ENGINEERING MECHANICS

PROF. K. RAMESH

Department of Applied Mechanics

IIT Madras

PRE-REQUISITES : It is a very basic course

INTENDED AUDIENCE : Any Interested Learners

COURSE OUTLINE :

This is a basic first level course to learn rigid body mechanics covering both statics and dynamics. Statics covers free body diagrams, equilibrium of rigid bodies, analysis of trusses and beams, discussion on friction, virtual work and stability. Dynamics deals with general plane motion of rigid bodies, use of translating and rotating frames of reference for analysis, plane kinetics and 3D kinematics.

ABOUT INSTRUCTOR :

K. Ramesh is currently the K Mahesh Chair Professor at the Department of Applied Mechanics, IIT Madras; and formerly a Professor at the Department of Mechanical Engineering, IIT Kanpur. He has made significant contributions to the advancement of Digital Photoelasticity. He received his undergraduate degree in Mechanical Engineering from the Regional Engineering College, Trichy (now NIT, Trichy), Postgraduate degree from the Indian Institute of Science, Bangalore and the Doctoral Degree from the Indian Institute of Technology Madras.

He has made significant contributions to the advancement of Digital Photoelasticity. This has resulted in a Monograph on Digital Photoelasticity Advanced Techniques and Applications (2000), Springer, a chapter on Photoelasticity in the Springer Handbook of Experimental Solid Mechanics (2009), a chapter on Digital Photoelasticity in the book on Digital Optical Measurement Techniques and Applications (2015), Artech House London and a recently published book on Developments in Photoelasticity - A renaissance (2021), IOP Publishing, UK. He has over 190 publications to date of which two have been reproduced in the Milestone Series of SPIE. His research has been funded by organizations such as ARDB, ISRO, DST, EU (FP7) and NSF. He received the Zandman award for the year 2012, the first Indian to receive it since its inception in 1989, instituted by the Society for Experimental Mechanics, USA for his outstanding research contributions in applications utilizing photoelastic coatings.

He has been a Fellow of the Indian National Academy of Engineering since 2006. He received several awards such as Distinguished Alumnus Award of NIT, Trichy (2008), President of India Cash Prize (1984). He has been a member of the Editorial Boards of the International Journals: Strain (since 2001), Journal of Strain Analysis for Engineering Design (2009–10), Optics and Lasers in Engineering, and a steering committee member of Asian Society for Experimental Mechanics since its inception in 2000.

COURSE PLAN :

Week 1: Introduction and Force Systems

Week 2: Equilibrium of Rigid Bodies and Introduction to Trusses

Week 3: Analysis of Trusses and Introduction to Beams

Week 4: Analysis of Beams

Week 5: Virtual work and Energy relations

Week 6: Review so far and Friction

Week 7: Belt friction, Review of particle dynamics, Circular motion

Week 8: Plane kinematics of rigid bodies, absolute motion and relative motion

Week 9: Instantaneous center, Rotating frame of reference

Week 10: Choice of rotating frame and understanding Coriolis acceleration

Week 11: Plane kinetics

Week 12: 3D kinematics