

Course Description

01208111 Engineering Drawing 3(2-3-6)

Lettering techniques, applied geometry drawing, orthographic drawing, pictorial drawing, dimensioning and tolerancing, sectional view drawing, auxiliary views, development, sketching techniques, detail and assembly drawings, introduction to computer-aided drawing.

01208211 Engineering Design and Modeling 3(2-3-6)

Prerequisite: 01208111

Mechanical design process, computer aided design, product data management, reverse engineering, tolerancing design, design and production drawing.

01208221 Engineering Mechanics I 3(3-0-6)

Prerequisite: 01417167

Force analysis, equilibrium, application of equilibrium equations to frames and machines, centroid, theorem of Pappus, beams, shear and bending moment diagrams, cable, dry friction, wedges, screws and belts, virtual work, stability of equilibrium, area moment of inertia, introduction to dynamics.

01208222 Engineering Mechanics II 3(3-0-6)

Prerequisite: 01208221

Mass moment of inertia, mechanics of particle and rigid body in plane motion, equation of motion, principle of impulse and momentum, principle of work and energy, impact, fundamental of space motion.

01208223 Mechanics of Materials 3(3-0-6)

Prerequisite: 01208221

Equilibrium of deformable body, concept of stresses and strains, stresses and strains relationship, normal stress and strain in axially loaded member, shearing stress and strain in circular shaft subjected to torsion, bending and shearing

stresses in beams, deflection of beams, stresses under combined loading, Mohr's circle, buckling of columns.

01208241 Thermodynamics I 3(3-0-6)

Prerequisite: 01417167

Properties of pure substances, work and heat, ideal gas, first and second laws of thermodynamics, simple steam power plant and refrigeration cycle, entropy, basic heat transfer and energy conversion.

01208242 Fluid Mechanics 3(3-0-6)

Prerequisite: 01417168

Fluid properties, fluid statics, continuity equation, momentum equation, energy equation, dynamics of incompressible and inviscid fluid flow, dimensional analysis and similitude, incompressible and viscous flow, flow in pipes, drag force and lift force.

01208271 Computer Methods for Mechanical Engineering 3(2-3-6)

Prerequisite: 01417267

Numerical methods in engineering problems solving. Mathematical modeling and simulations of mechanical engineering problems. Use of computer for design and analysis of mechanical engineering problems.

01208281 Workshop Practice 1(0-3-2)

Practices in the use of measurement devices, hand tools, power tools, materials and accessories in mechanical works, welding, machining, wood works, piping system, electrical and electronics works, and safety.

01208311 Machine Design 3(3-0-6)

Prerequisite: 01208223

Fundamental of mechanical design, properties of materials, theories of failure, design of simple machine elements, rivets, welding, screw fasteners, keys and pins, shafts, springs, gears, power screws, couplings, bearings, brakes, clutches, belts, chains.

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| 01208321 | Mechanics of Machinery | 3(3–0–6) |
| | Prerequisite: 01208222 | |
| | Mechanisms and the analysis of displacements, velocity and acceleration of their members, analysis of forces and motions in machines, balancing of rotation and reciprocation masses. | |
| 01208322 | Mechanical Vibrations | 3(3–0–6) |
| | Prerequisite: 01417267 | |
| | Theory of free and forced vibration of systems with one and more than one degree of freedom, unbalanced rotation, whirling of shaft, vibration measuring instruments, vibration isolation and absorption, and industry applications. | |
| 01208331 | Automotive Technology | 3(3–0–6) |
| | Automotive body and frame, engine operation, lubrication systems, cooling systems, fuel delivery systems, ignition systems, starting and charging systems, power train systems, suspension systems, braking, and steering systems. | |
| 01208341 | Thermodynamics II | 3(3–0–6) |
| | Prerequisite: 01208241 | |
| | Irreversibility and availability, vapor power cycles, gas power cycles, refrigeration cycles, thermodynamics relations, gas mixtures, chemical reaction. | |
| 01208342 | Power Plant Engineering | 3(3–0–6) |
| | Prerequisite: 01208341 | |
| | Energy conversion principles and availability concept, fuels and combustion analysis and component study of steam, gas turbine and internal combustion engine power plants, combined cycle and cogeneration, hydro power plant, nuclear power plant, control and instrumentation, power plant economics and environmental impacts. | |

01208351 Heat Transfer 3(3-0-6)

Prerequisite: 01417267

Principles of heat transfer by conduction, convection and radiation, steady and unsteady state condition in one, two or three dimensional heat transfer, heat exchanger, boiling and condensation.

01208352 Refrigeration and Air Conditioning 3(3-0-6)

Prerequisite: 01208341 and 01208351

Basic knowledge of refrigeration and coefficient of performance, modified vapor compression, refrigeration cycles, system components analysis, refrigerant and their properties, evaporative cooling and cooling towers, absorption refrigeration, calculation of cooling load of refrigeration systems, freezing of foods, air condition, cooling load estimation of air conditioning systems, air distribution and duct system design.

01208371 Automatic Control 3(3-0-6)

Prerequisite: 01417267

Modeling of physical system, transfer function and block diagram, on-off control and PID control, solution of ordinary differential equation using Laplace transformation, time variable response, analysis of system stability by root-locus method, frequency response and data display, design and improvement of control system efficiency, state-space method.

01208381 Mechanical Engineering Laboratory I 1(0-3-2)

Prerequisite: 01208201 or 01208221

Experimental works in the areas of mechanics of machinery, automatic control, engineering materials, thermodynamics and internal combustion engines.

01208382 Mechanical Workshop Practice 1(0-3-2)

Prerequisite: 01208281

Skill building practices in the use of machines, power tools, hand tools, various measurement devices. Process planning, tools and machines selection, real part

fabrication and mechanical assembly fitting practices are carried out through term project assignment.

01208399	Internship	1
	Internship for mechanical engineering in private enterprises, government agencies, government enterprise or academic places at least 240 hours and at least 30 workdays.	
01208411	Mechanical Design Processes	3(3-0-6)
	Mechanical design, designers, design teams, design process, planning for design, concept generation, concept evaluation, product generation, product evaluation.	
01208412	Product Development	3(3-0-6)
	Prerequisite: 01208311	
	Steps in product development process including needs identification, specification, conceptual design, detailed design, prototyping and evaluation, design for manufacture and assembly, production, cost, intellectual property.	
01208413	Entrepreneurship for Mechanical Engineering	3(3-0-6)
	Creative thinking, product development, market opportunity, legal aspects in entrepreneurship, entrepreneurial financial, marketing and human resource management, financial accounting for management.	
01208414	CAD/CAM for Mechanical Engineering	3(3-0-6)
	Hardware and software for CAD/CAM, part modeling and assembly, detail drawing, geometric dimensioning and tolerancing, bill of materials, CAM for turning and milling.	
01208415	CNC Machine and Programming	3(3-0-6)
	Type of CNC machines, manufacturing process and planning, metal cutting technology, CNC programming for turning and milling machines.	

- 01208416 Design and Manufacturing Processes for Polymer Products 3(3-0-6)
Prerequisite: 01208311
Types and properties of polymer, polymer forming process by injection, blow, and compression, design criteria for polymer products, molds and machines for production, mold design and material, industrial standard testing, rapid tooling.
- 01208417 Design and Manufacturing Processes for Metal Products 3(3-0-6)
Prerequisite: 01208311
Types and properties of metal, metal forming process by machining, metal casting and forging, sheet metal design, machines for sheet metal production, design criteria for metal products, mold and die designs for metal forming processes, rapid tooling.
- 01208418 Mould Design for Rubber Products 3(3-0-6)
Properties of rubber, rubber forming processes, design and manufacturing of rubber moulds using computer-aided engineering, quality control and improvement for rubber products.
- 01208419 Tire Manufacturing system 3(3-0-6)
Production process, quality management and control, environmental friendly tire design, productivity improvement, maintenance concept.
- 01208421 Introduction to Finite Element Methods 3(3-0-6)
Concept of finite element method, integral formulations and variational methods, formulation of finite element methods for analysis of linear static solids and structures, heat transfer in solids, and fluid flow.
- 01208422 Introduction to Computational Fluid Dynamics 3(3-0-6)
Concept of computational fluid dynamics, transport equations of flow, finite volume method, application of computational fluid dynamics software for laminar and turbulent flows in a pipe, flow over obstacles, flow and heat transfer in an air-conditioned room, heat transfer in an electronic equipment, modeling of fire in a room.

- 01208423 Biomechanics Engineering 3(3-0-6)
Mechanics and dynamics of body motion, muscle, joints and heart, analysis of force, stress and strain of bone, muscle and tissue, applications of biomechanics engineering to medical equipment and instrument.
- 01208424 Introduction to Engineering Composite Materials 3(3-0-6)
Prerequisite: 01208223
Fiber-reinforced polymeric composites, micromechanics of fiber-reinforced composites, mechanical behavior of laminae, classical lamination theory, thermal and hygroscopic stress analysis, strength of laminates, structural analysis of laminated plates, fabric-reinforced composites, preliminary design of composite structures.
- 01208425 Tire Mechanics 3(3-0-6)
Functional specification of tire, tire structure and components, characteristics of initial state, tire mounting, tire inflating, mechanical behaviors of tire during load carrying and rolling.
- 01208426 Fluid Machinery 3(3-0-6)
Prerequisite: 01208242
Theory and design of turbomachinery, characteristics, performance and application of fans, blowers, compressors, and pumps, hydraulic and pneumatic systems.
- 01208427 Construction Machinery 3(3-0-6)
Prerequisite: 01208321
Basic machine components, tractors and related equipment, excavating equipment, scrapers, trucks, grading and compacting equipment, compressors and drills, selection of construction equipment, planning and management.
- 01208428 Equipment Management 3(3-0-6)
Principles of equipment management, planning, control and evaluation of equipment utilization, maintenance and repair, spare parts control.

- 01208431 Computer-aided Automotive Design 3(2-3-6)
 Computer sketching, 3-dimensional geometrical object construction, solid part design, surface object design, volume object construction, part assembly, 2-dimensional working drawing.
- 01208432 Automotive Vehicle Dynamics 3(3-0-6)
 Prerequisite: 01208222
 Standard units, vehicle resistances, traction force, acceleration of vehicles, braking, engine and vehicle performance, gear ratio selection, vehicle handling characteristics.
- 01208433 Alternative Energy for Vehicles 3(3-0-6)
 Prerequisite: 01208331
 Automotive engines, automotive natural gas system, liquefied petroleum gas system, safety standard, hybrid systems, electric vehicles, automotive batteries, electric motors, fuel cells, fuel cell supporting systems, flexible fuel engines.
- 01208434 Internal Combustion Engines 3(3-0-6)
 Prerequisite: 01208341
 Engine types and operation, engine design and operating parameters, fuels and combustion, ideal engine operating cycles, gas exchange processes, combustion in spark-ignition and compression-ignition engines, pollutant formation, emission standards and control, advanced technologies for internal combustion engines.
- 01208435 Control of Air Pollution from Automobile 3(3-0-6)
 Prerequisite: 01208331 and 01208341
 Air pollution from spark-ignition and diesel engines, emission regulations for air pollution, impacts of each air pollution species on ecology system, greenhouse gases, control devices of air pollution from automobile.
- 01208436 Automotive Battery System and Energy Storage Technologies 3(3-0-6)
 Materials for energy conversion and storage, thermodynamics and transport processes of electrochemical cell, battery testing, battery modelling, battery

degradation, battery management systems, thermal management systems, control of battery systems, battery pack manufacturing.

01208437 Lubrication 3(3-0-6)

Prerequisite: 01208242

Viscosity, Reynolds equation, hydrodynamic lubrication, pad bearing, journal bearing, hydrostatic lubrication, elastohydro dynamics lubrication.

01208438 Vehicle System Integration 3(3-0-6)

Prerequisite: 01208331 and 01208371

V-model development, system modeling and simulation, model-based design, software-in-the-loop, hardware-in-the-loop, system verification and validation, electronic control unit, controller area network.

01208439 Automotive Manufacturing Technology 3(1-4-4)

Automotive body production, metal, plastic and rubber parts manufacturing process, field trip required.

01208441 Combustion 3(3-0-6)

Prerequisite: 01208341

Combustion and thermochemistry, fuel types and properties, introduction to chemical kinetics, ignition, premixed and non-premixed flames, laminar and turbulent flames, control of pollution and environmental effects.

01208442 Energy Management and Economics 3(2-3-6)

Prerequisite: 01208241 or 01202221 และ 01205201 or 01205211

Energy situation and concepts of energy conservation, energy audits, calculation of the overall thermal transfer value and the roof thermal transfer value, energy conservation in thermal and electrical system, energy management in buildings and industry, energy economics analysis and energy usage environment.

01208443	Gas Engineering	3(3-0-6)
	Properties of gases and distillation system, gas separation and process, gas compression, gas measurement, calculation of gas flow in pipe.	
01208444	Introduction to Solar Engineering	3(3-0-6)
	Prerequisite: 01208351	
	The sun's position calculation, solar radiation calculation, solar collector and energy storage, feasible study in engineering and economics, energy conversion, system design and applications of solar energy.	
01208445	Gas Turbine	3(3-0-6)
	Prerequisite: 01208341	
	Types of engine and working, gas turbine cycle, improve of gas turbine performance, gas turbine for airplane, gas turbine accessory.	
01208446	Thermal System Design	3(3-0-6)
	Prerequisite: 01208351	
	Basic concepts of thermodynamics, application of first and second law of thermodynamics with thermal systems, heat transfer, workable design of heat engines, heat pumps, steam turbine, gas turbine, condensers and reciprocating engines, economic analysis, equation fittings, modeling thermal equipment, system simulation and optimized design.	
01208447	Gas Dynamics	3(3-0-6)
	Prerequisite: 01208341	
	Compressible flow, isentropic flow, normal shock wave, flow with friction, flow with heat transfer, generalized one, two and three dimensional flow, oblique shock waves.	
01208448	Introduction to Renewable Energy	3(3-0-6)
	Sources and types of renewable energy, energy conversion processes and storage methods, equipments and implementations in energy conversion processes, evaluation of renewable energy sources.	

01208449 Energy Audits 3(2-3-6)

Prerequisite: 01208241

Analysis and measurement of performance for heating, ventilating, and air conditioning systems, refrigeration systems, lighting and hot water systems in commercial and industrial buildings, measurement techniques for energy audits, energy conservation.

01208451 Applications in Refrigeration System 3(3-0-6)

Prerequisite: 01208352

Refrigerant, lubricating oil, expansion device, electrical control, monitoring systems, refrigerant piping and vessel design, multi-pressure refrigeration process, cold storage, food preservation by cooling, cryogenic, thermal-electric, steam jet refrigeration system, air cycle and vortex tube, design of refrigeration system and installation.

01208452 Control Elements and Applications in Air Conditioning Systems 3(3-0-6)

Prerequisite: 01208352

Function of control variable, control purpose, control methods, control of liquid flow, air flow, temperature, humidity, control elements in air conditioning system. Study in use of instruments, installation practice, operation and maintenance, compilation into written reports.

01208453 Plumbing System Design 3(3-0-6)

Prerequisite: 01208242

Plumbing code and standards, plumbing system for building, increasing water head in plumbing system, guiding rule for finding the circulator, drainage system and vent pipe design, design of hot-water pipe line, fire protection system.

01208454 Industrial Ventilation 3(3-0-6)

Prerequisite: 01208242

Principle of ventilation, dilution ventilation, ventilation for heat control, hood design, specific operations, design procedure, make-up and recirculated air,

construction specifications, testing of ventilation systems, air cleaning devices.

01208455 Clean Room and Applications in Air Conditioning System 3(3-0-6)

Prerequisite: 01208352

Controlling room environment, principle of air filtration, selection and application of air filter, introduction to clean room, environmental pollution, clean room type, clean room design, energy savings, control of air flow, biological clean room, countermeasures for biological hazards.

01208461 Principles of Fire Protection 3(3-0-6)

Principles of fire protection, fire classifications and selection of extinguishers, human behavior in fires, safety to life from fire, principles of passive and active fire protection, fundamental of fire suppression systems, building fire safety design, fire safety planning, fire safety inspection, fire hazard analysis.

01208462 Building Codes and Fire Codes 3(3-0-6)

Building codes and fire codes, analysis of the purpose and enforcement of building codes, analysis of international and local fire codes, regulations and local laws relating to building codes, development of building codes and fire codes in Thailand.

01208463 Theory and Design of Automatic Fire Suppression Systems 3(3-0-6)

Theory and approval standards of automatic fire suppression systems, analysis and selection of automatic sprinkler systems and their components, design of automatic sprinkler systems, gaseous fire suppression systems, foam and dry chemical fire suppression systems.

01208464 Fire Alarm and Smoke Control System 3(3-0-6)

Principles of fire alarm system and smoke and fire detectors, analysis of fire alarm circuits and components, standards and design of fire alarm and smoke control systems, principles and design of smoke control and air pressurized system, fire model for smoke control system.

- 01208465 Risk Analysis in Fire Protection Engineering 3(3-0-6)
 Theory and concept of risk analysis in fire protection engineering, risk identification and measurement, risk management by insurance method, risk tools, risk engineering methods, preparation for loss adjustments, risk management analysis and planning.
- 01208466 Introduction to Fire Phenomena 3(3-0-6)
 Combustion in natural fires heat transfer in fire ignition flame spread and burning rate fire plume and ceiling jet combustion products in fire enclosure fire phenomena.
- 01208471 Engineering Measurements 3(3-0-6)
 Prerequisite: 01417267
 Measuring of engineering quantity in electrical signal for control, study and display, measurement of motion, pressure, temperature, strain, fluid flow, forces and torques, dynamic response of measuring devices.
- 01208472 Design of Mechanical System Control 3(3-0-6)
 Prerequisite: 01208371
 Dynamic model of mechanical systems, electronic control system design, electric motor control system, control and design of PLC, introduction to control using microprocessor.
- 01208473 Electronic Application in Mechanical Engineering 3(3-0-6)
 Prerequisite: 01205201
 Electrical instruments in mechanical systems, characteristics diodes, LED, and transistors, fundamental concepts of filters, time comparators and digital circuits, application and design us operational amplifiers, integrated circuits, relays, transdue interfacing and servomechanicsm, principles of robotic system.
- 01208474 Fluid Power 3(3-0-6)
 Prerequisite: 01208242
 Fluid power systems, basic theory and symbols in fluid power systems,

hydraulic systems and circuit design, pneumatic systems and circuit design, trouble shooting and maintenance in fluid power systems.

01208475 System Dynamics Simulation 3(3-0-6)

Prerequisite: 01417267

Definition and classification of dynamic systems and components, state-variable and input-output models, mathematical modeling of system components of electrical, mechanical, fluid, and thermal, modeling of multi-domain systems, nonlinear systems and linear representations of nonlinear components, simulation techniques using software package.

01208476 Modern Control Systems 3(3-0-6)

Prerequisite: 01208371

Vector spaces, modeling, state-stead system representations, solution to the state equations, stability, controllability and observability, Eigen-structure assignment, partial and full order observers.

01208477 Introduction to Industrial Robots 3(3-0-6)

Prerequisite: 01208321

Introduction to industrial robots, robot reference frames, forwards manipulator kinematics, inverse manipulator kinematics, Jacobian of manipulators, manipulator dynamics and introduction to robot controls, trajectory generation, mechanism design, introduction to hybrid force and position control.

01208478 Vibration Monitoring and Analysis 3(3-0-6)

Prerequisite: 01208322

Predictive maintenance, mechanical vibration, Fourier series and fast Fourier transform, vibration measurement and instrumentation, symptoms of vibration signals, diagnosis, setup of alarm band.

01208479 Engineering Acoustics 3(3-0-6)

Introduction to acoustics, Introduction to the propagation of acoustic disturbances, one-dimensional acoustic wave motion, waves in three dimensions,

sound in enclosures, sound radiation, multipole sources, sound reflection, transmission refraction and attenuation, laboratory sessions.

01208481 Mechanical Engineering Laboratory II 1(0-3-2)

Prerequisite: 01208341

Experimental works in the areas of heat transfer, refrigeration, air conditioning, power plant engineering, energy conversion, fluid mechanics, and internal combustion engines.

01208490 Co-operative Education 6

On the job training as a temporary employee in order to get experience from the assignment.

01208495 Mechanical Engineering Project Preparation 1(0-3-2)

Preparation of project proposal, literature review and progress report.

01208496 Selected Topics in Mechanical Engineering 1-3

Selected topics in mechanical engineering at the bachelor's degree level. Topics are subject to change each semester.

01208497 Seminar 1

Presentation and discussion on current interesting topics in mechanical engineering at the bachelor's degree level.

01208498 Special Problems 1-3

Study and research in mechanical engineering at the bachelor's degree level and compiled into written reports.

01208499 Mechanical Engineering Projects 2(0-6-3)

Prerequisite: 01208495

Projects of practical interest in various fields of mechanical engineering.

Service Courses

01208201 Basic Principles of Engineering Mechanics 3(3-0-6)

Prerequisite: 01417167

Force analysis, equilibrium, fluid statics, kinematics and kinetics of particles and rigid bodies, Newton's second law of motion, work and energy, impulse and momentum.

01208302 Introduction to Fluid Mechanics and Fluid Machinery 3(3-0-6)

Prerequisite: 01417168

Fluid properties, fluid statics, dynamics of incompressible and inviscid flow, dynamics of incompressible and viscous flow, continuity equation, linear momentum equation, energy equation, flow in pipes, characteristics, performance and application of fan blower compressors and pumps.

Course serviced by other curricula

- 01200431 Principles of Rail Engineering 3(3-0-6)
Thailand rail systems, state railway of thailand system, BTS system, operation and maintenance, permanent way, track works, diesel locomotives, diesel multiple units, electric multiple units for mass rapid transit, signalling and telecommunication systems, SCADA system, power supply system, field trips.
- 01200432 Rolling Stock Technology 3(3-0-6)
Thailand's rolling stocks, diesel locomotives, diesel multiple units, electric multiple unit for mass rapid transit and commuter, high speed rolling stocks, monorail rolling stocks, trams and light rail rolling stocks, train performance, wheel-Rail interactions, rail vehicle dynamics, rolling stock maintenance, field trips.
- 01200433 Signalling and Telecommunication Systems 3(3-0-6)
Thailand's signalling, telecommunication, SCADA, and power supply systems, Interlocking system, Wayside Equipment, on-board equipment, rail telecommunication system, central train control center, SCADA system, rail power supply system, third rail system, catenary cables and pantographs, rail power stations, field trips.
- 01200434 Rail Infrastructure 3(3-0-6)
Thailand's rail infrastructure, rail route alignment design, permanent way design, viaduct/elevated way design, tunnel design, station design and location, track works design, depot design, stabling yard design, park and ride building design, E&M systems (building service systems), field trips.
- 01200435 Rail System Operation and Maintenance 3(3-0-6)
Thailand's rail operation and maintenance, system operation planning, headway time, time table construction, train control, safety regulations, fare collection system, shunting operations for passenger and freight cars, station operation, principle of maintenance, maintenance schedules, rolling stock maintenance,

signalling/telecom/SCADA/power supply system maintenance, track work maintenance, E&M system (building service system) maintenance, field trips.

01204111 Computers and Programming 3(2-3-6)

Basic structure of modern computer systems, data representation in computers, algorithmic problem solving, program design and development methodology, introductory programming using a high-level programming language, programming practice in computer laboratory.

01205201 Introduction to Electrical Engineering 3(3-0-6)

Direct current and alternating current circuit analysis. Generators and their uses. Motors and their uses. Transformers. Three-phase systems. Power transmission system. Electrical instruments.

01205202 Electrical Engineering Laboratory I 1(0-3-2)

Prerequisite: 01205201

Laboratory experiments on topics covered in introduction to electrical engineering.

01206221 Applied Probability and Statistics for Engineers 3(3-0-6)

Probability, expected value and common probability distributions, sampling distributions, statistical inference for one-and-two sample problems, regression analysis, analysis of variance and their applications to industrial systems.

01206251 Engineering Economics 3(3-0-6)

Analysis of economic aspects for engineering decisions under certainly and uncertainly, methods of measurement of equivalent value based on total investment analysis and incremental investment analysis, applications of replacement analysis, break-even analysis and government project analysis including effects of income taxes.

- 01206311 Manufacturing Process I 3(3-0-6)
Prerequisite: 01213211
Fundamental of manufacturing processes: foundry, forming, welding, powder metallurgy, hot and cold forming, cutting, turning, shaping, drilling, milling, surface finishing, gear manufacturing, rapid prototyping. Measurement and inspection.
- 01213211 Materials Science for Engineers 3(3-0-6)
Relationships between structures, properties, processes and performances of engineering materials. Phase equilibrium diagrams and their interpretation. Micro and macrostructures related to properties of engineering materials. Investigation of material structures. Material properties testing and analysis. Corrosion and degradation of materials. Production processes of engineering materials. Composite and construction materials.
- 01403114 Laboratory in Fundamentals of General Chemistry 1(0-3-2)
Prerequisite: 01403117 or registered together
Laboratory work for 01403117 Fundamentals of General Chemistry.
- 01403117 Fundamentals of General Chemistry 3(3-0-6)
Atomic structure, periodic table and periodic properties, chemical bonds, stoichiometry, gases, liquids, solids, solutions, chemical kinetics, chemical equilibria, acids and bases, ionic equilibria, representative elements, metals, nonmetals and metalloids, transition metals.
- 01417167 Engineering Mathematics I 3(3-0-6)
Limits and continuity of functions, derivatives and applications, differentials, integration and applications, polar coordinates , improper integrals, sequences and series, mathematical induction.

01417168	Engineering Mathematics II Prerequisite: 01417167 Vectors and solid analytic geometry, calculus of multivariable functions, calculus of vector-valued functions.	3(3-0-6)
01417267	Engineering Mathematics III Prerequisite: 01417168 First order linear differential equations, linear differential equations with constant coefficients, Laplace transforms and inverse transforms, power series solutions, system of linear differential equations.	3(3-0-6)
01420111	General Physics I Mechanics, harmonic motion, waves, fluid mechanics, thermodynamics.	3(3-0-6)
01420112	General Physics II Prerequisite: 01420111 Electromagnetism, electromagnetic waves, optics, introduction to modern physics and nuclear physics.	3(3-0-6)
01420113	Laboratory in Physics I Prerequisite: 01420111 or registered together, or 01420117 or registered together Laboratory for General Physics I or Basic Physics I.	1(0-3-2)
01420114	Laboratory in Physics II Prerequisite: 01420113 and 01420112 or registered together, or 01420118 or registered together Laboratory for General Physics II or Basic Physics II.	1(0-3-2)