Microwave-photonics and wave-matter interactions

I am looking for motivated and hardworking students to work with me on interesting and challenging research projects. This page consists of a list of projects in which I am actively looking for students at M.Tech and M.Tech+Ph.D. level. Before proceeding to the offered projects, please carefully read the following expectations from prospective students.

1. At least **40 hours of work per week** is expected after the completion of course work.
2. You will have to **submit one weekly report every week** and **one monthly** report every month. These reports must be in a prescribed format and prepared strictly in **LaTeX only**.
3. There will be at least one project meeting every week (based on your weekly report) to discuss the updates.
    - I commit to give you typed comments and suggestions every week based on your report.
4. If you don't put in enough sincere efforts (*not necessarily the results*), a bad grade is guaranteed in Project-I evaluation. If your efforts (*not necessarily the results*) are not up to the expectations after fourth semester, an extension in M.Tech. project is likely, irrespective of your placement and joining date. However, if you have followed #1 and #2 above you need not worry.

A rough estimate of the time I have invested in setting up this page should give you an indication of the seriousness of the above statements.

If you are still reading and are still interested, I have a wide spectrum of projects ranging from purely theoretical to purely applied topics. Whether you are fascinated by fundamental concepts or more inclined towards experimental work, there is something on which we might work together.

My broad research interest lies at the interface of optical physics and communication technologies. I am interested in investigating new fundamental concepts in wave-matter interactions, explore their technologies implications and develop engineering applications. These steps are depicted in the figure below.

The projects that I am offering lie on the above research spectrum. However, individual projects are generally not spread throughout the spectrum. The predominant scope of each project is a subset of the spectrum and is indicated by a green bar for each project.

---

1. Photonic reconfiguration of microwave devices based on photoconductivity.

- Preferred specialization: RFME
- Level: M.Tech.

---

2. Photonic reconfiguration of microwave devices using phase-change materials.

- Preferred specialization: RFME
- Level: M.Tech., M.Tech.+Ph.D.

---

3. Full wave EM and circuit modelling of coupled interconnects.

- Preferred specialization:
  - RFME
  - Students in VLSI can also opt. However, the project predominantly involves electromagnetic wave theory.
- Prerequisite: Should have completed *VLSI Interconnects* course.
- Level: M.Tech.

---

4. Application of magnonic nano-conduits for interconnects.

- Preferred specialization:
  - RFME
  - Students in VLSI can also opt. However, the project predominantly involves electromagnetic wave propagation in gyromagnetic medium.
- Level: M.Tech.
- Prerequisite: Should have completed *VLSI Interconnects* course.

---

5. Novel devices based on photonic topology of gyrotropic materials.

- Preferred specialization: RFME
- Level: M.Tech.

---

6. Topology controlled Cherenkov radiation in complex medium.

- Preferred specialization: RFME
- Level: M.Tech.

---

7. Reflection-less/absorptive filters.

- Preferred specialization: RFME
- Level: M.Tech.

---

8. EM-wave interaction with non-stationary medium.

EM-wave propagation in time-varying medium, moving medium, space-time modulated medium.

- Preferred specialization: RFME
- Level: M.Tech.