EECS 598: Electromagnetic Metamaterials

Course Objective:
The course will present a detailed introduction to electromagnetic metamaterials. The field of metamaterials is an emerging area and limited resources are available to students that wish to learn about this research area. Textbooks and graduate courses on the subject matter are scarce. Therefore, the student is left to learn from research papers scattered throughout numerous journals. This course is offered in response to this growing need.

Course Description:
The course covers engineered structures possessing tailored electromagnetic properties, or properties that are difficult or impossible to achieve using conventional materials. The course content includes classical microwave structures like periodically loaded transmission lines and waveguides, corrugated surfaces, wire arrays, as well as more recent structures such as high impedance surfaces and metasurfaces, electromagnetic bandgap structures, negative refractive index and artificial magnetic media. Optical structures including photonic bandgap materials and metal-dielectric plasmonic media are also covered. The course allows students to develop an intuitive understanding of the electromagnetic response of various structures through exact and approximate methods. Periodic analysis, effective medium theories, and distributed circuit concepts are utilized to gain understanding.