

## Application Form for the ITTC Organisation

NATIONAL VACUUM SOCIETY: Slovak Vacuum Society (SVS), Vazovova 5, 812 43 Bratislava

COURSE TITLE: **Vacuum technology, principles and applications**

LOCATION: Štrbské Pleso, Hotel Trigan

DATE OF COURSE: 13. -16. October 2020

STAND-ALONE COURSE OR PART OF A CONFERENCE or WORKSHOP:

TTC will be realised as a parallel activity for the conference event with a title School of Vacuum Technology, 13 -16. October 2020, TTC for full 3 days per 7 hours.

OBJECTIVE OF THE COURSE:

**1. Basic physical principles and processes I:** Kinetic theory of gases, physics of low pressures, basic laws for ideal gases, what is a vacuum (definitions, units, history), the flow of gas molecules, distribution of molecules according to mean free path, collisions of molecules, sorption, physisorption, chemisorptions, desorption rate, pressure on the wall, molecular incidence rate and cosine law, transport phenomena, thermal transportation, gas flow (4 h).

**2. Basic physical principles and processes II:** evaporation, free path of molecules, viscosity coefficient, mean free path, molecule diameter, relation, thermal conductance of gases, conductance, impedance, throughput, molecular flow, continuum flow (viscous), Transitional Flow, diffusion of gases through solid (metal), interaction of particles with solid surface (4 h).

**3. Vacuum production methods and devices and measurement:** Positive Displacement Vacuum Pumps, Basics of pumping technology, mechanical vacuum pumps (rotary pump, dry pump), turbomolecular pump, diffusion pump, cryopump, getter pump, ion pump, Kinetic, Capture VP, cryotrapping, Vacuum gauges, Partial pressure measurements, Leak detection (4 h).

### **4. Application of vacuum in research, applications of the vacuum technology**

Vacuum measurement and gauges: manometers, thermocouple manometer, ionization gauges (hot, cold cathode), calibration of vacuum gauge, partial pressure measurements, Leak detection: leak rate, leak detection techniques, mass spectrometer leak detection, mass spectrometry/spectroscopy, ion sources - ionisers, ion detectors, mass analysers (magnetic deflection, quadrupole mass filter, time-of-flight), methods like Auger, SIMS, XPS, data analysis (4 h).

### **5. Applications of vacuum methods**

Practical examples of vacuum applications in various analytical methods and processes, Vacuum materials, Clean rooms, (4 h).

### **Goals of the course**

The participants should comprehend physical principles connected with lower pressure - vacuum. They will be instructed about modern methods of production and measurement of vacuum for different vacuum, high- and ultra-high vacuum applications.

The Technical Short Course is offered mainly to students and junior researchers (PhD students) responsible for safe handling and operation (maintenance) of vacuum equipment in the local laboratories. The course should significantly enhance the knowledge and understanding of basic physical processes relevant for vacuum technology, provide practical knowledge required for every day operation of vacuum devices and measurements of vacuum, as well as introduce the trainees to selected aspects of technological processes requiring vacuum. Further focus will be given to materials suitable for vacuum use. Space will be also devoted to clean rooms, practical experience with work with vacuum equipment. A short test evaluation of the participants' progress will be reviewed, and for those are passing the required evaluation limits will be awarded by a course certificate issued by the Slovak Vacuum Society.

At STU Bratislava, the best and second largest Uni in the country courses related to vacuum were stopped. Despite this fact quite a few Thesis each year are being related to vacuum problems. Students welcome the opportunity to get knowledge in this area.

**Proposed Teachers** (all lectures will be in Slovak, basic terms in English will be given also by the help of the IUVESTA Visual Aids program slides):

Dr. Viera Dubravcova, Slovak University of Technology, Slovakia  
 Dr. Marian Vesely, Slovak University of Technology, Slovakia  
 Dr. Andrej Vincze, International Laser Centre, Bratislava, Slovakia  
 Prof. Eva Majkova, Academy of Sciences, Slovakia  
 Dr. Ľubomír Vančo, STU Bratislava, Slovakia  
 Dr. Jozef Novak, Academy of Sciences, Slovakia  
 Prof. Vladimír Tvarožek, STU Bratislava, Slovakia

#### **LANGUAGE: Slovak**

EXPECTED EDUCATIONAL AND JOB LEVEL OF STUDENTS: Bachelor and Master students from Universities, also possible for Technicians, Students with BSc title, exceptionally students with technical high school education, technicians from industry and research institutions. English names of different apparatus and processes will be given.

EXPECTED AVERAGE NUMBER OF STUDENTS PER COURSE: 10-15

#### **FINANCES:**

- Expected IUVESTA support: **2 500 €**
- Participant fee (includes accommodation, meals and organization) without IUVESTA support: **350 €**
- Travel costs per participant: 60 €
- Perspective IUVESTA support per participant: 250 €
- External Sources (STU) or Slovak Vacuum society contribution **500 EUR**

PROVISIONAL BUDGET ATTACHED:

Web page of the event and e-mail address:

<http://www.svs.stuba.sk/svt22/TTC>

[skolavt@gmail.com](mailto:skolavt@gmail.com)

**REPORT**

The Society (the recipient of the grant) is required (within 1 month after ITTC completion) to send a Report to the IUVESTA Scientific Secretary which should include the following information:

Title, location, and date of the TSC

Intent of the course, language of the course

List of teachers and attendants (with affiliations)

Names of beneficiaries of the IUVESTA support, with spending specifications

I agree to fulfil all the points of the above

Name: prof. Robert Redhammer, PhD.



Robert Redhammer  
President of the Slovak Vacuum Society

Date and Signature: February 14, 2020

Budget proposal for TTC (2020.10.13-16)

TTC Slovakia

VENUE: Strbske Pleso, Slovakia

DATE: 13 - 16 october 2020

<b>Income</b>	Unit cost (EUR)	Quantity	Sub-Total (EUR)	Remarks
Registration Fee (per person)	50	15	750	15 registered participants
SVS or STU sponsoring	500	1	500	Lodging and expenditures for 2 participants
IUVSTA funding	2 500	1	2 500	Lodging and expenditures for 10 participants
Total (EUR)			3 750	

<b>Expenditures</b>	Unit cost (EUR)	Quantity	Sub-Total (EUR)	Remarks
Meals (3 days per person)	60	15	900	Full board, meals and coffee breaks
Meeting Rooms (per day)	60	3	180	
Hotel Rooms (3 nights)	180	15	2 700	3 nights 60 eur per bed
Total (EUR)			3 780	