



Laser Solutions Short Courses

Short Courses Chair: **Silke Pflueger, ULO Optics Inc., Los Gatos, CA, USA**

ICALEO's short courses session offers the opportunity to learn something new or brush up on existing skills. The first course discusses beam characterization, essential for everybody working with lasers. Heat treatment has been around for decades, but new lasers and sensors have made it a very competitive industrial process. Marking and engraving are standard technologies, but do you really understand them? Hybrid welding and micromachining are hot topics everybody talks about - learn more about them in the afternoon courses. The day also includes an exciting talk on how to turn your invention into a company!

Course 1: Beam Diagnostics - Measurement Techniques and Applications

Sunday, September 23 • 9:00am

Volker Brandl, PRIMES GmbH, Pfungstadt, Germany

Participants will learn about the physical principles behind the instruments that measure laser properties. After a brief introduction to the parameters that describe a laser, we will discuss detection methods and try to find links between different application situations and the properties of the different detection techniques. Examples will be presented that show the links between alterations seen in the measurement data and the kind of error that occurred in the laser, beam path or focusing optics. Applications and future developments of laser beam analysis are outlined.

The objectives for this course are:

- 1) Quality assurance at laser systems.
- 2) Beam parameters – theory and practical measurements.
- 3) Detection techniques – physical principles behind beam analysis.
- 4) The impact of optical element failure on measurement data.
- 5) Industrial applications and integration of beam analysis.

Course level: Beginner to Intermediate

Course 2: Laser Heat Treatment with Latest System Components

Sunday, September 23 • 10:15am

Steffen Bonss, Fraunhofer IWS, Dresden, Germany

Laser beam heat treatment has been established during the last years as a complementary technology for local hardening treatment tasks at tool manufacturing, automotive industry and many others. New high power diode lasers and a lot of process supporting systems, that have been developed in recent years, are responsible for the increase of industrial laser hardening applications. The short course starts with information about the basics of laser heat treatment. Thereafter, a review about suitable lasers and recommended systems for reliable and well adapted laser heat treatment processes is given. Examples of the last ten years transfer of laser beam hardening into industry are presented and discussed.

The objectives for this course are:

- 1) Laser heat treatment.
- 2) High power diode laser application.
- 3) Process monitoring and control.
- 4) Application examples from industry.

Course level: Beginner to Intermediate

Course 3: Understanding Laser Marking, Engraving and Annealing and Current Trends

Sunday, September 23 • 11:15am

Jeff Thorsen, Telesis Technologies, Fremont, CA, USA

Today's micro material processing consists of many applications such as laser marking, laser annealing and laser engraving, yet many end users interchange these terms. Our short course will help define what each is, as well as educate the audience about the best means to mark, engrave and anneal using conventional mechanical pinstamp and industrial lasers. It is very common to hear technology people in a discussion throw around terms like marking, engraving and annealing. This course will provide the audience with a firm understanding of what these are and the methods and technologies to perform each.

The objectives for this course are:

- 1) Define what laser marking, engraving and annealing are.
- 2) Understand what technologies are available, such as fiber, solid state and gas lasers.
- 3) Understand what alternative technologies are available for marking and engraving such as pin stamp.

Course level: Beginner to Intermediate

Course 4: Entrepreneurial Engineering

Sunday, September 23 • 12:45pm

Larry Marshall, Southern Cross Ventures, Palo Alto, CA, USA

Learn how to turn your invention into a company - learn how a fellow laser engineer founded 5 1/2 successful companies and delivered 2 successful IPOs.

The objectives for this course are:

- 1) Reverse how you think about technology and markets.
- 2) How to build and manage the right team for success.
- 3) How to pitch your idea to investors and secure capital.
- 4) How to create your business plan and pivot when necessary.
- 5) How and when to exit your company.

Course level: Beginner to Intermediate

Course 5: Introduction to Laser Material Interactions and Micromachining with Pulsed Lasers

Sunday, September 23 • 1:55pm

Sami Hendow, Consultant, Los Altos, CA, USA

Sascha Weiler, TRUMPF Inc., Farmington, CT, USA

Participants will learn about the various regimes of laser-material interactions using pulsed lasers from microsecond to ultrashort pulse durations. We will discuss the various processes that are associated with energy exchange and their contribution to material processing. We will then cover the effects of changing peak power, pulse energy and pulse width, using nsec, psec and fsec pulses. We will also contrast the observed effects between these regimes on metal, silicon and ceramic materials, as well as other side effects such as oxide formation due to surface heating.

The objectives for this course are:

- 1) Basic understanding of the principles involved in laser-material interactions when pulsed lasers are used.
- 2) Recognize the various processes involved when a pulse is absorbed and ablation commences and their effects on material removal and HAZ.
- 3) Understand the effects of changing pulse peak power and pulse energy on material processing.
- 4) Recognize the impact of shortening pulse width on material processing.
- 5) Cover machining examples using nsec, psec and fsec lasers.

Course level: Beginner to Intermediate

Course 6: Review of Hybrid Laser Arc Welding

Sunday, September 23 • 2:55pm

Brian Victor, Laserline, Inc., Santa Clara, CA, USA

This course provides an introduction to Hybrid Laser Arc Welding (HLAW), the combination of a laser and arc process in the same weld pool. This short course will review the fundamentals of each welding process, how to choose laser and arc equipment, typical process parameters and examples, typical defects, as well as the synergic benefits for multiple alloy systems: aluminum, steel/stainless and titanium.

The objectives for this course are:

- 1) Review the basics of each welding process.
- 2) Select the right equipment.
- 3) Determine starting parameters.
- 4) Learn how to troubleshoot common defects.

Course level: Beginner to Intermediate