Office hours will be Mondays at 12 noon weeks 2, 4, 6 and 8. The link to the MSTeams meeting has been posted on the B5.6 Nonlinear Systems Teams Channel.

The material covered in each problem sheet is listed below:

Sheet 1.

Section 1. Linear Systems.

1.1 Fundamental Theorems.

1.2 Normal forms in two dimensions.

1.3 Linear Flows.

Section 2. Nonlinear Systems

2.1 Existence and Uniqueness.

2.2 Flows, asymptotic sets, and invariant sets.

2.3 Stability.

Sheet 2.

2.4 Lyapunpov functions.

Section 3 Local analysis.

3.1 Stable manifold theorem.

3.2 The centre manifold.

3.3 Reduction to the centre manifold.

Section 4. Bifurcations.

4.1 Local bifurcations for vector fields.

Sheet 3.

4.2 The extended centre manifold.

5. Local analysis of maps.

6. Limit cycles and Hopf bifurcations.

6.1 The Poincaré-Lindstedt method.

Sheet 4.

6.2 The Hopf bifurcation.

6.3 Local bifurcations of maps.

7. Global bifurcations, Homoclinic chaos, Melnikov's method.

7.1 A paradigm.

7.2 The problem.

7.3 Bernouilli shift.

7.4 Smale's horseshoe.

7.5 Transverse homoclinic points.

7.6 Melnikov's method.