

**Syllabus**  
**UTK – M532 – Ordinary Differential Equations II**  
**Spring 2005, Jochen Denzler, MWF 11:10–12:05, Ayres 104**

**Course contents (531+532):** *In 531, we covered the basic theorems about existence, uniqueness and dependence on initial data with a geometric perspective, including the modern analytic tools that were historically motivated by ODEs and are crucial for conceptually organized proofs; stability of equilibria by the methods of Lyapunov and the linearized stability criterion, including matrix exponentials, basic eigenvalue theory and the Jordan normal form.*

We will now first have a closer look at linear systems, including a classification of 2dim equilibria and (without full proofs) study more details of the interplay between the linearization and the nonlinear system (a glimpse of invariant manifolds).

We'll briefly cover the Poincaré Bendixson theory (sooner or later).

Power series methods for linear analytic ODEs; ordinary, regular singular, and irregular singular points (not much about the latter).

The Sturm–Liouville eigenvalue problem by comparison and variational methods.

**Exams:** There will be two exams during the semester, and a final during the official exam period.

**Total grade:** 25% homework,  $2 \times 20\%$  for the in-class exams, 35% final exam.

**Homework:** Will be assigned on a flexible schedule, and in various forms.

**Book(s):** I don't adapt an official course textbook, because neither covers the full variety of intended material. The course philosophy for the qualitative methods and conceptual issues is closest to Chicone's book; however Chicone does not cover most of the linear material (Sturm–Liouville; Power series methods). Walter's book does (but would have been at odds with the 1st semester course philosophy). Both are on course reserve in the library. See the book info posted on-line for more details.

**Course Philosophy:** The course blends classical ODE material with more modern qualitative methods (dynamical systems point of view.) This latter has been stressed in the 1st semester of the course, since it is traditionally neglected in the sophomore course, but highly relevant for current research.

The new material in 532 should be closer to your undergraduate experience than 531 was, and much of it (although not all) will be independent of 531; I will however try to use every opportunity the new material affords to reinforce and deepen the targeted conceptual perspective of the previous semester.

**Office hours:** I am posting regular office hours on my website, but am available for drop-in or appointments. You may call my cell phone: (789-8031; number might change during the semester). I intend NOT to be in on Tuesdays (research day), to cope with a time management concern I am having.