MECHANICS COMPREHENSIVE EXAM TOPICS FOR ORAL EXAM

STATICS topics:

ST1: Statics of a particle
ST2: Statics of a rigid body, classification of force systems
ST3: Resultant of a coplanar force system
ST4: Resultant of a parallel force system, centre of gravity of plane figures
ST5: Equilibrium state of coplanar force systems
ST6: Coulomb and rolling friction
ST7: Loading diagrams of beams
ST8: Statics of structures, Gerber-beams
ST9: Coplanar truss structures
ST10: Second moment of area

Literature:
[1]   Educational materials given in the lectures of Statics
[2]   Szíki G. Á.: Technical Mechanics I. – Statics, Debrecen University Press, 2019

STRENGTH OF MATERIALS topics:

SZ1: Displacement state, derivative tensor and its decomposition, strain and stress states
SZ2: Hooke's law, strain energy
SZ3: Sizing and control, Mohr and HMH theorems
SZ4: Pure tension and compression
SZ5: Pure bending, moments of inertia of cross sections
SZ6: Pure torsion
SZ7: Combined loadings resulting uni-axial stress state
SZ8: Combined loadings resulting tri-axial stress state
SZ9: Buckling of columns
SZ10: Work theorems (Betti's and Castigliano's theorems)

Literature:
[1]   Educational materials given in the lectures of Strength of Materials
[2]   Mankovits T., Huri D.: Strength of Materials (Problems and solutions), University of Debrecen, Debrecen, 2018.

DYNAMICS AND VIBRATION topics:

MR1: Description of the motion with scalar and vector quantities, Frenet-basis and its kinematic application
MR2: The differential equation of motion, theorems of kinetics, constrained motion on a curve
MR3: Velocity and acceleration analysis of a rigid disc, instantaneous centre of zero velocity and acceleration
MR4: Rolling without slipping, centrodes, kinetic quantities and formulas for a rigid disc
MR5: Newton's laws of motion and the theorems of kinetics for a rigid disc
MR6: Elements of mechanical vibrating systems
MR7: Modelling of vibrating systems, generating the governing differential equations of motion
MR8: Free vibrations of single degree of freedom systems
MR9: Forced vibrations of single degree of freedom systems
MR10: Free vibrations of multiple degrees of freedom systems, natural frequencies, mode shapes

Literature:
[1]   Educational materials given in the lectures of Dynamics and Vibration
[2]   S. Graham Kelly: Mechanical Vibrations – Theory and Applications, Cengage Learning, 2012