



Karelia

University of Applied Sciences

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Precision Engineering

Precision engineering is deeper understanding of manufacturing processes, metrology and material science to generate added value to product performance through functionality. Precision engineering combines designing, manufacturing and quality control at higher level as a combined process

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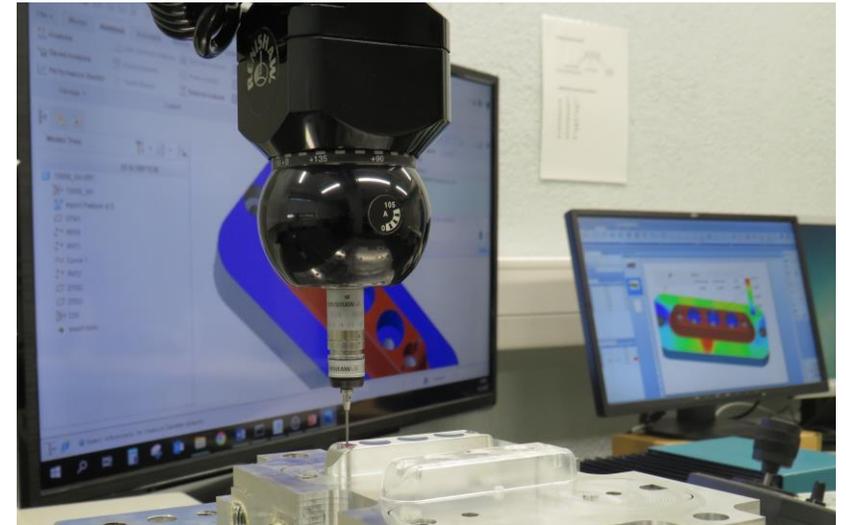
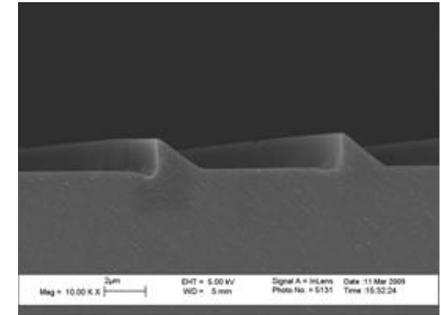
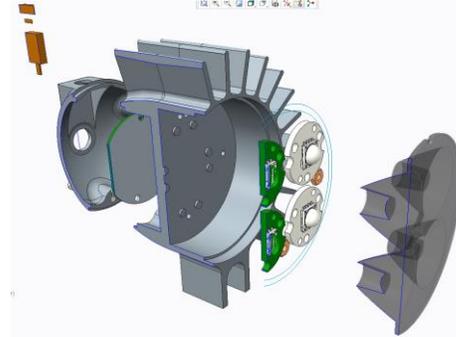
Research, education and product development



- Excellent precision manufacturing facilities since 1994: diamond turning, high speed machining, injection moulding, metal injection moulding and metrology
- Applied research with companies (optics, polymers, locking and security, forestry machines, medical components), telecommunication component manufacturing background
- Educational, manufacturing and research services
- Equipment worth 3000 k€, R&D project budget 500 - 1000 k€ yearly
- Over +50 industrial customers and partners

R&D and product development for plastics and metal component manufacturing

- Designing of polymer components
- Injection mold design, manufacturing, injection moulding and metrology
- Integration considerations of materials, optics and electronics
- Precision manufactured components and metrology
- Functional micro and nanostructures
- Development of polymer LED optics
- Metal injection moulding prototype process



Manufacturing and prototyping services

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Advanced manufacturing and measuring

- Prototyping of precision engineered polymer and metal components
- Metal Injection Moulding of prototype parts
- Measuring, material and environmental testing services
- Manufacturing of photonics devices components by diamond turning

Tailored industrial short courses

- High speed milling and mold manufacturing (Finnish only)
- Standards for optical manufacturing
- Optical Component Manufacturing (through application examples)
- Lean & Six Sigma (Finnish only)
- Plastic materials

Advanced manufacturing equipment's

- High speed milling, ultra precision single point diamond machining
- Laser interferometry, CMM, multi axis profilometry and laser scanning
- 2-k injection moulding
- Sintering oven



Tailored industrial short courses

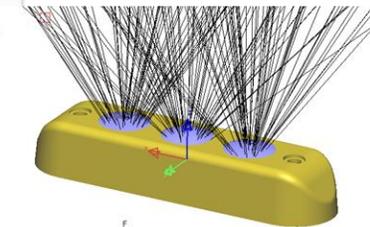
Tailored industrial short courses

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From requirements: technical, optical, material, legislative, standard conformity, aesthetic, functionality, weathering, safety, re-cycling

In-conjunction with design, manufacturing, metrology and testing technologies



In to a viable product



Optical Component Manufacturing – course

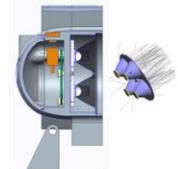
This joint workshop with manufacturing industry will go through with real life examples the limitations and critical steps of prototyping optical parts or devices. This workshop will highlight some difficulties and possibilities while going through a product development cycle of photonics devices.

The course will have a hands on session where an optical quality freeform steel insert for moulding application will be manufactured, measured and moulded. The hands on session will be accompanied by going through several case studies of precision engineered demonstrators manufactured by Karelia. The case studies will handle the following topics (published at EUSPEN and SPIE conferences):

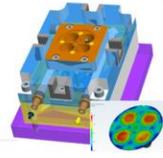
- ALD coated freeform spectrometer mirror
- Combination process of diamond machining and roll-to-roll UV-replication for thin film micro- and nanostructures
- Practical Shrinkage Compensation method for Injection Moulded LED Optic
- Ultrasonic vibration cutting of freeform steel insert
- Injection moulded lens array for imaging application
- Fabrication of hybrid optical line generator by direct machining



Standards for LED devices



SSL optical, mechanical and electronics design



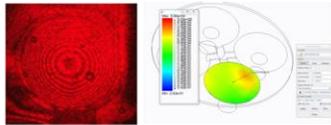
Moulded part design and mould design



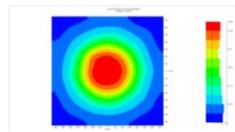
Manufacturing of optical inserts by diamond turning, lithography or as a combination



Replication injection moulding or UV-curable replication



Functionality testing and surface metrology



Reversing metrology data back to optomechanical design

Type: on-site training in a precision engineering laboratory at Karelia University

Duration: 3–4 days (case studies, theory of precision manufacturing and laboratory sessions)

Course material: precision manufacturing theory package and publications

To whom: R&D managers of optical manufacturing, precision machine tool operators, metrology specialists, optical designers, product development specialists etc.



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<https://photonicscenter.fi/>

