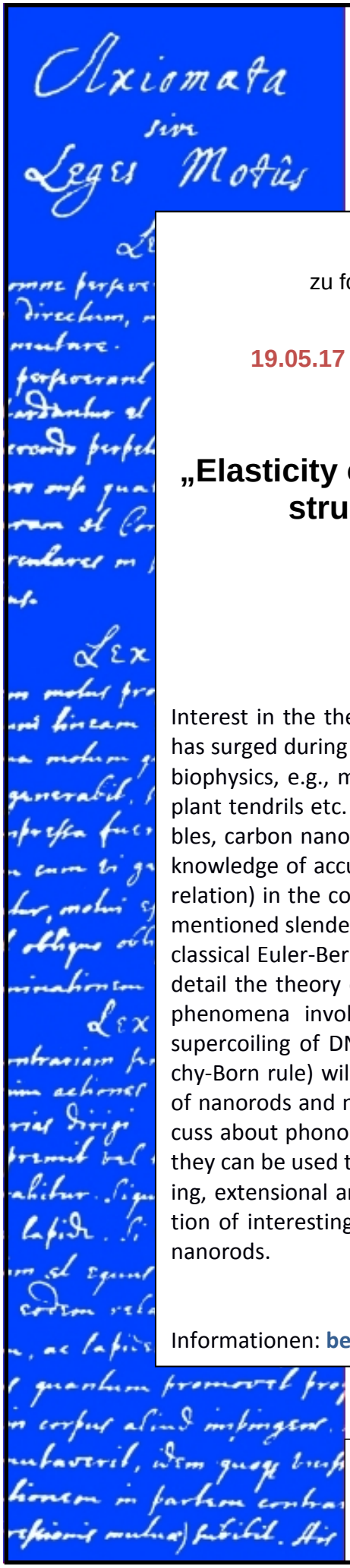

LTM

FAU FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG
TECHNISCHE FAKULTÄT

Vorlesungsreihe

zu folgender Veranstaltung wird herzlich eingeladen

(ECTS: 2,5)

19.05.17 –04.07.2017 jeweils Di und Fr 8:15 – 10:15 Uhr
(außer Di, 06.06. und Fr, 16.06.)
Egerlandstr. 5, Raum 00.044

„Elasticity of one-dimensional continua and nanostructures – a multiscale viewpoint“

Prof. Ajeet Kumar
Prakhar Gupta, Smriti Singh
Department of Applied Mechanics
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Interest in the theory of one-dimensional elastic continua and nanostructures has surged during the last few decades, due in large part to their applicability in biophysics, e.g., modeling of biological filaments such as DNA, collagen fibrils, plant tendrils etc. The theory has also been employed for modeling marine cables, carbon nanotubes, nanowires, curly hairs, guide wires, catheters etc. The knowledge of accurate nonlinear constitutive laws (e.g., moment vs. curvature relation) in the context of this theory is the key in accurate modeling of above mentioned slender elastic bodies. This course will begin with a brief overview of classical Euler-Bernouli and Timoshenko beam theories. We will then discuss in detail the theory of special Cosserat rods which is useful in modeling physical phenomena involving large cross-sectional rotations (e.g., self-folding and supercoiling of DNA, looping of cables). A multiscale framework (Helical Cauchy-Born rule) will then be discussed to obtain the nonlinear constitutive laws of nanorods and nanotubes from their molecular calculations. We will also discuss about phonon modes in the context of nanorods and nanotubes and how they can be used to obtain the relevant elastic constants such as bending, twisting, extensional and shearing stiffnesses. The course will end with demonstration of interesting examples involving buckling in carbon nanotubes and solid nanorods.

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