PH 421 Photonics: Project (2023)

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Total strength is 66, so we will have 11 groups of 6 people each

Requirements:

- A 1 hour long **pre-recorded presentation** by each team, which should be made available to the entire class on microsoft teams 2 days before your live presentation date
- A 20 minute shorter **live blackboard** presentation during the class:
    - Giving a broader picture of the work
    - Explaining the specific calculations/plots you reproduced
    - Live iPython notebook demo reproducing the plots/calculations
    - In lieu of a traditional **project report**, an executable paper (**iPython notebook** is strongly encouraged) reproducing the calculations/plots/derivations needs to be supplied to the instructor for evaluation
- In both the presentations as well as the executable paper, **details of the contributions of individual group members** to the project should be clearly spelt out.
- Evaluation is based on the following criteria:
    - Understanding of the topic: breadth and depth (eg. via reading cross-references)
    - Quality of presentation (eg. motivation, breaking down the problem, conclusion)
    - Reproducing parts of the paper or chapter (i.e. your executable paper (iPython notebook) demo) -- this component has the highest weightage

	Topic	Reference
1	Optical Second Harmonic Generation in Anisotropic Multilayers	https://doi.org/10.48550/arXiv.2307.01368
2	Impact of longitudinal phase-matching variations on three-wave nonlinear interactions	https://doi.org/10.1364/OME.491284
3	Nonlinear optics at an interface	Boyd section 2.11 (easy, maybe preferable for backloggers)
4	Molecular origin of nonlinear optical response	Boyd chapter 5
5	Nonlinear optics in the two level approximation	Boyd sections 6.1--6.4
6	Stimulated Raman scattering	Boyd sections 10.1 -- 10.5
7	Encircling an exceptional point in a nonlinear non-Hermitian system	https://doi.org/10.1364/OL.44.000638
8	Nonlinear exceptional-point lasing with ab initio Maxwell–Bloch theory	https://doi.org/10.1063/5.0105963
9	Non-reciprocal geometric phase in nonlinear frequency conversion	https://doi.org/10.1364/OL.42.001990
10	SPDC for quantum applications	https://arxiv.org/pdf/1809.00127.pdf and Boyd section 2.12
11	Nonlinear optics of photonic hyper-crystals: optical limiting and hyper-computing	https://doi.org/10.1364/JOSAB.36.001629