

# Course Descriptions

Mechanical Engineering and Technology at AUG

Course Name	Mathematical Way of Thinking
Course No	MATH105001
ECTS Credits	5
Language	Georgian
Lecturer	Levan Sigua <a href="mailto:l.sigua@agruni.edu.ge">l.sigua@agruni.edu.ge</a> Konstantine Dardjania <a href="mailto:k.darjania@agruni.edu.ge">k.darjania@agruni.edu.ge</a> Nugzar Iosebashvili <a href="mailto:n.iosebashvili@agruni.edu.ge">n.iosebashvili@agruni.edu.ge</a> Tengiz Kobakhidze <a href="mailto:t.kobakhidze@agruni.edu.ge">t.kobakhidze@agruni.edu.ge</a>
Prerequisites	None
Description	Dirichlet's principle; mathematical induction; prime numbers; arithmetic and geometric progression; complex numbers; combinatorics; set theory; probability theory; statistics; logic; graph.

Course Name	Mathematics I
Course No	MATH106007
ECTS Credits	6
Language	Georgian
Lecturer	Levan Sigua <a href="mailto:l.sigua@agruni.edu.ge">l.sigua@agruni.edu.ge</a> Konstantine Dardjania <a href="mailto:k.darjania@agruni.edu.ge">k.darjania@agruni.edu.ge</a>
Prerequisites	Mathematical Way of Thinking
Description	Set; matrices; rules for matrix operations; the properties of determinants; permutations and cofactors; Cramer's rule, inverses, and volumes; the Rank and the Row Reduced Form; vectors and coordinate geometry in 3-space; analytic geometry in three dimensions; hanging cables and chains; the dot product and projections; vector in n-space; the cross product in 3-Space; the cross product as a determinant; planes and lines in 3-space; quadric surfaces; conics, parametric curves and polar curves; parabolas; the focal property of parabola; ellipses; the focal property of an ellipse; the directrices of an ellipse; hyperbolas; the focal property of hyperbola; classifying general conics; sequences and convergence; limits of functions; limits at infinity and infinite limits; continuity of a function at a point and interval; finding maxima and minima graphically; the formal definition of limit.

<b>Course Name</b>	<b>Mathematics II</b>
Course No	MATH205005
ECTS Credits	5
Language	Georgian
Lecturer	Levan Sigua <a href="mailto:l.sigua@agruni.edu.ge">l.sigua@agruni.edu.ge</a> Konstantine Dardjania <a href="mailto:k.darjania@agruni.edu.ge">k.darjania@agruni.edu.ge</a>
Prerequisites	Mathematics I (for Engineers)
Description	Tangent lines and their slopes; the derivative; differentiation rules; the chain rule; the mean-value theorem; extreme values; concavity and inflections; functions of several variables; limits and continuity; partial derivatives; higher-order derivatives; sums and sigma notation; areas as limits of sums; the method of substitution; integration by parts; the definite integral; properties of the definite integral; improper integrals; first-order differential equations; second-order linear differential equations with constant coefficients; sequences, series and power series; Fourier series; periodic functions; Taylor and Maclaurin series.

<b>Course Name</b>	<b>Mathematics III</b>
Course No	MATH206006
ECTS Credits	6
Language	Georgian
Lecturer	Levan Sigua <a href="mailto:l.sigua@agruni.edu.ge">l.sigua@agruni.edu.ge</a> Konstantine Dardjania <a href="mailto:k.darjania@agruni.edu.ge">k.darjania@agruni.edu.ge</a>
Prerequisites	Mathematics II (for Engineers)
Description	Error analysis; representations of numbers; Roundoff errors and floating-point arithmetic, error propagation; interval arithmetic; interpolation by polynomials; the interpolation formula of Lagrange; Neville's algorithm; Newton's interpolation formula; the error on polynomial interpolation; the integration formulas of Newton and Cotes; Peano's error representation; systems of linear equations; linear equations iterative methods; linear equations subtraction method; differential equations difference method; initial value problem; basic probability concepts; events and sample spaces; contingency tables and Venn diagrams; simple probability; joint probability; marginal probability; conditional probability; decision trees; marginal

	probability using the general multiplication; Bayes' theorem; the probability distribution for a discrete random variable; the <i>normal</i> distribution and other continuous distributions; sampling and sampling distributions; confidence interval estimation.
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<b>Course Name</b>	Physics I
Course No	PHYS105001
ECTS Credits	5
Language	Georgian
Lecturer	Zaza Metreveli <a href="mailto:z.metreveli@agruni.edu.ge">z.metreveli@agruni.edu.ge</a>
Prerequisites	None
Description	Classical physics and modern technologies; physical units and SI system; linear motion; kinematic equations; circular motion; velocity and acceleration; tangential acceleration; rotational motion; Newton laws; forces in physics: elasticity and Hooke's law, friction; Newton's law of universal gravitation; free fall motion; impulse; conservation of energy; force and momentum; pendulum physics; pressure and Pascal's law; electrical forces; Coulomb's law; Ohm's law; waves; Ideal gas law; internal energy; intro to geometrical optics; atom structure and radiation.

<b>Course Name</b>	Physics II
Course No	PHYS204004
ECTS Credits	4 + 1 (Laboratory Course PHYS201005)
Language	Georgian
Lecturer	Zaza Metreveli <a href="mailto:z.metreveli@agruni.edu.ge">z.metreveli@agruni.edu.ge</a> Zurab Jibuti <a href="mailto:z.jibuti@agruni.edu.ge">z.jibuti@agruni.edu.ge</a>
Prerequisites	Physics I
Description	Rotational kinetic energy; inertia; center of mass; rigid body dynamics; Ohm's law for closed circuit; energy dissipation in closed circuit; magnetic field; electromagnetic induction; AC current; transformer; condensation and evaporation; surface tension; Laplace's equation; capillary action; first law of thermodynamics; adiabatic process; second law of thermodynamics; heat engine; geometrical optics; light interference; light dispersion; spectrum analysis; electromagnetic spectrum; photoelectric effect; introduction to

	nuclear physics; nuclear chain reaction; nuclear fusion; radioactivity; radioactive decay.
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<b>Course Name</b>	Physics III
Course No	PHYS204006
ECTS Credits	4 + 1 (Laboratory Course PHYS201007)
Language	Georgian
Lecturer	Zurab Jibuti <a href="mailto:z.jibuti@agruni.edu.ge">z.jibuti@agruni.edu.ge</a>
Prerequisites	Physics II
Description	Rolling; equilibrium; stiffness of a solid material; Young's modulus; ideal fluid; Bernoulli's principle; real fluid; Doppler effect; supersonic speed; convective heat transfer; heat transfer; electrical capacity; dielectrics; superconductivity; semiconductors; magnetism; diamagnetic, paramagnetic and ferromagnetic materials; electromagnetic wave; polarization, reflection and transmission.

<b>Course Name</b>	Principles of Engineering
Course No	ENGI104001
ECTS Credits	4
Language	Georgian
Lecturer	Akaki Pagava <a href="mailto:a.pagava@agruni.edu.ge">a.pagava@agruni.edu.ge</a> Revaz Makharoblidze <a href="mailto:r.makharoblidze@agruni.edu.ge">r.makharoblidze@agruni.edu.ge</a> Murad Kalabegashvili <a href="mailto:m.kalabegashvili@agruni.edu.ge">m.kalabegashvili@agruni.edu.ge</a> Mamuka Benashvili <a href="mailto:m.benashvili@agruni.edu.ge">m.benashvili@agruni.edu.ge</a>
Prerequisites	None
Description	History and development of engineering; engineering disciplines; natural science and art in engineering; problem solving in engineering; engineering ethics; engineering way of thinking; difference and similarity between Mechanical, Civil and Electrical Engineering.

<b>Course Name</b>	Engineering Graphics I
Course No	CVEN304003

ECTS Credits	4
Language	Georgian
Lecturer	Merab Barsonidze <a href="mailto:m.barsonidze@agruni.edu.ge">m.barsonidze@agruni.edu.ge</a>
Prerequisites	None
Description	Descriptive geometry; 3D projections; projective geometry; hand drafting; technical drawing; linear algebra.

Course Name	Engineering Graphics II
Course No	CAD304002
ECTS Credits	4
Language	Georgian
Lecturer	Merab Barsonidze <a href="mailto:m.barsonidze@agruni.edu.ge">m.barsonidze@agruni.edu.ge</a>
Prerequisites	Engineering Graphics I
Description	Advanced descriptive geometry; technical engineering drawing; projective geometry.

Course Name	Engineering Graphics III
Course No	ENGI304008
ECTS Credits	4
Language	Georgian
Lecturer	Merab Barsonidze <a href="mailto:m.barsonidze@agruni.edu.ge">m.barsonidze@agruni.edu.ge</a>
Prerequisites	Engineering Graphics II
Description	Introduction to AutoCAD; basic Commands in AutoCAD; modifying and manipulating drawings in AutoCAD; 2D drafting in AutoCAD; different functionalities of AutoCAD; 3D solid modeling in AutoCAD; editing and visualizing solids models in AutoCAD; surface modeling; rendering in AutoCAD.

Course Name	Theoretical Mechanics I
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Course No	ENGI205002
ECTS Credits	5
Language	Georgian
Lecturer	Lali Qajaia <a href="mailto:lali.kajaia@agruni.edu.ge">lali.kajaia@agruni.edu.ge</a>
Prerequisites	Mathematics I
Description	Rigid body kinematics; statics; force equilibrium principle; planar and rotational motion.

<b>Course Name</b>	<b>Theoretical Mechanics II</b>
Course No	ENGI205003
ECTS Credits	5
Language	Georgian
Lecturer	Lali Qajaia <a href="mailto:lali.kajaia@agruni.edu.ge">lali.kajaia@agruni.edu.ge</a>
Prerequisites	Theoretical Mechanics I
Description	Rigid body dynamics; motion of material objects in relation to the physical factors that affect them: force, mass, momentum, energy; shock theory; differential equations describing motion and oscillation.

<b>Course Name</b>	<b>Electrical Circuits</b>
Course No	ELEC2030014
ECTS Credits	3 + 1 (Laboratory Course ELEC201015)
Language	Georgian
Lecturer	Eka Rurua <a href="mailto:e.rurua@agruni.edu.ge">e.rurua@agruni.edu.ge</a> (LC) Edisher Midelashvili <a href="mailto:e.midelashvili@agruni.edu.ge">e.midelashvili@agruni.edu.ge</a>
Prerequisites	None

Description	Basic components of electrical circuits; Voltage and current sources; Kirchhoff's laws; equivalent star and delta networks; potential diagram; generation of three-phase electric power; complex numbers; Ohm's and Kirchhoff's Voltage law with complex numbers; RLC circuits; electrical resonance; power coefficient.
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Course Name	Measurements and Instruments
Course No	ENGI205012
ECTS Credits	5
Language	Georgian
Lecturer	Ivane Kapanadze <a href="mailto:i.kapanadze@freeuni.edu.ge">i.kapanadze@freeuni.edu.ge</a>
Prerequisites	None
Description	Measuring instruments and systems; statistics in measurements; direct and indirect measurements.

Course Name	Strength of Materials I
Course No	ENGI204028
ECTS Credits	4 + 1 (Laboratory Course ENGI201029)
Language	Georgian
Lecturer	Konstantine Chkhikvadze <a href="mailto:Ko.chkhikvadze@agruni.edu.ge">Ko.chkhikvadze@agruni.edu.ge</a>
Prerequisites	Theoretical Mechanics I
Description	Stress-strain curve; elasticity and plasticity; types of loadings; types of stresses; Hooks law; basic deformations; yield strength; ultimate strength; Young's modulus; Poisson's ratio; deformations of beams columns and shafts.

Course Name	Strength of Materials II
Course No	ENGI304032
ECTS Credits	4 + 1 (Laboratory Course ENGI301033)

Language	Georgian
Lecturer	Konstantine Chkhikvadze <a href="mailto:Ko.chkhikvadze@agruni.edu.ge">Ko.chkhikvadze@agruni.edu.ge</a>
Prerequisites	Strength of Materials I
Description	Differential equations; stiffness matrix; finite element analysis; Euler-Bernuli beam equation; basics of Ansys; Mesh generation.

Course Name	Theory of Mechanisms and Machines I
Course No	MECE205001
ECTS Credits	5
Language	Georgian
Lecturer	Roman Tskhvaradze <a href="mailto:r.tskhvaradze@agruni.edu.ge">r.tskhvaradze@agruni.edu.ge</a>
Prerequisites	Physics II, Mathematics II
Description	Classification of mechanisms; mechanical linkages; static and dynamic forces; velocities and accelerations; planar and 3D mechanisms; design; kinematic analysis of linkage mechanisms.

Course Name	Theory of Mechanisms and Machines II
Course No	MECE304005
ECTS Credits	4
Language	Georgian
Lecturer	Roman Tskhvaradze <a href="mailto:r.tskhvaradze@agruni.edu.ge">r.tskhvaradze@agruni.edu.ge</a>
Prerequisites	Theory of Mechanisms and Machines I
Description	Cams; balance of rotational components; spur gears and cam-follower systems.



<b>Course Name</b>	Thermodynamics
<b>Course N<sub>o</sub></b>	MECE305003
<b>ECTS Credits</b>	5
<b>Language</b>	Georgian
<b>Lecturer</b>	Roman Tskhvaradze <a href="mailto:r.tskhvaradze@agruni.edu.ge">r.tskhvaradze@agruni.edu.ge</a>
<b>Prerequisites</b>	Physics III, Mathematics II
<b>Description</b>	Basic concepts of thermodynamics; property evaluation of ideal gases and compressible substances; theory and application of the first and second laws of thermodynamics.

<b>Course Name</b>	Materials Science
<b>Course N<sub>o</sub></b>	ENGI305010
<b>ECTS Credits</b>	5
<b>Language</b>	Georgian
<b>Lecturer</b>	Jemal Katsitadze <a href="mailto:j.katsitadze@agruni.edu.ge">j.katsitadze@agruni.edu.ge</a>
<b>Prerequisites</b>	Chemistry, physics I, Mathematics I
<b>Description</b>	Crystal structure, microstructure and physical properties of metals, ceramics, polymers, composites, and amorphous materials. Also includes elementary mechanical behavior and phase equilibria.

<b>Course Name</b>	Basis of Heat Transfer
<b>Course N<sub>o</sub></b>	MECE305004
<b>ECTS Credits</b>	5
<b>Language</b>	Georgian
<b>Lecturer</b>	Roman Tskhvaradze <a href="mailto:r.tskhvaradze@agruni.edu.ge">r.tskhvaradze@agruni.edu.ge</a>
<b>Prerequisites</b>	Mathematics II, Physics III
<b>Description</b>	Types of heat exchange; conduction; convection; radiation.

Course Name	Hydraulics
Course No	MECE305006
ECTS Credits	5
Language	Georgian
Lecturer	Tamaz Odilavadze <a href="mailto:t.odilavadze@agruni.edu.ge">t.odilavadze@agruni.edu.ge</a>
Prerequisites	Mathematics I, Physics II
Description	Hydro dynamics; physical behavior of ideal and real fluids; laws of hydrostatics; fluid equilibrium differential equations; types of pressure; hydraulic shocks; laminar and turbulent flow; Reynolds number; fluid flows through pipes.

Course Name	Principles of Programming
Course No	ENGI104001
ECTS Credits	4
Language	Georgian
Lecturer	George Macharashvili <a href="mailto:g.macharashvili@agruni.edu.ge">g.macharashvili@agruni.edu.ge</a>
Prerequisites	None
Description	Introduction to Programming; history of C programming language; preprocessor, compiling and linking; variables in C; C keywords; operators in C; decision making and loops in C; I/O operations in C; basic commands in Linux; functions in C; pointers; arrays; structures; unions; Bit fields; typedef; C preprocessor; header files; C libraries; using g++ compiler on Linux; introduction to <i>make</i> on Linux; error handling.

Course Name	Programming I
Course No	CS204009
ECTS Credits	4
Language	Georgian
Lecturer	George Macharashvili <a href="mailto:g.macharashvili@agruni.edu.ge">g.macharashvili@agruni.edu.ge</a>
Prerequisites	Principles of Programming

Description	From C to C++; Linux operating system; standard Linux directories; introduction to Drivers; standard template library; classes & objects in C++; inheritance, overloading, polymorphism in C++; data encapsulation; namespaces; dynamic memory: <i>new</i> and <i>delete</i> in C++; templates; creating Class Libraries in C++; exception handling.
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Course Name	Programming II
Course No	CS304004
ECTS Credits	4
Language	Georgian
Lecturer	George Macharashvili <a href="mailto:g.macharashvili@agruni.edu.ge">g.macharashvili@agruni.edu.ge</a>
Prerequisites	Programming I
Description	Continuation of Programming I; in depth study of C++; classes in C++; iomanip; pipe in C++; overloading; templates; standard template library; exception handling; data encapsulation; namespaces; dynamic memory; iterator; constructing algorithms; introduction to CERN ROOT.

Course Name	Technical Modeling
Course No	ENGI304013
ECTS Credits	4
Language	Georgian
Lecturer	Irma Davitashvili <a href="mailto:i.davitashvili@agruni.edu.ge">i.davitashvili@agruni.edu.ge</a>
Prerequisites	Mathematics III
Description	Matlab fundamentals; Simulink fundamentals; modeling differential equations in Simulink; PID control using Matlab.

Course Name	Machine Parts
Course No	MECE405007
ECTS Credits	5

Language	Georgian
Lecturer	Maia Barbakadze <a href="mailto:m.berbakadze@agruni.edu.ge">m.berbakadze@agruni.edu.ge</a>
Prerequisites	Theory of Mechanisms and Machines II
Description	Types of gears, belts, frictional discs, bearings, keys, couplers, rivets, bolts, and their calculation and design.

Course Name	Electromechanics
Course No	ELEE304009
ECTS Credits	4
Language	Georgian
Lecturer	Eka Rurua <a href="mailto:e.rurua@agruni.edu.ge">e.rurua@agruni.edu.ge</a>
Prerequisites	Electrical Circuits
Description	Electrical motors; asymmetrical two-phase induction motor; single-phase induction motor; induction motor capacitor; shaded-pole motor; running three-phase asynchronous motor with single-phase supply; permanent magnet synchronous motors; synchronous reactive motor; synchronous hysteresis motor; universal motor; DC permanent magnet motors; piezoelectric motor; tachogenerator; synchro; stepper motor; linear motor; electric Commutator; vibro motor.

Course Name	Internal Combustion Engines
Course No	MECE405008
ECTS Credits	5
Language	Georgian
Lecturer	Roman Tskhvaradze <a href="mailto:r.tskhvaradze@agruni.edu.ge">r.tskhvaradze@agruni.edu.ge</a>
Prerequisites	Mathematics II, Physics III
Description	Fundamentals of Internal Combustion Engines and their classification; two and four stroke engines and their run cycles.

<b>Course Name</b>	Hydraulic Machines
<b>Course No</b>	MECE405009
<b>ECTS Credits</b>	5
<b>Language</b>	Georgian
<b>Lecturer</b>	Tamaz Odilavadze <a href="mailto:t.odilavadze@agruni.edu.ge">t.odilavadze@agruni.edu.ge</a>
<b>Prerequisites</b>	Hydraulics
<b>Description</b>	Hydraulic machinery and pumps; impact of jets; fixed and moving vanes; classification of turbines.

<b>Course Name</b>	Automated Control Systems
<b>Course No</b>	MECE404010
<b>ECTS Credits</b>	4
<b>Language</b>	Georgian
<b>Lecturer</b>	Revaz makharoblidze <a href="mailto:r.makharoblidze@agruni.edu.ge">r.makharoblidze@agruni.edu.ge</a>
<b>Prerequisites</b>	Mathematics III, Physics III
<b>Description</b>	Control system applications without human intervention; theory of stability; state models and their stability, controllability, and observability properties.

<b>Course Name</b>	Mechatronics
<b>Course No</b>	ELEE404024
<b>ECTS Credits</b>	4
<b>Language</b>	Georgian
<b>Lecturer</b>	Eka Rurua <a href="mailto:e.rurua@agruni.edu.ge">e.rurua@agruni.edu.ge</a>
<b>Prerequisites</b>	Electromechanics
<b>Description</b>	Application of imbedded microcontrollers to the design of mechatronic systems; introduction to feedback and feedforward control concepts; application to automotive, consumer, industrial and commercial systems.

<b>Course Name</b>	<b>Digital Control I</b>
Course No <sub>o</sub>	ELEE405025
ECTS Credits	5
Language	Georgian
Lecturer	Teimuraz Khundadze <a href="mailto:khundadze@agruni.edu.ge">khundadze@agruni.edu.ge</a>
Prerequisites	Mathematics III
Description	Basics of electronics; automated systems based on digital control; programming method; building working prototype.

<b>Course Name</b>	<b>Manufacturing Processes</b>
Course No <sub>o</sub>	MECE405012
ECTS Credits	5
Language	Georgian
Lecturer	Jemal Katsitadze <a href="mailto:j.katsitadze@agruni.edu.ge">j.katsitadze@agruni.edu.ge</a>
Prerequisites	None
Description	Fundamentals of manufacturing processes such as casting, heat treating, particulate processing, forming, machining, joining, and surface processing; selection of manufacturing processes based on design and materials.

<b>Course Name</b>	<b>Computer Architecture / Computer Science</b>
Course No <sub>o</sub>	CS404005
ECTS Credits	4
Language	Georgian
Lecturer	Demur Shavadze <a href="mailto:d.shavadze@agruni.edu.ge">d.shavadze@agruni.edu.ge</a>
Prerequisites	None

Description	History of computing; history of computer architecture and its different types; classification of computer systems; structure of computer and its main components; CPU, ALU, Registers, RAM; types of instructions; cache memory; BIOS; RISC and CISC architecture; development from Intel 4040 to i7; bits, bytes, word, double word; binary, octal and hexadecimal systems; GPU; I/O ports and devices; external memories (HDD, CD, DVD, Blue Ray).
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Course Name	Theory of Automobiles
Course No	MECE405011
ECTS Credits	5
Language	Georgian
Lecturer	Roman Tskhvaradze <a href="mailto:r.tskhvaradze@agruni.edu.ge">r.tskhvaradze@agruni.edu.ge</a>
Prerequisites	Internal Combustion Engines
Description	Equations governing vehicle movement; vehicle dynamics; torque and power; fuel consumption; braking; suspension.

Course Name	Algorithms
Course No	CS404003
ECTS Credits	4
Language	Georgian
Lecturer	Demur Shavadze <a href="mailto:d.shavadze@agruni.edu.ge">d.shavadze@agruni.edu.ge</a>
Prerequisites	Mathematics III (for Engineers)
Description	Basics of algorithms; types and examples of algorithms; time and memory complexity; sorting algorithms; Hash functions; double hashing; Graph theory; dynamic programming; number theory; NP-Complexity.

Course Name	Sophomore Project
Course No	MECE202950
ECTS Credits	2

Language	Georgian
Lecturer	Mamuka Benashvili <a href="mailto:m.benashvili@agruni.edu.ge">m.benashvili@agruni.edu.ge</a>
Prerequisites	None
Description	Introduction to Technical Report Writing; Introduction to Lab Equipment; laboratory safety; project management.

<b>Course Name</b>	<b>Junior Project</b>
Course No	MECE305951
ECTS Credits	5
Language	Georgian
Lecturer	Mamuka Benashvili <a href="mailto:m.benashvili@agruni.edu.ge">m.benashvili@agruni.edu.ge</a>
Prerequisites	None
Description	Design process including specification development, concept design, detail design and prototype production.

<b>Course Name</b>	<b>Senior Project</b>
Course No	MECE405952
ECTS Credits	5
Language	Georgian
Lecturer	Maia Barbakadze <a href="mailto:m.barakadze@agruni.edu.ge">m.barakadze@agruni.edu.ge</a>
Prerequisites	Machine Parts
Description	Designing the structure of a Gear set and its constituents; making detailed calculations; creating engineering drawings.