



ADVANCED MEASUREMENT TECHNIQUES IN FLUID MECHANICS



Course Schedule: 10 – 14 July 2023

Co-ordinating Faculty:

Prof. Saptarshi Basu

Professor

Department of Mechanical Engineering

Indian Institute of Science

Course Mode: Offline

Duration: 5 days, 10 – 14 July 2023

Number of participants: 150

Department of Mechanical Engineering

Aerospace Engineering

Indian Institute of Science

Course Fee per participant:

Faculty : Rs. 6,000.00 + 18% GST

Students: Rs. 3,500.00 + 18% GST

Post Docs participant: Rs. 4,000.00 + 18% GST

Industrial participant: Rs. 11,000.00 + 18% GST

Minimum qualification required: BTech / BSc

Registration Deadline: 30 June 2023

Registration link:

<https://iisc.online/shortterm/home.html>

Contact:

CENTRE FOR CONTINUING EDUCATION

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Program Coordinator:

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Short Course on
**Advanced Measurement
Techniques in Fluid
Mechanics**

10 – 14 July 2023
Indian Institute of Science
Bengaluru, India



Offered by the Mechanical (ME) and
Aerospace (AE) Engineering
Departments, IISc

With support from the SERB-VAJRA
Faculty Scheme

Program – Day1 (Aero)

- 1. Magnetic Resonance Velocimetry (Tropea)**
Principles, flow systems, data processing, resolution, data assimilation
- 2. Pressure Probes and Taps (Diwan)**
Sensors, Frequency response, Pitot (static) probes, multi-hole probes, in-flow probes
- 3. Hot-Wire Anemometry (Diwan)**
Principles, probes, spatial/temporal resolution, multi-wire probes, turbulence measurements

Lunch

Laboratory Demonstrations
(Department of Aerospace
Engineering)

Program – Day 2 (Aero)

- 1. Optical Fundamentals and Image Processing (Duvvuri)**
Cameras, lenses, light propagation, aberrations, diffraction limits, illumination, resolution, filters, FFT, etc.
- 2. Shadowgraphy and Schlieren (Duvvuri, Venkatakrisnan)**
Optical configurations, focussing Schlieren, Background orientated Schlieren, Image processing
- 3. Inteferometry (Panigrahi, Kanpur)**
Principles, Mach-Zehnder, Differential, Example applications, multi-wavelength, holography

Lunch

Laboratory Demonstrations
(Department of Aerospace
Engineering)

***Schedule:** Lectures are held from 9h to 13h, each 45 min. with 15 min. questions and discussions followed by a 20 min. break. Laboratory demonstrations will be conducted in groups from 14h to 16h, rotating among 3 or 4 stations.*

Participants will receive all lecture slides electronically prior to the course, which include information for prior or subsequent reading.

Program – Day3 (Aero)

- 1. Particle Image Velocimetry/
Particle Tracking Velocimetry I+II**
(Venkatakrisnan)
Principles, seeding, optical configurations, Stereo PIV, Micro-PIV, Scheimpflug, Image processing, Shake-the-box
- 2. Pressure Sensitive Paint**
(Venkatakrisnan)
Principles, temporal response, example applications
- 3. Measurement of Wetting Phenomena** (Dash)
Contact angles; contact line movement, confocal microscopy, TIRF, Astigmatism PIV, Chromatic confocal sensors

Lunch

Laboratory Demonstrations
(Department of Aerospace Engineering)

Program – Day4 (ME)

- 1. Introduction to Optical Point Measurement Techniques**
(Tropea)
Lorenz-Mie Theory, Geometric optics, Brewster angle, time-shift technique, DFD technique
- 2. Laser Doppler Velocimetry**
(Tropea)
Principles of operation, optical systems, signal processing, flow seeding, data processing and estimators
- 3. Phase Doppler Techniques**
(Tropea)
Principles, optical configurations, signal processing, data processing

Lunch

Laboratory Demonstrations
(Department of Mechanical Engineering)

Program – Day5 (ME)

- 1. Measurement Techniques for Two-Phase Flows** (Sahu)
principles, optical setup, image processing, single point and imaging techniques.
- 2. Heat Flux Measurement** (Basu)
Thermocouple, IR cameras, transient measurements
- 3. Applications of Laser-induced Fluorescence in Fluid Mechanics** (Ravikrishna)
Principles, temperature measurement, species concentration, multiphase flow

Lunch

Laboratory Demonstrations
(Department of Mechanical Engineering)

Who should attend? This course is intended primarily for researchers at the graduate or post-doctoral level, but also for those working in an industrial research environment. After attending the course, the participants should be in a position to select the most appropriate measurement techniques for their application and know where to find the necessary information to proceed with its implementation. Laboratory demonstrations are provided to complement the classroom lectures.
