ECE MS Exam: Photonics – ECE 240A-B-C

1) Optical Resonators.

Optical resonators serve in all known laser devices and are critical for its performance. Whether the device is realized as a free space or waveguide platform, basic characteristics of resonator design are shared.

1.1) Provide an example of at least four resonator types;

1.2) Define the resonator mode;

1.3) Derive and state modes of Confocal Resonator type;

1.4) Derive the beam waist in such resonator;

1.5) Describe the resonator Stability criteria and draw The Stability Diagram;

2) Optical Modulation.

2.1) Define uniaxial and biaxial optical materials and provide at least two examples of each;

2.2) Describe at least two types of electro optic modulators and compare their performance;

2.3) Draw the general topology of Mach-Zehnder E-O waveguide modulator and quantify the extinction and the modulation rate limits;

2.4) Write the transmission characteristic of Mach-Zehnder E-O modulator in terms of applied voltage in case when it is single- and dual-arm driven;

2.5) Draw the waveguide polarization modulator and describe its operation principle; state coupled-equations governing its performance.