
Eesti Maaülikool
Estonian University of Life Sciences
EMÜ
FROM SCIENTIST TO SOCIETY

ESTONIA –
liveable and everlasting

Cover photo by: **Arne Ader**

FROM SCIENTIST TO SOCIETY

- How to restore a park or an old mansion?
- Is it possible to grow grapes in your own garden?
- Should you plant birch-trees in a fallow field?
- How to restore an old mill inherited from your Grandpa?
- Is the pond behind the sauna at our farm suitable for breeding carps?

The researchers at the Eesti Maaülikool (Estonian University of Life Sciences) are sure to know the answers to these five questions. The scientists of the EMU are bound to know answers to many other questions as well. You can find such questions by the dozen in the present booklet. On the other hand, we would like to draw your attention to the know-how at our University and show where the disciplines fostered here are heading to. The booklet includes a list of themes for applied research and development. The themes break up into nine groups: plant, forest, animal, food, energy, environmental, economic, construction, and technological science. We are gladly ready to help the farmer, entrepreneur or local government.

LABORATORY ANALYSIS OF SOIL AND PLANT, ADVICE FOR THE INTERPRETATION OF THE RESULTS

Keywords: field crop husbandry, horticulture, forestry, greenery, scientific research.

We offer services and know-how:

- chemical analysis of soil, peat and organic manure;
- laboratory analysis of the physical parameters of soil;
- chemical analysis of plant material;
- counselling for the application of the results of the analyses.

Analyses are made both for carrying out scientific research and for giving practical managing advice.

Based on the analyses of the chemical and physical parameters of soil we offer counselling for example for:

- compiling fertilisation plans;
- assessing soil suitability and
- planning land use.

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CULTIVARS, FERTILIZATION, POSTHARVEST, BIO-CHEMICAL COMPOSITION OF THE HORTICULTURAL CROPS

Keywords: producers and processers of horticultural crops, producers of input materials (fertilizers, mulches etc.).

Agrotechnological experiments with new cultivars. The aim of the fertilization experiments is to enable to optimise plant nutrition.

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GROWING STONE FRUITS

Keywords: commercial orchard owners, farmers, hobby gardeners.

Counselling service for growing plums and cherries.

We present new plum and cherry cultivars, advise on cultivar selection, help to find compatible pollination partners for fruit trees that are not self-fertile, and advise our clients in the solution of any difficulties in connection with the conventional and organic growing of stone fruits.

Our service will enable to reduce several risks that often associate with the growing of stone fruits and try to encourage the growers to practise with these crops.

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GROWING POME FRUITS

Keywords: commercial orchard owners, producers, hobby gardeners.

Counselling service for growing apples and pears.

Advice is given on the choice of apple and pear tree varieties (conventional and organic), for the establishment and maintenance of plantations.

The service offered enables entrepreneurs and hobby gardeners entering to or already active in the field of horticulture make more informed and risk-free decisions.

In addition to the counselling service, it is possible to conclude an agreement for growing planting material.

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GROWING BERRY CROPS

Keywords: berry growers and processors, gardeners

Counselling service and trainings:

- selection of new berry varieties;
- getting to know old varieties of a genetic resource;
- cultivation from plantation to harvest;
- getting to know diseases and pests.

In addition, we offer planting material of different varieties.

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PROCESSING AND PRODUCT DEVELOPMENT OF PLANT ORIGIN RAW MATERIAL

Keywords: processing, bioactive compounds, functional food, natural cosmetics and plant protection products, producers and manufacturers of plant origin raw material.

Services of product development and pilot-scale processing to launch high value-added food and non-food products. Biochemical analyses of raw material and products, nutritional value, packaging and labelling of products. Support and advice of applying the business grants.

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ORGANIC BEEKEEPING AND POLLINATION

Keywords: nature conservation board, farmers, tourism, beekeepers, schools, kindergartens.

Training and counselling for:

- the foundation of organic apiary;
- using honey bees, bumble bees and solitary bees to increase the efficiency of crop pollination;
- using honey bee and bumble bee colonies for pollination in greenhouse conditions;
- promoting the abundance of bumble bees and solitary bees in farmland to improve the pollination of crops;
- conservation of bumble bee species;
- using honey bee and bumble bee commercial hives as teaching material in outdoor studies at schools and tourism farms.

The offered knowledge will help to increase the yields and quality of the entomophilic crops (e.g. *Fabaceae* and *Crucifera*), fruits and berries.

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IDENTIFICATION OF PLANT PESTS IN DIFFERENT CULTURES (HORTICULTURAL AND FIELD CROPS, ORNAMENTAL TREES AND SHRUBS)

Keywords: counselling services for farmers and horticultural companies, societies and private persons.

Counselling:

We provide high-quality know-how on pest identification and their biology.

Recommendations for pest control (plant extracts, botanical and synthetic insecticides).

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DIAGNOSING OF PLANT DISEASES OF HORTICULTURAL AND FIELD CROPS

Keywords: organic and conventional growers, plant protection and plant cultivation advisors.

Observation field trials for late blight foliar resistance evaluation.

Counselling

We provide high-quality know-how for pathogen diagnosing, and for the development and distribution of pathogen epidemiology on main horticultural and field crops.

Suggestions for disease control (integrated pest management).

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WEED CONTROL

Keywords: organic and conventional farming, pesticides.

Counselling for:

- performing chemical and mechanical weed control;
- selection of pesticides, optimization of pesticide dosages.

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NOVEL FIELD CROPS, PLANT DISEASES

Keywords: sweet potato, agrotechnology, pathogens.

We advise:

- in the field of growing novel crops suitable for Estonian weather conditions (for example, sweet potatoes, oilseeds) and pathogens;
- potato diseases and their control.

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CHEMICAL ANALYSIS OF VOLATILE ORGANIC COMPOUNDS

Keywords: plant breeding, plant stress.

We study response of plants to stress, which is caused by growth conditions that are different from normal growth conditions such as temperature, humidity, light, CO_2 concentration and impact of plant pests and diseases (larvae, bacteria, viruses). Plant stress is evaluated by analysing volatile or non-volatile organic compounds stored or released by plant organs in gas chromatograph mass-spectrometry. Samples can be taken while working in the laboratory or on-site.

We offer counselling about plant stress and plant volatiles.

We carry out projects in collaboration with plant breeders, where we study the impact of fertilizers on plant volatiles which in turn affects the attractiveness of plants towards herbivores.

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GREEN MANURES AND CROP ROTATION

Keywords: organic and conventional farming, crop rotation.

Counselling for:

- growing green manure crops and the choice of technology (undersowings, pure sowings, cover crops), their impact on the balance of nutrients and humus;
- preparation of crop rotations, incorporating green manures into crop rotations and compilation of humus balance for crop rotations.

We carry out research projects in collaboration with organic and conventional producers, where we study suitability of cover crops (catch crops) and their impact on soil properties.

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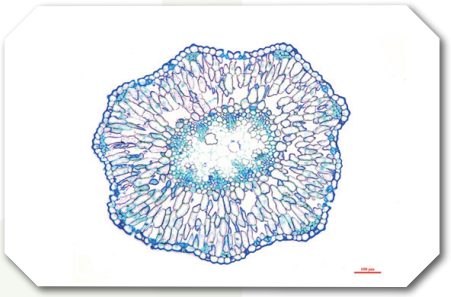
MICROSCOPY SERVICES FROM PLANT SOFT TISSUES

Keywords: life sciences, microscopic imaging, plant anatomy.



The services we offer:

- taking and fixing the samples;
- embedding the sample into resin LR white;
- making semithin (1-2 µm) and ultrathin (70-110 nm) sections with ultramicrotome (Leica EM UC7);
- photographing semithin sections under light microscope (Nikon Eclipse 2000);
- photographing ultrathin sections under transmission electron microscope;
- preparing samples for scanning electron microscopy;
- photographing samples under scanning electron microscope.

The service can be helpful for illustrating different (scientific or popular) work and enables making different measurements of small objects.

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FAST-GROWING BROADLEAVES FOR RENEWABLE ENERGY

Keywords: alternative land use and silviculture.

Energy forestry technology and counselling:

- for forest owners;
- for land owners.

Alders, birches and aspens are fast-growing and productive tree species.

- Planting is simple and cheap.
- Suitable for afforestation of abandoned fields.
- Alders increase the nitrogen content in soil.

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DETERMINATION OF WOOD SPECIES AND THEIR PROPERTIES

Keywords: procurement, processing and transport of wood.

We give advice and carry out the following laboratory studies:

- determination of wood species of timber or sawn wood;
- testing of properties (density, moisture content, compressive and flexural strength etc.) of wood and wood based materials.

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FOREST PATHOGENS DETECTION AND WOOD QUALITY ESTIMATION

Keywords: determination of disease agents on trees, detection of wood discoloration and rot fungi, molecular diagnostic, forest pathological assessment.

The use of modern laboratory methods in our daily work allows us to offer you:

- identification of pathogens from forest, nursery, orchard and landscaping trees, as well as timber from timber storage;
- assessment of wood damage (e.g. discolouration and rot agents);
- analysis of the possibilities of pathogen control methods.

For whom: forest owners, forest nurseries, wood industries, greenery managers, arborists.

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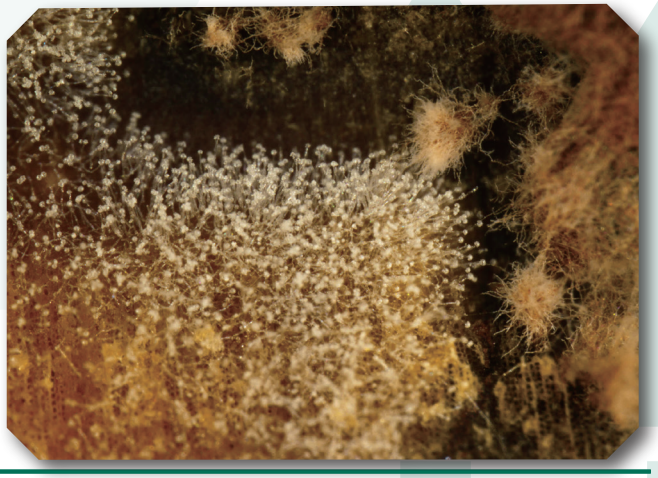

RESOURCE ANALYSIS OF WOOD BASED BIOENERGY

Keywords: procurement, processing, transport and utilization of wood based energy raw materials

We give advice and make analyses of the location and availability of wood based energy resources.

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TECHNOLOGIES OF WOOD RAW MATERIAL PRODUCTION AND PROCESSING

Keywords: procurement, processing and utilization of wood.

We give advice and make analyses of:

- We give advice and make analyses of:
- technologies of wood procurement;
- technologies of the production of wood fuels;
- wood processing technologies;
- drying of wood;
- methods of the control of wood drying.

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TESTING OF PROPERTIES OF WOOD FUELS

Keywords: procurement, processing, transport and utilization of wood fuels, scientific research.

We give advice and carry out the following laboratory studies:

- properties (moisture content, calorific value, ash content, ash fusion etc.) of various biofuels;
- analysis of the composition of biofuels.

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TESTING OF TIMBER BY NON-DESTRUCTIVE METHODS

Keywords: procurement and processing of wood.

We give advice and carry out the following laboratory studies:

- testing of physical and mechanical properties of wood by non-destructive testing methods (electrical and ultrasonic);
- development of mathematical models for the non-destructive methods.

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MACHINES AND TECHNOLOGIES FOR SMALL-SCALE FOREST HARVESTING

Keywords: forest management.

Objective: dissemination of knowledge about eco-friendly machines and technologies for small-scale forest harvesting, work safety of small-scale forest harvesting by way of organized courses

Utilization of big forest machines for harvesting of small volumes in private forests is often economically not feasible and is not eco-friendly. Felling can be carried out by chainsaw, skidding by horses, ATV, “iron-horse“, mini-forwarders or by farm-tractors. During the course different machines and technologies suitable for small-scale forest harvesting are presented, also work safety issues are discussed.

FIELD TRAINING: PRUNING OF GROWING TREES

Keywords: forest management.

Objective: dissemination of knowledge about profitability of pruning of growing trees by way of field trainings.

Pruning of pole stands increases the value of harvested logs from final felling due to higher price of knot-free timber. Such timber is suitable for the production of premium quality products like furniture, window frames, mouldings etc. Due to pruning the fire hazard of stands is also reduced. During the field training an overview of the techniques and tools for pruning is given and the economic efficiency of pruning is analysed.

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CURLY BIRCH CULTIVATION

Keywords: alternative land use, forest management

In order to increase the profitability of brushwood and agricultural land with low site quality it is advisable to grow curly birch on former arable and pasture areas. It is relatively fast growing, has short rotation and its wood has high value.

Curly birch’s grainy pattern wood belongs to the world’s ten most expensive among the precious wood, whereas most of the wood comes from tropical rainforests. Cultivation of curly birch is environmentally friendly as the valuable quality wood originates mainly from culture stands planted on forest lands or former agricultural areas.

We give practical advice on curly birch stand establishment (planting material, habitation selection etc.) and maintaining (pruning, thinning, plant protection etc.), and we also assist in marketing of the wood. We organize thematic and practical trainings, excursions and offer individual and group counselling.

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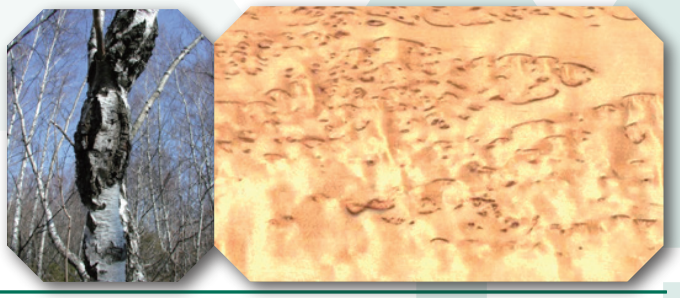

ASSESSMENT OF THE SANITARY CONDITION OF TREES AND SHRUBS IN GARDENS, GREENERIES AND FORESTS

Keywords: forest protection, entomology, park management, urban forestry, gardening.

Insect pests and fungal diseases may cause large damage to the trees and shrubs in gardens, parks and forests. Undetected pest or fungal pathogen can threaten all stands. It is possible to minimize and relieve the influence and consequences of the damage only by fast discovering and applying proper protection methods.

We assess the sanitary condition of park trees, carry out forest protection expertise and give advice for sanitary improvement of trees.

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MAPPING AND INVENTORY OF WOODLAND KEY HABITATS

Keywords: forest owners.

We can map and inventory woodland key habitats and assess the nature value of forest stands.

Woodland key habitat is an area for forest management where probability for habitat of endangered or rare species is higher than usual. To preserve these habitats special management is needed or to stop management completely.

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FOREST AND TIMBER QUALITY AND VOLUME ASSESSMENT

Keywords: nature resource management and nature protection agencies, State Forest Management Centre, real estate companies, nature tourism companies and farms, schools.

Counselling, training and practical services for growing forest and roundwood volume estimations, market value estimations and forest management planning. Neutral expert assessments on growing forest and roundwood value assessments for solving disputes between parties.

Counselling and training:

- roundwood volume and quality assessment;
- sawnwood volume and quality assessment;
- forest volume measurement and condition assessment;
- roundwood volume assessment by assortments for growing forest;
- market value assessment for forest estate.

Pakutavad teenused:

- extracted timber or roundwood volume measurement;
- sawn timber quality assessment and volume measurement;
- growing forest volume measurement;
- post cutting stand condition assessment;
- growing forest volume and quality assessment by assortments;
- market value assessment for forest estate;
- geographical mapping of forests, parks and other trees for spatial planning.

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ANALYZING GROWTH TRENDS WITH DENDROCHRONOLOGICAL METHODS

- Composing growth prognoses
- Dating the accurate tree age
- Estimating forest productivity
- Estimating forest nature value
- Dating buildings
- Analyzing disturbances
- Estimating the effectiveness of forest drainage
- Estimating the effect of anthropogenic pollution
- Estimating the effect of thinning

Variability in the structure of tree ring width series gives information about long-term environmental changes during the growing period. By cross-dating, i.e. matching the pattern of wide and narrow tree rings it is possible to find the exact year of formation of each tree ring or to determine the geographic origin of trees. Based on dendrochronological methods (detecting severe growth changes etc.) it is possible to reconstruct the stand and stand development including different disturbances (thinning, fire, ditching, insect outbreak etc.).

It is possible to study the growth of coniferous and several deciduous species by using tree-ring dating. Tree-ring width measurement data enable to estimate the tree's yearly increment and the stand growth. Based on stand increment data thinning and other management works of stands can be planned.

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SERVICES PROVIDED BY THE CHAIR OF VETERINARY BIO AND POPULATION MEDICINE

Keywords: cattle industry

- Developing and implementing programs for the control and eradication of animal infectious diseases.
- Epidemiological investigations of animal infectious diseases.
- Assessment of animal health and welfare risks associated with keeping/housing conditions.
- Diagnostics and molecular epidemiological studies of tuberculosis, paratuberculosis and mycobacteriosis in animals.
- Macroscopic (autopsies) and microscopic investigations (cytology, haematology, histopathology) of animal pathologies.
- Ultrastructural investigations of cells, tissues, and organs.
- Immunohistochemical and electronmicroscopic investigations of tissues.

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IN VITRO PRODUCTION OF BOVINE EMBRYOS

Keywords: cattle industry

The bovine oocytes are collected from live animals or alternatively, from the slaughterhouse. The oocytes are fertilized and cultured up to blastocyst stage, and then transferred or frozen. The method is used for the production of embryos from the desired parents.

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COLLECTION AND TRANSFER OF BOVINE EMBRYOS

Keywords: cattle industry.

In vivo developed embryos are collected from valuable donor females to increase the number of offspring and accelerate genetic potential of the population; to change one breed for another and to conserve rare breeds.

- Collection, transfer and/or freezing of embryos from selected females within a herd.
- Transfer of imported frozen embryos.

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ARTIFICIAL INSEMINATION (AI) COURSE

Keywords: cattle industry

Eighty hours course includes theory and practice of AI, detection of estrus, proper timing of AI, handling of semen, specific features of sexed semen, ultrasound examination of reproductive tract, overview of reproductive disorders, regulation of estrous cycle and many other important practical aspects.
The course is organized by the Open University of EMÜ.

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ASSESSMENT OF BULL SEMEN QUALITY

Keywords: cattle industry.

Computer assisted sperm motility analysis and flow cytometry are used to assess different sperm motion characteristics, mitochondrial activity and chromatin stability.

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GENETIC ANALYSES

Keywords: animal breeding.

At the Laboratory of Genetics of the Institute of Veterinary Medicine and Animal Sciences we offer the genotyping of animals for their genetic identification in order to verify correctness of parentage and pedigree. Parentage verification is necessary for the purchase and sale of purebred animals, sperm and embryos, for the verification of the identity of twins and for the precision of the genetic evaluation given to male animals on the basis of their offspring. Identification of breeding animals' genetic defects through DNA analyses enables the breeders to avoid, by choosing pairs, the obtaining of recessive homozygote individuals. The elimination of the rams bearing high risk of scrapie PrP-genotypes from breeding will increase the flock's scrapie resistance. Choice based on the hereditary types of milk proteins enables to improve the technological properties of milk.

For the DNA analyses blood, sperm, hair and tissue samples are used.

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COUNSELLING ON THE BREEDING OF FARM ANIMALS AND PRESERVATION OF GENETIC RESOURCES, GENETIC ANALYSES

Keywords: cattle breeding.

Counselling and training of cattle breeding managers, breeding advisers, officials and specialists of breeding organisations with the aim of increasing the productivity of animals and improving the health of cattle in order to increase the profitability of the enterprise and to preserve the genetic resources of farm animals.

Fields of counselling:

- breeding of farm animals;
- preservation of the genetic resources of farm animals.

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HANDS-ON TRAINING OF EMBRYOTECHNOLOGY FOR HIGH SCHOOL STUDENTS

Keywords: education.

1.5 h hands-on training consists of theoretical introduction to gamete biology, and practical training and demonstrations in order to give knowledge about oocytes, sperm cells, embryos, and embryo technology applications in biomedicine and animal science.

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CHEMICAL ANALYSIS, NUTRITIVE VALUE AND FEED QUALITY EVALUATION

Keywords: animal husbandry, feed production.

Analysis of the chemical composition of feed (including fermentation parameters, mycotoxins and amino acids), feed nutritive value and quality evaluation.

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BIOCHEMICAL BLOOD COMPOSITION

Keywords: animal husbandry.

Biochemical analysis of blood composition.

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RAW MILK QUALITY ASSESSMENT

Keywords: dairy cow management, dairy product production.

Raw milk chemical composition and coagulation properties.

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ADVICE AND TRAINING IN ANIMAL NUTRITION

Keywords: animal husbandry, dairy herd management.

- Farm animal nutrition advice, including ruminant feeding and metabolism and relationships with milk composition and yields.
- Ration formulation for the dairy herd.
- Design and execution of feeding experiments including those involving feed additives and novel feeds.

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COUNSELLING AND IN-SERVICE COURSES IN FISH AND CRAYFISH FARMING

Keywords: fish and crayfish farming.

The aim of the consultations and in-service courses is to give an overview of the principal knowledge about fish and crayfish farming in Estonia, comprising the current status of the aquaculture sector together with trends and features of its development. Target groups here include the fish and crayfish farmers and the representatives of various administrations in the field or related to aquaculture area.

Counselling and in-service courses

- Water as a living environment for fish.
- Fish biology.
- Aquaculture technology.
- Fish farming in Estonia.
- Ornamental fish farming.
- Biosecurity in aquaculture.
- Crayfish farming and management.

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ICHTHYOPATHOLOGICAL INVESTIGATION, COUNSELLING AND TRAINING ON FISH HEALTH

Keywords: fish farming, fisheries and hydrobiology, fish stocks and environmental monitoring.

Counselling and training of veterinarians, fish farmers and environmental specialists with a view to reduce the health risks of the wild caught and farmed fish as well as to increase the production efficiency and competitiveness in aquaculture.

- Ichthyopathological investigations and fish health examinations.
- Wild or farmed fish parasitological examinations.
- Counselling and training of veterinarians and fish farmers.
- Expert analysis to identify possible causes of the death of fish.

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PROFESSIONAL LABORATORY MILK PROGESTERONE ASSAY SERVICE AND COUNSELLING

Keywords: milk progesterone, enzyme immunoassay (EIA), cattle, fertility, reproductive performance, reproductive management.

Focus groups:

- Universities, research institutes and companies.

Focus areas:

- Research on reproductive function of cattle.
- Reproductive management of cattle (early detection of non-pregnant cows, detection of commencement of luteal activity, detection of abnormal oestrous cycles, measuring efficiency and accuracy of detection of estrus, identification of inseminations performed at wrong time).

Counselling

We give advice on interpretation of results and how to best use milk progesterone analysis for the fertility management of cattle.

Method

Milk progesterone is analyzed by using a monoclonal antibody based quantitative enzyme immunoassay (EIA). The advantage of the EIA is that the changing of milk fat concentrations does not affect assay results, thus allowing precise analysis of progesterone from milk samples with different milk-fat concentrations. The EIA is internationally recognized as a gold standard and a research tool in studying reproductive function in dairy, beef and Tanzanian zebu cattle.

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ANIMAL CLINIC

Diagnostics and treatment

The animal clinic offers priced veterinary service for the diagnostics and treatment of farm animals, horses, small and exotic animals.

The animal clinic has modern facilities for the diagnostics and treatment of animal diseases both on individual and herd level.

For further information please see:
http://loomakliinik.emu.ee/en

Equine Clinic
Mon–Fri 8.00–16.00 Phone +372 731 3713
Outside working hours, call our 24-hour stand-by emergency service +372 52 22 062
Productive Animal Clinic
Mon–Fri 8.00–16.00 Phone +372 731 3713, +372 52 57 973
Small Animal Clinic
Mon–Sun 9.00–20.00
Outside working hours on Mon–Sun 20.00–9.00
hone +372 731 3224, +372 50 33 878
Department of Experimental Animals
Ants Kavak E-mail ants.kavak@emu.ee Phone +372 731 3201

Training

The University of Life Sciences offer regular training on animal health and treatment both for veterinarians and farmers. For the schedule of trainings please see the webpage of the Open University: http://avatudylikool.emu.ee/taiendope

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FOOD TECHNOLOGY

Keywords: food processing and technology.

Laboratory and counselling services

- The effect of technological methods and regimes on the composition of dairy, meat, bakery, confectionery and beverage products.
- Product development experiments at food technology laboratories.
- Scientific and applied research.
- Chemical, microbiological, organoleptic and structural analysis of food products.

Trainings, in-service courses, and hands-on trainings for professionals, high schoolers, and other interested parties

- Technology of meat and meat products.
- Technology of milk and dairy products.
- Technology of bakery and confectionery products.
- Meat and milk processing equipment.
- Food microbiology.
- Food packaging.
- Sensory assessment of food.

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FOOD HYGIENE AND SAFETY

Food analysis using different chromatographic (LC-Q-TOF-MS, LC-MS/MS) spectrophometric/fluorometric methods.

Expert opinions and risk assessments in food hygiene and safety.

Consultation services in food microbiological safety, food toxicology and food production hygiene.

Elaboration of guidelines and training materials related to food microbiological and chemical safety.

Training courses:

- Food hygiene and safety, basic course.
- Food hygiene, mid-level course.
- Food hygiene and self-control in small-scale and private establishments.
- Food production hygiene and sanitation management.
- Principles and methods of sampling of the production environment.
- Establishing of self-control systems and auditing.
- Prerequisite programs and food safety management systems.
- Transport of farm animals in accordance with animal protection requirements.
- Control of food allergens.
- Sanitary and hygiene course for hunters.
- Meat hygiene and inspection.
- The safety of meat and meat products and production hygiene.
- The safety of fish and fish products and production hygiene.
- Determination of food storage conditions and food shelf-life.
- Food chemical safety.
- Foodborne pathogenic microorganisms.
- Listeria monocytogenes as a foodborne pathogen.

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PLANNING OF RENEWABLE ENERGY APPLIANCES

Keywords: microgeneration of electricity, distributed generation.

Planning of small energy generation solutions according to specific consumption pattern, natural conditions and perspectives.

Distributed energy solutions based on wind, solar, bioenergy or fossil energy sources can be autonomous or connected to the utility grid. The key factor in the work of these systems is the ability to use the energy produced on-site directly by the consumer. This enables to save on electricity grid fees or reduce the need for batteries, dependent on the fact whether it is an on-grid or off-grid setup. Devices tailored to the specific location and consumer needs enable to increase the economic performance.

Additional information:
http://energiaklass.emu.ee
http://energia.emu.ee

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http://te.emu.ee/en

Micro-windturbine, photovoltaic panels and solar-collectors on the roof of the Institute of Technology.

ENERGY CONSUMPTION AND POWER QUALITY MEASUREMENTS AND ANALYSES

On-site measurements of electricity consumption and power quality parameters. Analysis of the measurement data on statistical basis and on the basis of standards, as well as analysis of electricity consumption over longer time periods if there is access to remote metering data.

The service can be connected to the planning of renewable energy appliances.

Additional information:
http://energiaklass.emu.ee/
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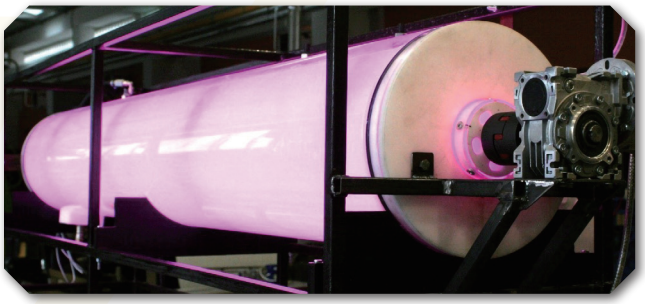
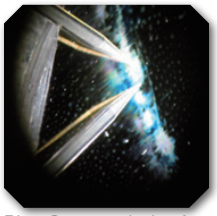


NANOMATERIALS FOR ENERGY APPLICATIONS

Keywords: nanoparticles, carbon nanotubes, light emitting diodes, photovoltaics.

Use of nanomaterials in prototyping devices for energy related applications is a growing field. Changing the size of the nanoparticle through novel chemical synthesis methods brings about new properties in their absorption and emission characteristics. Tuning properties of devices through nanotechnology enables obtaining smaller and more efficient devices and is a step further in miniaturization.

The energy application engineering Chair not only fabricates these nanomaterials but also develops and tests devices with them. For PV applications, nanomaterials allow absorption in the visible part of the solar spectrum. On the other hand, for LED, the emission color of the device can be varied by changing the size of nanomaterial as shown below.



Blue-Green emission from HfO2 carbon nanotube based nanocomposite

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Erwan Rauwel
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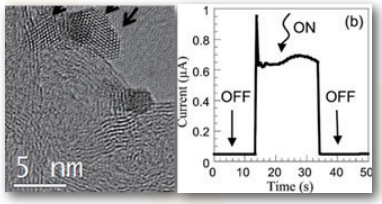
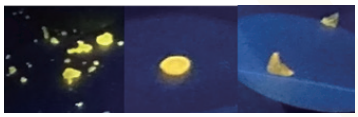


Size of HfO2 nanoparticles by transmission electron microscopy and photocurrent generation in HfO2-CNT in HfO2 carbon nanotube based nanocomposite..
Beilstein J. Nanotechnol. 2016, 7, 1075–1085



Qualitative assessment of ZnO nanoparticle pellets for LED fabrication. Emission intensities are tuned through varying growth methods of the nanoparticles.
Work of PhD student, Keshav Nagpal, EMÜ

EVALUATION OF WOOD BASED FIREPLACES

Keywords: firewood, efficiency, pollution.

Testing solid fuel furnaces and making recommendations to the developer and user for efficiency and combustion purity.

Due to the nature of the popular bottom air intake fireplace, furnaces, stoves and boilers that use wood logs as fuel are sources of significant air pollution. A modern UZ fireplace allows the user to increase the purity of combustion, therefore, increases efficiency of combustion. It is possible to measure pollution and losses in real time by analyzing flue gas.

Measurements can be taken under laboratory conditions as well as at the customer's site. The result is a cleaner combustion process and lower fuel consumption.

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MEASUREMENTS IN AGRICULTURE

Keywords: remote measurements.

Measurements in the conditions of an animal farm, real-time transmission of data and video recordings via the Internet, database management. Analysis of measurement results, presentation of statistical indicators.

Drone-based monitoring of crop growing conditions, transmission of data to the farmer.

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OPTIMIZATION OF AIR-WATER HEAT PUMP OPERATION USING MACHINE LEARNING

Keywords: machine learning, air-to-water heatpump, heat gains, coefficient of performance.

The outside temperature affects the air-to-water heat pump's coefficient of performance (COP), which means that the heat pump runs the most at the hours with the lowest efficiency. By adding an energy storage device (water tank) to the heating system, it is possible to start the heat pump during the hours with the highest efficiency, thus saving electricity. In order to be able to plan the operation of the air-to-water heat pump, it is necessary to know in advance the actual heating demand of the house at all hours of the day. By collecting long-term data on the energy consumption of a dwelling, it is possible to forecast future consumption schedules with the help of machine learning, which can be used to optimize the operation of the air-to-water heat pump.

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USING ENERGY STORAGE DEVICES FOR INCREASING SELF-CONSUMPTION

Keywords: energy storage, renewable energy, prosumer.

More and more consumers produce, at the same time, electrical energy from renewable energy sources. By renewable energy sources we mean wind generators and solar PV panels. We are dealing with grid-connected microgrids. From the consumers' viewpoint it is important to consume as much locally produced energy as possible. This will decrease energy bills or stop them overall. At the same time, possibilities to sell electricity to the utility grid and to earn money will increase. From the government viewpoint the importance of increasing self-consumption is the following: the need for utility grid maintenance and repair works will decrease and CO_2 emissions will lessen.

We will find an appropriate configuration for your prosumer that enables you to maximize self-consumption and achieve an economical effect. The size of the prosumer and the sphere of activity is not essential.

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BIOFUELS AND BIOCHEMICALS

Keywords: solid, liquid and gaseous biofuels, analysis of biofuels and biochemicals, biochemical conversions, thermochemical conversions.

Consultations

- 2nd and 3rd generation liquid biofuel production technologies and their development.
- Determination of biogas potential in different biomasses.
- Torrefaction experiments with different biomasses.

Analysis of biofuels

- Determination of biomass composition - determination of cellulose, hemicellulose, lignin, ash and moisture content.
- Determination fibre content and biochemical composition of biomass – determination of sugars by NREL method from biomass.
- Analysis of samples from the bioethanol production process - sugars, ethanol and inhibitors by HPLC.

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ANALYSES OF LIQUID FUELS, MOTOR OILS AND HYDRAULIC OILS/LIQUIDS

Laboratory of Biofuels and Biochemicals of the Institute of Technology analyses and evaluates the physical and chemical properties of both diesel and spark ignition engine fuels, engine oils, and hydraulic oils/liquids. The laboratory has the capability to perform analysis of liquid fuels and assess their compliance with the standards in use in the European Union. The analysis of liquid fuels, engine oils and hydraulic oils/liquids includes the following quality properties:

- Density
- Active sulfur compounds
- Distillation caractheristics
- Kinematic viscosity at 40 oC and 100 oC
- Viscosity index
- Saturated vapor pressure (mini method)
- Flash point
- Pour point
- Total contamination in middle distillates, diesel fuels and fatty acid methyl esters
- Ash and sulfated ash content
- Corrosiveness to Copper by Copper Strip test
- Bound and free water content
- Water soluble acids and bases, pH
- Acid and iodine value of fatty acid methyl esters

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ENVIRONMENTAL PROTECTION AND LANDSCAPE MANAGEMENT

- Assessments of damage caused by geese and Common Cranes.
- Preparation and consultations of an engagement plan in the implementation of spatial and nature conservation planning.
- Compilation and consultation of protection rules and management plans for protected and conservation areas.
- Analysis of the usage load and visitor monitoring in protected and recreational areas.
- Compilation of environmental related expert assessments.
- Environmental impact assessments of landscapes and natural environments (e.g. sports related routes; effects of trampling on recreational landscapes, etc.).
- Compilation of landscape management plans.
- Preparation and consultation of local government and county development plans and development strategies.
- Coastal area management and planning.
- Regional development related studies and expertise.
- Strategic environmental assessments.
- Thematic plans of traditional farm architecture, construction recommendations and consultations related to heritage and environmental values (non-construction).
- Consultations on environmental aspects of general plans and other plans (e.g. thematic plans).

Laboratory of Biochemistry and Environmental Chemistry

- Biogas composition analysis.
- Methane productivity analysis of biogas feedstocks.
- Assessment of the biodegradability of chemicals and materials.
- Assessment of the biological stability of compost, digestate and waste.
- Oxygen demand analysis of compost.
- Determination of residual biogas potential of digestate.

Trainings

- Use of drones in environmental research.
- Use of geoinformatics or ArcGIS (incl. ArcGIS Pro if the trainees have the possibility of the respective software).
- Advance training in environmental protection and nature conservation.
- Environmental impact assessment.
- Environmental policy and management.
- Preparation of landscape management plans.
- Landscape assessment and analysis methods.
- Defining and planning green network and valuable landscapes.

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TOURISM SOCIAL CARRYING CAPACITY RESEARCH

Keywords: impact, local community, tourism, tolerance, planning decisions, recommendations.

Uncontrolled tourism development could lead to dissatisfication and conflicts at tourism destinations. For avoiding that kind of situations well-grounded planning decisions should be made, for example zoning of the areas, scattering the tourism flow, diversification of supply, setting limitations etc. For reasoned decisions the opinion of local inhabitants about preparedness to support the development of tourism or needs for limitations and other aspects should be studied. Qualitative data would be gathered and analysed for the assessment of the social impact of visitors to the tourism destination and would be compared with other areas.

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TOURISTS' TIME-SPACE BEHAVIOUR

Keywords: tourism, trajectory, gates, congregating, measures.

For planning of tourism objects and for successful functioning of tourism structures there is a need to design and map the trajectory of visitors and where and for how long they stop for observations of the objects. The study is designed to avoid congregatings, queues and other contraries and rise the satisfaction of tourists. Trajectories and times would be registered for different target groups. This helps to implement measures for rising visitors' memorable experience and for better management of tourism flows.

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PLANNING NATURE BASED TOURISM

Keywords: nature based tourism, objects in nature, routes, services, information, recommendations, planning.

Nature tourism and use of natural resources for tourism purposes is increasingly growing and recommended in Estonia. Trails, single objects of interest on private and state lands, different activities related to observing nature or picking activities are the main possibilities in our country. How to develop a route or trail in my lands or region? What, how and whom I should offer? How should I start and whom should I agree? What kind of activities I could do and how to prepare and implement? How to make information materials and install them? These practical questions get answered during the planning process

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NATURE BASED TOURISM OBJECTS MAPPING AND MONITORING

Keywords: nature based tourism, tourism object, mapping, monitoring, planning, resources.

Detailed overview of resources and continuous monitoring is needed for successful nature based tourism development. For planning decisions it is important to understand links between customer journey and nature tourism objects and also assess how existing and planned infrastructure fits to customer expectations. It is really important because there is continuous rise in visitor numbers in nature areas and tourism sector is constantly changing.

Examples of the activities that are necessary for tourism planning and development:

- mapping and monitoring the objects and infrastructure needed for nature based tourism development,
- analysing and monitoring the quality and condition of nature based tourism objects and infrastructure,
- assessing how nature based tourism objects and infrastructure fits to the needs of different target groups and locates in the context of customer journey,
- analysing the suitability and influences between infrastructure and the surrounding environment;
- assessing nature based objects' carrying capacity,
- assessing nature tourism objects' tourism value.

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BOTANICAL EXPERTISE AND TRAINING IN NATURE PROTECTION

Keywords: expertise and training in nature protection, municipalities, nature protection institutions, land owners, tourism companies, real estate developers.

Expertise and training

- Management and restoration of seminatural grasslands.
- Species' action and management plans.
- Identification of protected plant species, management of the communities necessary for their conservation, evaluation of their translocation possibility.
- Nature tourism and nature education.

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MYCOLOGICAL CONSULTATIONS AND TRAINING

Keywords: educational institutions and enthusiasts.

- Identification of fungal species with information about their ecology, use and possible toxicity/harmfulness.
- Seasonal exhibitions (identification of fungal species, professional consultations for public).
- Fungal foray guidance
- Teaching fungal diversity in the forest.

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EXPERTISE OFFERED BY ORNITHOLOGICAL UNIT

- Species' action and management plans, population status evaluation.
- Management plans of conservation and protection areas.
- Expert assessments on nature conservation and environmental protection.
- Management and monitoring of zoological inventories.
- Research on animal movement and migration, including radar studies and telemetry.
- Conservational molecular genetics expert assessments and the elaboration of conservation management plans based on the results.
- Digitization and analysis of biodiversity data.
- Courses and practical instruction of bird identification and bird survey techniques.

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INLAND WATERBODIES - PROTECTION AND MANAGEMENT

Keywords: Ministry of the Environment, Environmental Board, municipalities, nature protection institutions, fish breeders, fishery institutions, developers of waterbodies.

Ekspertiisid ja koolitused

- Assessment of the ecological and environmental status of waterbodies.
- Sanitation of lakes.
- Sanitation of watercourses.
- Compilation of management plans, expert opinion.
- Analysis of the functioning disorders of waterbodies.
- Ecological toxicology of waterbodies.
- Assessment of the fish stocks of inland waterbodies and suggestions for their optimum management.
- Assessment of the condition of waterbodies.
- Assessment of the biological resources of waterbodies and suggestions for their exploitation.

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AGRICULTURAL BIOENERGY PRODUCTION

Keywords: herbaceous bioenergy crops, short rotation coppice, production, biomass refinery, bioeconomy, energetic efficiency.

Special agricultural crops and existing co-products of traditional agricultural management are often planned to use for bioenergy purposes in order to facilitate local nutrient cycle and independent energy supply. The profit of such activities that is comparable with typical agricultural business can be achieved only in case of right selection of most pest-resistant crops that are high-productive in local weather conditions. The suitability of particular crops for different bioenergy technologies plus the economic and energetic balance sheets must be incorporated in the business plan. Long-term practice with different raw materials enables to minimize the risks and supports both the economic and ecological benefits of bioenergy production.

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ENTOMOLOGICAL EXPERTISE

Keywords: consultation and training.

Ekspertiisid ja koolitused

- Evaluation of damage caused by insects: correlated studies, prognoses and possible solutions.
- Consultation for amateur entomologists including theoretical courses and practical training.
- Identification of insects' species supplemented by outlining and discussing their distribution and biology.
- Founding of a biological collection: care, necessary documentation and digitization.

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ADVICE AND CONSULTANCY AREAS FOR CHAIR OF LANDSCAPE ARCHITECTURE

The target group: municipalities, administration of nature protection areas, park owners and managers, ministries, RMK and private forest owners, state institutions or foundations and private companies.

ACCESSIBILITY AUDIT OF RECREATION AREAS AND URBAN PUBLIC SPACE

Keywords: accessibility audit, forests, parks, protected landscapes, universal design, access by people with disabilities.

Many public spaces, ranging from urban parks to forests have problems of accessibility to people with a range of disabilities or impairments. We have expertise in this area.

Services include:

- Survey and assess accessibility for different groups in different areas or landscape types.
- Test the sustainability of public spaces.
- Offer planning and design advice based on the outcome of the surveys.

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URBAN RESILIENCE, HEALTH AND WELL-BEING, ECOSYSTEMS SERVICES, SUSTAINABLE URBAN PLANNING

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URBAN GREEN INFRASTRUCTURE SURVEY, ASSESSMENT AND PLANNING

Following our extensive research in urban green space (including public and private urban green elements) management and using specialised equipment and resources we can offer:

- Survey and assess accessibility for different groups in different areas or landscape types.
- Test the sustainability of public spaces.
- Offer planning and design advice based on the outcome of the surveys.

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SUSTAINABLE URBAN WATER SYSTEM PLANNING AND DESIGN

Our focus is on demand-led research to develop sustainable, robust and flexible solutions targeting new developments and retrofit SUDs into existing developed areas using an integrated and transdisciplinary approach. Following our experience with sustainable urban water systems' (SUDS) planning and design, we can offer advice on Integrated stormwater management (ISWM) and sustainable urban water system (SUDs) planning and design for residential areas, public campuses, highways and roads etc.

We offer:

- Survey and needs assessment for SUDs and integrated stormwater management techniques and tools and their application at different urban scale.
- Learning alliances, workshops and best practice guidance.

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LANDSCAPE AND VISUAL IMPACT ASSESSMENT (LVIA) USING THE VIRTUAL LANDSCAPE THEATRE

Both common and exemplary landscapes, that we inhabit create the background structure for our activities and form a part of everyone's identity. This is why large portion of people care very deeply about visual appearance of new objects and their impact on the functioning of the landscape. This is especially applicable in case of:

- renewable energy projects,
- planning of new roads and traffic structures,
- larger projects in protected areas.

Interactive landscape theatre makes it possible to create expansive virtual landscapes from actual map data and explore such models in real time from any viewpoint. This makes it possible to determine visibility/occlusion of the new landscape element and explore its spatial proportions and relation to other landscape elements. Up to 15 people can be immersed in the virtual landscape at once and take part in workgroup discussions of sketches; assess the visual and landscape impact; take active part in participatory planning process.

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MAINTENANCE PLAN FOR HISTORICAL PARKS UNDER NATURE AND CULTURAL HERITAGE PROTECTION

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LANDSCAPE CHARACTER ASSESSMENT (IN ACCORDANCE WITH THE PRINCIPLES OF THE EUROPEAN LANDSCAPE CONVENTION (ELC))

- for municipalities, who value the landscape character,
- for landscape protection areas.

Landscape character assessment is a main starting point for implementing the ELC and we have many years of experience in this. We can offer:

- Mapping and inventory of landscape types at different spatial scales.
- Field survey and assessment.
- Preparation of reports describing landscape character.

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RECREATION AREA PLANNING AND DESIGN AT A STRATEGIC OR SITE DESIGN SCALE

As outdoor recreation and various forms of tourism expand and develop there is a greater need for planning and design at different spatial scales. We can offer:

- Planning of recreation and tourism at a large territorial scale (such as a national park, landscape protection area, RMK recreation area or country),
- Assess sensitivity and capacity for recreation and tourism development,
- Prepare advice on planning, design and management of recreation and tourism infrastructure.

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ADVICE FOR FOREST PLANNING AND DESIGN WHERE VISUAL AND AESTHETIC ASPECTS HAVE TO BE TAKEN INTO ACCOUNT

Designing clear cut areas of the production forests is becoming part of common practice in Finland, UK and elsewhere. Based on experience of mentioned countries and relying on Estonian forest landscape peculiarities, we can offer consultation to:

- Design for single clear cut areas,
- Prepare forest landscape plan for larger forest areas,
- Design for roadside and other exposed forests.

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PLANNING AND DESIGN OF HEALING GARDENS AND HEALTH TRAILS

The relationship between landscape and health is a growing area of research and practice. We have built up special expertise in a number of areas related to this and can offer the following services:

- Landscape design using Evidence Based Design principles,
- Expert assessment of a landscape for healing gardens,
- Education in Healing landscapes,
- Education in Garden therapy,
- Garden therapy programmes for people with special needs,
- Consultation of the same topics for private landowners,
- Hospital green area design, assessment and garden therapy programs by departments,
- Green area analyses by different area usergroups.

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ADVICE ON LANDFORM AND PLANT-COVER DESIGN AND RECULTIVATION OF MINING AREAS AND QUARRIES

In Estonia there are many areas affected by mining (oil shale) and quarrying (sand/gravel and stone) and other disturbance (landfill) which need either to be restored or planned and designed with an end use in mind. We can offer the following:

- Advice on the design of landforms including water bodies for new projects and for restoration of old workings,
- Prepare models and visualisations of the future landscape after the completion of a project,
- Advise on after use and recultivation/vegetation restoration,and management.

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ADVICE ON THE PROTECTION AND MAINTENANCE OF LANDSCAPES OF CULTURAL HERITAGE

Cemeteries, historic urban or rural parks and gardens, railway station parks, school gardens and parks, etc.

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ADVICE ON THE ASSESSMENT OF REMAINS OF SOVIET CULTURAL LANDSCAPES (SOVKHOS AND KOLKHOZ)

The major part of the Estonian cultural landscape is developing on the basis of soviet collective agriculture, with its built remains and settlement patterns. We can offer the following:

- Advice on the assessment methods for these landscape and settlement types,
- Consulting on suggested development or protection schemes.

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PREPARATION, MONITORING AND EVALUATION OF DEVELOPMENT PLANS AND STRATEGIES

Target groups: rural enterprises and entrepreneurs, advisers, municipalities, local action groups, professional organizations, public sector.

The preparation of a development plan helps to plan the development of a company, organization, institution, region or field of activity. The service includes analysis of the situation of the object or area (review of regulatory legislation, development documents, socio-economic situation and preparation of SWOT analysis and problem analysis) and mapping of strategic choices (creation of vision, mission statements, defining and choosing of strategic goals, formulation of strategy, formulation of fields of activities, preparation of action plan, creation of system of development indicators). In the implementation of the development plan, it is important to monitor and assess its effects, based on which adjustments are made to the development and action plans.

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BUSINESS MODEL DEVELOPMENT AND MENTORING

Target groups: rural enterprises and entrepreneurs, start-ups, young entrepreneurs, development organizations, professional organizations.

Business model analysis and design using business model canvas. Providing mentoring support to an entrepreneur in creating and developing a business model. Mentoring for start-ups and young entrepreneurs. Preparation of a business plan and financial analysis of investments.

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SMALL BUSINESS MARKETING

Target groups: rural enterprises and entrepreneurs; advisers, municipalities, professional organizations, public sector.

The peculiarities of small businesses marketing through marketing mix (product development, pricing tactics and strategy, marketing communication methods). Small businesses' decisions on marketing channels and short distribution channels (individual and cooperative). Branding systems for small business (from individual to national) and public relations. Planning and analysis of marketing. Digital marketing (social media, website, online-shop) - planning and analysis.

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STRATEGIC DEVELOPMENT OF ENTERPRISES

Target groups: rural enterprises and entrepreneurs, advisers, municipalities, professional organizations, public sector.

Screening options for making strategic decisions in enterprises. Description of different processes, mapping and analysis of managerial decisions (incl. use of resources, investments, financing and availability of supports) and their impact on the economic performance of the enterprise (key performance indicators). Analysis of the diversification possibilities of enterprises' activities, risk and hazard assessments. Compilation and evaluation of business plans. Management consulting.

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CONSULTATIONS AND TRAININGS ON COOPERATION AND COOPERATIVES

Target groups: rural entrepreneurs, cooperatives, non-profit organizations, development organizations, advisers, municipalities, professional organizations, public sector.

Preparation of an action plan for the establishment of a cooperative and/or cooperation project. Formulation of the goals of the cooperative and/or cooperation project, planning of the structure, governance and management model of the cooperative and/or cooperation project. Composition of the capital of the cooperative and implementing democratic control over its use. Estonian legislation on cooperatives and success stories of Estonian cooperatives.

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ANALYSIS OF PRODUCTIVITY, EFFICIENCY AND PERFORMANCE INDICATORS

Target groups: rural enterprises and entrepreneurs; advisers, municipalities, professional organizations, public sector.

Setting up productivity, performance and efficiency indicators in the company and organization; calculating, analyzing and interpreting indicators, and finding possible alternatives to increase productivity and efficiency.

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COMPETITIVENESS AND MARKET ANALYSIS

Target groups: rural enterprises and entrepreneurs, food producers, advisers, municipalities, professional organizations, public sector.

Compilation of necessary information for the enterprise and its analysis on the basis of evaluation of competitiveness, compilation of market information and data on product marketing. The use of competitiveness indicators in directing the economic activities of the enterprise and in improving its economic performance. Compilation of data on competitiveness indicators and their analysis to assess the local and international competitiveness. Evaluation of the enterprise's/ sector's competitiveness and benchmarking.

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SOCIO-ECONOMIC ANALYSIS AND BUSINESS MODELS IN BIO- AND CIRCULAR ECONOMY

Target groups: rural enterprises and entrepreneurs, advisers, municipalities, professional organizations, public sector.

Analysis of socio-economic aspects and business models of bioresource use and enhancement. Assessing the impact of the application of environmentally friendly technologies on the company's financial results and considering the possibilities of alternatives.

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ESTABLISHMENT OF AN ACCOUNTING SYSTEM FOR A STARTING ENTERPRISE

Target groups: rural enterprises and entrepreneurs, advisers, municipalities, professional organizations, public sector.

Accounting legislation. Preparation of enterprise's accounting manual. Organization of enterprise's financial account (incl. accounting of biological assets) and managerial accounting. Preparation of enterprise's annual report and evaluation of enterprise's financial situation.

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REGIONAL DEVELOPMENT AND ANALYSIS OF REGIONAL COMPETITIVENESS

Target groups: rural enterprises and entrepreneurs, advisers, municipalities, professional organizations, public sector.

Evaluation and analysis of competitiveness of rural areas (village, rural municipality, town) on the basis of their situation. The assessment is formed on the basis of the comparison of specific indicators (social capital, entrepreneurial activity, income etc.) and of additional regional indicators formulated for the analysis.

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RURAL SOCIOLOGICAL RESEARCH AND ANALYSIS

Target groups: rural enterprises and entrepreneurs, advisers, municipalities, professional organizations, public sector.

Preparation of the research question and research methods (qualitative or quantitative), choice of survey method, sampling (choice of target group, preparation of sample, sampling methods, choice of sample size and distribution), preparation of questionnaire, conducting the survey, data analysis, reporting.

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RISK ASSESSMENT AND RISK MANAGEMENT IN RURAL BUSINESS

Target groups: rural enterprises and entrepreneurs, advisers, public sector .

Establishment of a methodological framework for risk assessment and development of tools for risk management. Analysis of risk scenarios and development of mitigation options for the company.

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TESTING OF BUILDING MATERIALS

Keywords: timber, steel, concrete, fiber reinforced concrete (FRC), glass fiber reinforced polymers (GFRP).

- Physical-mechanical properties of construction materials: compression, bending, torsion, tensile strength etc.
- Shrinkage of concrete and fiber reinforced concrete.
- Strength and stiffness of fiber concrete.
- Bonding strength of GFRP.

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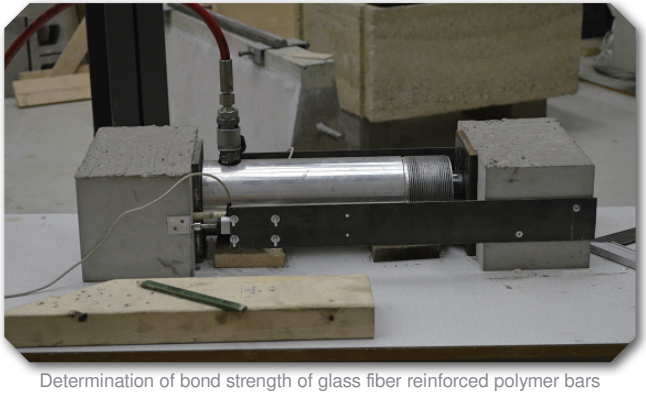
Determination of flexural toughness of FRC



Determination of bond strength of glass fiber reinforced polymer bars

TESTING OF BUILDING STRUCTURES ON OBJECTS AND IN LABORATORY

Keywords: load bearing capacity, deformations, testing of new and existing structures.

- Reinforced concrete beams, columns, panels, hollow core panels.
- Timber beams, columns, trusses.
- Steel beams, columns.
- Composite beams, columns, panels.

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Testing of timber-steel-concrete composite panel

Testing of prestressed hollow core panel

DETERMINATION OF RESIDUAL STRESSES IN COATINGS AND DETAILS

Keywords: construction, mechanical engineering, residual stresses

- Galvanic, powder, plasma, PVD, CVD coatings.
- Residual stresses in the surface layer of details by hole-drilling method.

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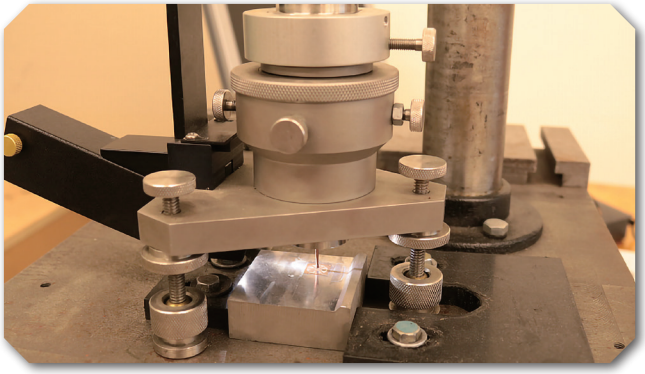

Determination of residual stresses in the surface layer of detail by hole-drilling method

SPACE PLANNING AND CONSTRUCTIVE SOLUTIONS OF AGRICULTURAL BUILDINGS

Keywords: agricultural and industrial buildings.

- Designing of agricultural buildings and facilities according to the planned technologies and in a view of typology.
- Structural design along strength and stability calculations for new and existing buildings.

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SPACE PLANNING AND STRUCTURAL SOLUTIONS OF RESIDENTIAL BUILDINGS

Keywords: designing.

- Architectural and structural solutions.
- Detail planning and calculations for energy performance certificate.

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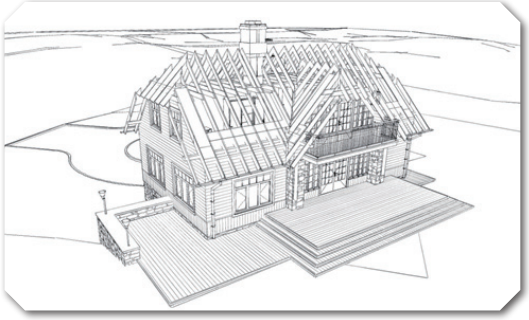

INVESTIGATIONS OF NATURAL BUILDING MATERIALS

Keywords: natural building materials, (timber, clay, lime, straw, reed, hemp, flax, sawdust), hygrothermal properties and behaviour of materials.

- Consulting service on general properties and application techniques of natural building materials (incl. natural finishing materials).
- Physical-mechanical properties of natural building materials.
- Hygrothermal properties of natural insulation materials in laboratory conditions and *in situ*.

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Test house from common reed and with clay plaster

Determination of thermal conductivity of building materials

INVESTIGATION OF BUILDING PHYSICS PROPERTIES OF BUILDING ENVELOPES AND MATERIALS, INNER CLIMATE, CONSULTATIONS

Keywords: building physics, building envelopes and materials, inner climate, *in situ* studies.

- Hygrothermal state of building envelopes (Blower Door, thermography, hygrothermal performance etc.).
- Thermal conductivity and other properties of materials.
- Inner climate (temperature, relative humidity and CO_2 content, air movement).

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Blowerdoor test

Measurement devices in test house's walls

CONDITION ASSESSMENT OF SUBSOILS AND FOUNDATION STRUCTURES

Keywords: foundations, settlements, design.

- Assessment of bearing capacity of subsoil and foundations, settlements of foundations, dynamics monitoring, stability of foundations.
- Designing of foundations solutions taking into account geological and hydrogeological conditions.

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Cracks in wall due to settlements of foundation

ASSESSMENT OF TECHNICAL SITUATION OF BUILDINGS AND STRUCTURES

Keywords: technical situation of building, thermography, stress wave timing, moisture content, resistance micro-drilling.

- Assessment of building and structures.
- Assessment of structures in non-destructive methods.
- Consulting service on special conditions of buildings under national heritage protection.

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Timber foundations in old Tartu

Non-destructive assessment of timber structure

NOTE: All available experimental scientific services are NOT certified.

THE ASSESSMENT OF FIT BETWEEN HUMAN PHYSICAL CAPABILITIES AND THE PROPERTIES OF THE WORK SYSTEM

Keywords: manual material handling, postures, repetitive motions, ergonomic quality of tools, ergonomics, safety engineering.

The fit between human capabilities, limitations and what is required by technology or environment is particularly important when the goal is to ensure a sustainability of workforce or to design technology and environments that are easy to use. In order to achieve such goals, data about technology related risks is needed in the decision making.

Our competency covers a wide range of subjective and objective methods, which can be implemented during the planning or other phases in the product's or environment's lifecycle. Subjective methods are used for risk assessment in existing work systems and our competency includes methods that are described in the series of "EN 1005 Safety of machinery. Human physical performance" and methods endorsed by relevant governmental agencies such as NIOSH (USA), HSE (UK) or BAuA (Germany). Meanwhile in the planning phase data about human performance and physical capabilities are required in order to make design decisions. Our experience and competency allow to tailor the measurement devices according to the needs of the task.

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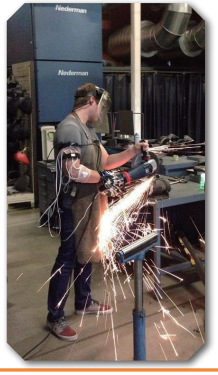

DESIGN OF ANIMAL-FRIENDLY AND ECO-FRIENDLY CATTLE FARMS

Keywords: agriculture, animal husbandry, dairy farming.

Counselling of dairy farmers on domestic and foreign customs, experiences and standards when renovating an existing or building a new farm.

Experts will help to:

- select a housing system;
- draft flow processes of milking, feeding, watering, manure removal etc.;
- select machines, equipment and farm installations;
- design farm layout.

The prepared technological design serves as an input for building design documentation or it can be used to justify a business plan.

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TESTING OF MILKING MACHINES

Keywords: agriculture, animal husbandry, dairy farming.

The technical condition and performance of milking machines is evaluated with modern measurement systems.

Measurement data characterise:

- the performance of the vacuum pump;
- vacuum loss in milk and vacuum pipeline;
- vacuum stability in the milking machine;
- accuracy of the milking machine pulsation.

On the basis of the measurement data it is possible to:

- On the basis of the measurement data it is possible to:

The duration of the entire test is about two hours. It is possible to test milking machines during regular milking.

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ERGODESIGN – ERGONOMIC ASSESSMENT OF WORKPLACES -CONSULTATION, PREVENTION AND INTERVENTION

Keywords: work environment, ergodesign, ergonomic assessment of workplaces, advisoring, prevention and intervention.

Measurements:

- assessment of mental and physical overload risks;
- assessment of cognitive workload;
- videoanalysis of work posture and repetitive movements;
- measurement of effectiveness of ergonomic intervention activities.
- **Consultation:**
- workplace ergodesign and comfort styling;
- prevention of overload injuries, work stress and burnout.

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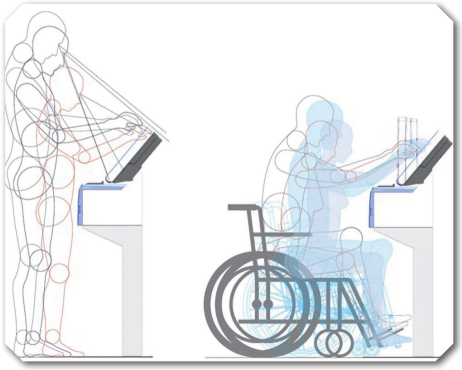

QUALTIY CONTROL OF PARTS

Keywords: product development, machine building, technical measurements, technical drawings.

Consultations:

- measuring machine elements with 3D coordinate measuring machine;
- measuring machine elements with portable 3D laser scanner;
- measuring geometrical tolerances;
- tolerances and fits;
- surface roughness determination;
- dimension chains calculation.

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TECHNICAL MEASUREMENTS

Keywords: machinery engineering, product development, engineering drawings.

Consultations:

- tolerances and fits;
- surface roughness determination;
- dimension chains calculation.

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MECHANICAL TESTING OF MATERIALS AND METALLOGRAPHY

Keywords: product development, machine building, mechanical properties, material structure.

Consultations:

- choosing materials on basis of the strength of the structure;
- measuring hardness (Brinell, Rockwell, Vickers);
- tensile tests, compression tests and flexure tests;
- preparing micro- and macrosections;
- metallography.

Test materials can be metals and metal alloys, plastics, wood etc.

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HEAT TREATMENT OF MATERIALS

Keywords: mechanical engineering.

Consultations:

- heat treatment processes;
- heat treatment service.

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NON-DESTRUCTIVE TESTING - LABORATORY OF INDUSTRIAL COMPUTER TOMOGRAPHY

Keywords: NDT, non-destructive testing, tomography, X-ray, voxel.

The laboratory includes the X-ray computer tomography scanner, YXLON FF35 CT, manufactured by the German company YXLON International GmbH. The system has two different powers of the X-ray tube: 190kV and 225kV. This configuration allows the device to be applied in a wider range of test specimens for desired precision. Full version of the VG Studio Max 3.2 software package is used for the data analysis. The dimensions of the largest body that can be scanned are Ø 300 mm x 500 mm. The maximum permissible load on the turntable is 30 kg.

Consultation:

- Finding porosity.
- Comparison with the nominal model.
- Dimensioning of internal body surfaces.
- Reverse engineering / Digitization .STL export.

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EVALUATION OF CUTTING STABILITY OF CNC LATHES AND MILLING MACHINES

Keywords: production technology, mechanical engineering, cutting processing, cutting force.

Tests to be performed:

- On site measurement of the shear forces in numerically controlled lathes and milling machines.
- Machine tool analysis and stability assessment based on cutting forces.
- Machine power evaluation.

The following issues can also be consulted:

- Determining effective cutting parameters according to the capacity of the machine.
- Suitability and choice of cutting tools, according to machine parameters.

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PROTOTYPING

Keywords: product development, engineering, machine building.

Consultations:

- engineering calculations;
- designing machineries and metal structures;
- 3D-modeling and reverse engineering;
- 3D printing.

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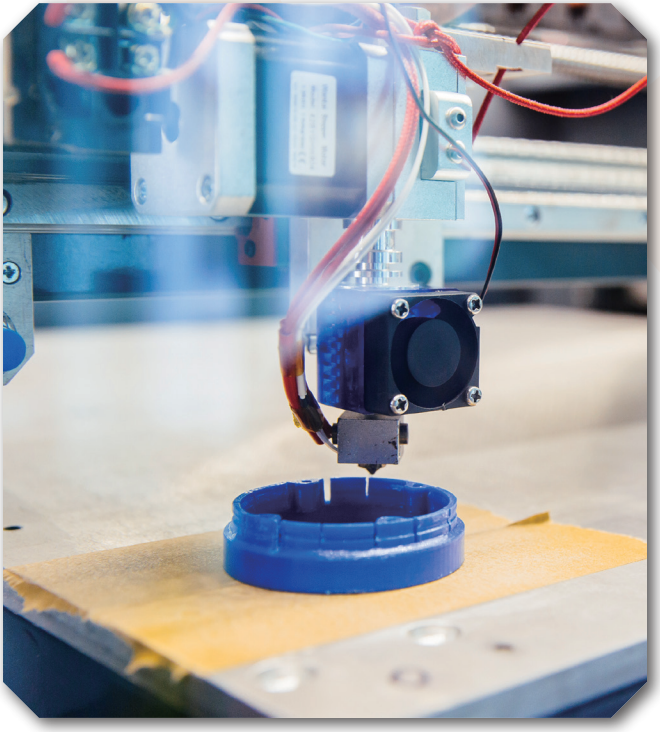

VEHICLE TESTING

Keywords: vehicle, power, adjusting.

Consultation:

- engine testing;
- vehicle engine testing;
- exhaust gases of vehicle;
- development of the vehicle subsystems.

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SYNTHESIS AND APPLICATION OF NANOMATERIALS

Keywords: nanomaterials (metals, metal oxides, carbon nanotubes), nanocomposites, synthesis, applied nanomaterials, how to handle nanomaterials.

The group acquired a long-term experience in synthesizing, manipulating and integrating nanomaterials in application. The counselling includes the selection of suitable nanomaterials for targeted applications. How to handle and prepare nanomaterials and nanocomposites.

Consultations:

- preparation of nanomaterials;
- how to use nanomaterials in applications;
- preparation of nanocomposites (polymers, ceramics, glass, carbons…);
- water purification (extraction of metal ions);
- antibacterial coating;
- nanomaterials for energy applications (Photovoltaics, LED);
- how to manipulate and work with nanomaterials;

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RECIPROCATING ENGINE TESTING

Keywords: engine diagnostics, engine tuning.

Consultation:

- testing of the reciprocating engine;
- tuning of the reciprocating engine;
- diagnostics of the reciprocating engine sensors;
- diagnostics of the diesel feed systems;
- development of the engine sub-systems.

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