Section 1: Introduction to automatic control systems – the concept of feedback (1st Week)
An introduction to the fundamental concepts of automatic control systems is presented. Additionally, the different types of physical automatic control systems are presented and their classification is elaborated, along with the basic principles of representation, design and performance estimation. Also, the advantages of automatic control systems are analyzed, and a historical review is given. Furthermore, the concept of feedback and the differences between open and closed loop systems are studied.

Section 2: Mathematical modelling of automatic control systems / The Laplace transform (2nd and 3rd Weeks)
The concept of the dynamic mathematical model is introduced. Moreover, a review of the definition and the basic properties of the Laplace transform is performed, with emphasis on the topics that are necessary for analyzing automatic control systems at the frequency domain. The basic regular and irregular signals are also analyzed, together with linearization techniques for nonlinear systems.

Section 3: Transfer functions – Block diagrams – Signal flow diagrams (4th and 5th Weeks)
The concept of the transfer function is defined and the effect of the poles on the stability and dynamic behavior of the system is studied. Additionally, the concepts of both the block diagram and the signal flow diagram are introduced. Moreover, the methods of calculating transfer functions for composite systems based on block diagrams and signal flow diagrams are analyzed.

Section 4: Dynamic response for first and second order systems (6th Week)
First and second order systems are defined and corresponding examples are given. Additionally, the basic notions associated with first and second order systems are presented (gain, time constant, damping constant, natural frequency), the dynamic response is studied, based on these parameters, and the characteristics of transient response are analyzed (rise time, settling time, overshoot).

Section 5: Steady state errors (7th Week)
The method for steady state error calculation, using the final value theorem, is presented and the position, velocity and acceleration errors are introduced, along with errors for random inputs.

Section 6: Linear system stability using the Routh-Hurwitz criterion (8th Week)
The concept of stability for linear systems is elaborated and the Routh-Hurwitz criterion is introduced. The use of the Routh-Hurwitz criterion for determining the regions of stability is also studied.

Section 7: P, PI, PD, PID Controllers (9th Week)
The basic principles of proportional, integral and derivative control, as well as their combinations for creating PI, PD and PID controllers are presented. Furthermore, the problem of PID controller parameter tuning is analyzed, and the Ziegler-Nichols method is presented.

Section 8: Root locus (10th and 11th Weeks)
The concept of root locus is presented and the methodology for systematically building root locus plots is analyzed. The interconnection of a system's root locus and its dynamic behavior and stability is studied.

Section 9: Bode and Nyquist plots – Relative stability (12th and 13th Weeks)
The concepts of sinusoidal transfer function and frequency response are presented. Additionally, the rules for building Bode and Nyquist plots are studied. The Nyquist stability criterion is analyzed and the concept of relative stability is presented, followed by the calculation of gain and phase margins.