

# Day-to-day Programme Utrecht Summer School 2019

## APPLIED BIFURCATION THEORY

15.07.2019 - 19.07.2019

Course Director: Prof. dr. Yuri A. Kuznetsov

E-mail: kuznet@math.uu.nl

Saturday and Sunday, 13.07.2019 and 14.07.2019		
Time	Activity	Description
12.00-18.00	Key pick up	You will find the exact key pick up location in the pre-departure information, which becomes available after you have paid the course fee.

Monday, 15.07.2019		
Time	Activity	Description
09:00-10:00	Welcome and coffee (BBG106)	
10:00-11:30	Lecture on codim 1 and 2 bifurcations of planar ODEs (BBG106)	<b>Yu.A. Kuznetsov</b> (UU/UT) Phase portraits. Topological equivalence and bifurcations. Local codim 1 bifurcations: Fold and Andronov-Hopf. Global codim 1 bifurcations: Cyclic fold, homoclinic, and heteroclinic orbits. Local codim 2 bifurcations: Cusp, Bogdanov-Takens, and Bautin (generalized Hopf).
11:30-13:00	Tutorial (BBG175)	<b>H.G.E. Meijer</b> (UT) Computer practicum with <i>pplane</i>
13:00-14:00	Welcome lunch (HFG, Library 7 <sup>th</sup> floor)	
14:00-15:30	Lecture on codim 1 bifurcations of n-dimensional ODEs (BBG106)	<b>Yu.A. Kuznetsov</b> (UU/UT) Bifurcations of equilibria: Fold and Andronov-Hopf. Bifurcations of limit cycles: Fold, period-doubling, and torus (Neimark-Sacker). Bifurcations of orbits homoclinic to hyperbolic and non-hyperbolic equilibria.
15:30-17:00	Tutorial (BBG175)	<b>H.G.E. Meijer</b> (UT) Computer practicum with <i>MatCont</i>

Tuesday, 16.07.2019		
Time	Activity	Description
10:00-11:30	Lecture on codim 1 bifurcations of maps (BBG106)	<b>H.G.E. Meijer</b> (UT) Fixed points and cycles. Local codim 1 bifurcations: Fold, period-doubling, and Neimark-Sacker. The period-doubling route to chaos. Invariant manifolds and homoclinic tangencies.
11:30-13:00	Tutorial (BBG175)	<b>H.G.E. Meijer</b> (UT) Computer practicum with <i>MatContM</i>
13:00-14:00	Lunch	
14:00-15:30	Lecture on basic theory of DDEs (BBG106)	<b>S. Verduyn Lunel</b> (UU) Initial value problems for DDEs. Stability of stationary and periodic solutions.

15:30-17:00	Tutorial (BBG175)	<b>M.M. Bosschaert</b> (UHasselt) Computer practicum with simulation of DDEs in <i>MATLAB</i>
18:00-	Summer School Dinner (Pannenkoekenhuis Rhijnauwen)	

Wednesday, 17.07.2019		
Time	Activity	Description
10:00-11:30	Lecture on codim 2 bifurcations of maps (BBG106)	<b>H.G.E. Meijer</b> (UT) Local codim 2 bifurcations: Cusp, 1:1 and 1:2 resonances. Phase-locking.
11:30-13:00	Tutorial (BBG175)	H.G.E. Meijer (UT) Computer practicum with <i>MatContM</i>
13:00-14:00	Lunch	
14:00-15:30	Lecture on local codim 1 bifurcations of DDEs (BBG106)	<b>S. Verduyn Lunel</b> (UU) Sun-star calculus. Computation of critical normal forms on center manifolds. Hopf bifurcation of DDEs.
15:30-17:00	Tutorial (BBG175)	<b>M.M. Bosschaert</b> (UHasselt) Computer practicum with <i>DDE-BifTool</i>
17:00-17:30	Assigning Projects	

Thursday, 18.07.2019		
Time	Activity	Description
10:00-13:00	Self-study (BBG175)	Work in groups on Projects
13:00-14:00	Lunch	
14:00-17:00	Self-study (BBG175)	Work in groups on Projects

Friday, 19.07.2019		
Time	Activity	Description
10:00-12:30	Seminar (MIN 2.02)	Presentation of Projects
12:30-13:00	Hand out Certificates	
13:00-14:00	Lunch	

For information about the social programme, please have a look at [https://www.utrechtsummerschool.nl/social\\_programme](https://www.utrechtsummerschool.nl/social_programme)