

## *PKU Globex Julmester*

### Applied Analysis for Engineering Sciences (3 Credits)

#### 工程科学应用分析

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Synopsis	The objectives of this course include: to show some modern (1900-1990) mathematical methods that are widely used in engineering sciences, nonlinear mechanics and other physical sciences; to help initiating research activities, namely, to boost ideas, to formulate the problem, and to explore the mathematics; to help bridging the gap between the mathematical tools and the physical understandings.	
Audience	Year 3 & 4 Undergraduate and Graduate Students <u>Prerequisites needed</u> : Calculus (Single variate, and multi-variate), Linear Algebra, Ordinary Differential Equations.	
Classroom		
Schedule	<u>Class</u> : 9-12 AM, M-F, July 1 – 19, 2024	<u>Total Contact Hours</u> : 45
Topics	<ol style="list-style-type: none"><li>1. The qualitative theory of Ordinary Differential Equations (ODE) systems<ol style="list-style-type: none"><li>a) The second order ODE (plane analysis)</li><li>b) Stability analysis via the Lyapunov function</li><li>c) Chaos in the Lorenz system and the logistic map</li></ol></li><li>2. Reaction-diffusion systems<ol style="list-style-type: none"><li>a) BVP (boundary-value problem) and IBVP (initial boundary-value problem)</li><li>b) Traveling wave analysis</li><li>c) Burgers' equation and Cole-Hopf transform</li><li>d) Evolutionary Duffing equation</li></ol></li><li>3. Hyperbolic equations<ol style="list-style-type: none"><li>a) Linear advection equation</li><li>b) Discontinuities in inviscid Burgers' equation</li><li>c) Elementary waves in a polytropic gas</li><li>d) Soliton and inverse scattering transform</li></ol></li></ol>	
Grading	Homework Assignments    40% Exam (open-book)        60% Total                         100%	