

Self-assessment of your knowledge in:

Mathematics, Mechanics, Thermodynamics and Technical drawing

Usually, mechanical or automotive (technically oriented) bachelor courses provide the following knowledge. Other bachelors (electrical, physical) will perhaps need some effort to complement the knowledge.

Please, evaluate your knowledge by marking the appropriate level field:

Mathematics	Status	Knowledge Level Assessment			
Linear algebra (matrices and operations on them – matrix product and inversion, determinants, solution of systems of linear equations and conditions of its existence)	absolutely compulsory	excellent	medium	poor	never heard about it
Differential and integral calculus of single variable; expansion of functions into series	absolutely compulsory	excellent	medium	poor	never heard about it
Differential calculus of multi-variables (partial derivative, total differential)	compulsory	excellent	medium	poor	never heard about it
Integral calculus of multi-variables, curve and surface integrals	recommended	excellent	medium	poor	never heard about it
Analytical geometry in 2-D space (line, curves of 2 nd order)	absolutely compulsory	excellent	medium	poor	never heard about it
Vector algebra in space (magnitude of vector, components in cartesian or other orthogonal coordinates, scalar product, vector product, mixed products)	absolutely compulsory	excellent	medium	poor	never heard about it
Vector analysis in space (gradient, divergence, rotation of vector, Green's, Gauss's and Stokes's theorems)	recommended	excellent	medium	poor	never heard about it
Fourier analysis (harmonic components of periodic functions, Fourier polynomials, Fourier integral)	recommended	excellent	medium	poor	never heard about it
Integral transformations (Laplace, Fourier,...)	recommended	excellent	medium	poor	never heard about it
Ordinary differential equations (initial and boundary conditions, numerical methods of integration)	compulsory	excellent	medium	poor	never heard about it
Linear differential equations of k-th order and sets of linear differential equations (homogeneous equation, general solution, characteristic equation, particular solution)	compulsory	excellent	medium	poor	never heard about it
Partial differential equations (particular solution, initial and boundary conditions)	recommended	excellent	medium	poor	never heard about it
Variation calculus (variation, application to geometrical or mechanical problems)	recommended	excellent	medium	poor	never heard about it

Mechanics and Thermodynamics	Status	Knowledge Level Assessment			
Equilibrium conditions of planar and spatial system of forces, free body diagram	absolutely compulsory	excellent	medium	poor	never heard about it
Passive resistances	compulsory	excellent	medium	poor	never heard about it

Tensor formulation of stress components (normal and shear stress components, main stress components, symmetry of stress tensor,...)	compulsory	excellent	medium	poor	never heard about it
Basic cases of stress – deformation, statically indefinite cases, limit states – modes of failure (tension and pressure, bending, torsion, combined cases, fatigue)	absolutely compulsory	excellent	medium	poor	never heard about it
Kinematics of planar (2-D) motion of a body (center of instantaneous rotation, analysis of velocity and acceleration components,...)	absolutely compulsory	excellent	medium	poor	never heard about it
Kinematics of planar mechanisms	recommended.	excellent	medium	poor	never heard about it
Dynamics of 3-D motion of a mass point	absolutely compulsory	excellent	medium	poor	never heard about it
Vibrations with 1DOF - free vibrations, excited vibrations	absolutely compulsory	excellent	medium	poor	never heard about it
Vibrations with multiple DOF - free vibrations, excited vibrations	compulsory	excellent	medium	poor	never heard about it
Dynamics of 2-D general motion of a body (rotation of a rigid body, moment of inertia, calculation of dynamic forces for 2-D cases - representation by mass points, e.g., connecting rod)	absolutely compulsory	excellent	medium	poor	never heard about it
Lagrange equations of the second type	recommended	excellent	medium	poor	never heard about it
Conservation of mass and energy for fluids (mass conservation, 1 st law of thermodynamics)	compulsory	excellent	medium	poor	never heard about it
Bernoulli equation for 1-D flow	absolutely compulsory	excellent	medium	poor	never heard about it
Basic reversible changes of perfect gas	compulsory	excellent	medium	poor	never heard about it
Irreversible changes and 2 nd law of thermodynamics, entropy	compulsory	excellent	medium	poor	never heard about it
Basic cases of steady heat transport (conduction, heat transfer, radiation)	absolutely compulsory	excellent	medium	poor	never heard about it

Technical drawings	Status	Knowledge Level Assessment			
Capability of reading and drawing technical sketches and drawings	compulsory	excellent	medium	poor	never heard about it

If you answered „poor“ or „never heard about it“ to some absolutely compulsory of topics listed above or if you answered „never heard about it“ to some compulsory topics your success in the course is not probable; you should improve your knowledge before entering the course.

Recommended = at least knowledge of basic terms is compulsory, the tools of it will be used during the course. If you answered „poor“ or „never heard about it“ to some recommended topics listed above you should study it using textbooks recommended by your course tutor before you try to pass through exams.