

ANALYSIS OF DYNAMICAL SYSTEMS

Coursework requirements

The coursework consists of two parts. The first part requires you to analyse a 2-D system and the second part requires the analysis of a 3-D system. The completed coursework may be handed over in two parts at any time during the semester.

Part 1: Analysis of a 2-D system

1. Perform linear analysis:
 - Find a fixed point or points of your system.
 - Linearise your system about the fixed point or points.
 - Plot the linearised phase portrait/s (strong suggestion).
 - Determine the type of the linearised fixed point or points.
 - Determine if/how changes in the control parameter values influence the dynamics (type of fixed point/s) of your system.
2. Perform nonlinear analysis of the full homogeneous system using a computer:
 - Compare the type of the nonlinear fixed point or points with the corresponding linearised fixed point or points.
 - Plot the nonlinear phase portrait/s. Compare it/them with the linearised one/s.
 - Explain any discrepancies between the nonlinear and linearised systems if any occur.
3. Perform nonlinear analysis of the non-autonomous system (if applicable) using a computer:
 - Analyse the influence of the explicitly time dependant part of the system on the system dynamics.
 - Study the nonlinear non-autonomous phase trajectories. Compare them against the corresponding homogeneous phase portrait.
 - Explain the obtained and presented results.
4. Draw overall conclusions and comment on the presented results.

Part 2: Analysis of a 3-D system

1. Compare the known properties of strange attractors against your system.
2. Draw conclusions based on your analysis results.

How?

The above problems and specific tasks must be tackled with the use of analysis methods presented and discussed during the lectures. The tasks requiring numerical integration can be solved/completed using the coursework analysis tools provided on the course web-page.

Personal consultation

Before submitting the completed and finalised coursework for an evaluation, You have the right to consult the Lecturer and discuss your progress to ensure that the final submitted coursework is lacking any technical mistakes and/or errors. Please do not hesitate to use this opportunity.