1. Describe the basic principle of laser oscillators and the CW laser operation in the steady state.

2. Describe the most common solid state lasers and their properties.

3. Describe temporal and spatial coherence. Discuss how lasers compare with thermal radiation sources.

4. Describe the most common diode lasers and their properties

5. Describe the pulses generation via Q-Switch

6. Describe the pulses generation via mode-locking

7. Describe the basic priciples of laser amplifiers, including the main limiting factors.

8. Describe some common nonlinear optical effect in the perturbative regime, and identify the conditions for efficient wave mixing effects. Describe how these effects can be used to characterize short laser pulses.

9. Describe the basic phenomena observed in a non-perturbative nonlinear optical regime in gases.

10. Describe the three step model of High harmonics generation and the temporal and frequency structure of high order harmonic.

11. Describe how isolated attosecond pulses can be produced via high harmonic generation.

12. Describe the basic components of femtosecond laser amplifiers, discuss the benefits of chirped pulse amplification and what limits the pulse duration

13. Describe the common methods to produce few cycle laser pulses and to stabilize the carrier envelope phase.

14. Describe the basics of electron optics for the design of a generic electron beam line

15. Describe how to generate femtosecond electron pulses

16. Describe how to generate attosecond electron pulses

17. Describe the principle functioning and properties of a free-electron laser