covered include Pulse propagation in fibers; Group-velocity dispersion; Self-phase modulation; Optical solitons; Polarization effects; Cross-phase modulation; Stimulated Raman scattering; Stimulated Brillouin scattering; Stimulated Brillouin scattering; Parametric processes.

Course schedule:
Week 1: Introduction & & Pre-course questionnaire
Week 2: Pulse propagation in fibers
Week 3: Group-velocity dispersion
Week 4: Self-phase modulation
Week 5: Exam 1 / Optical solitons
Week 6: Optical solitons
Week 7: Optical solitons / Polarization effects
Week 8: Polarization effects
Week 9: Polarization effects / Cross-phase modulation
Week 10: Cross-phase modulation / Exam 2
Week 11: Stimulated Raman scattering
Week 12: Stimulated Raman scattering / Stimulated Brillouin scattering
Week 13: Stimulated Brillouin scattering / Parametric processes
Week 14: Parametric processes
Week 15: Parametric processes / Exam 3

Course-book:
G. P. Agrawal, Nonlinear Fiber Optics, 5th ed., Academic Press, San Diego, 2013.

References:
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.

Evaluation:
Attendance, participation & assignment (25%), exam 1 (25%), exam 2 (25%), exam 3 (25%)