**Training Course PUMPS**





**TECHNICAL EDUCATION PROGRAM**

**TRAINING COURSES**

# in

**CENTRIFUGAL PUMPS**

**Ljubljana, 2022**

**Training Course PUMPS**



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| 1 | Subject | **ADVANCED TRAINING COURSES FOR ENGINEERS –**  **Mechanical design, Recommendations, Troubleshooting** |
| 2 | Topics | General pump design  * + General information   + Recommendation for hydraulic characteristics   + How to choose optimal pump type and design   + Pumps application in the systems  Optimization of pumping systems and Energy saving  * + Optimization of the pumps depend of operating regime   + Energy saving   + Optimization due to the cavitation, abrasion  Diagnostics and early failure detection  * + Guidelines for improving and eliminating the sources of malfunction  Troubleshooting, maintenance practices  * + Reasons for malfunctions  Pump design criteria  * + General information   + Recommendation how to use design criteria   + Recommendation how to avoid malfunction  Mechanical design  * + Design recommendation for different pump types   + Design recommendation for pump components  Forces and moments  * + General information about forces and moment   + Experience based calculation of forces  Stress calculation  * + Recommendation for stress calculation using different software  Balancing of hydraulic forces  * + Recommendation for balancing the hydraulic forces  Materials of production, technology, tolerances  * + Recommendation for material of constructions   + Recommendation for technology of production   + System of tolerances depending on pump application and design criteria |

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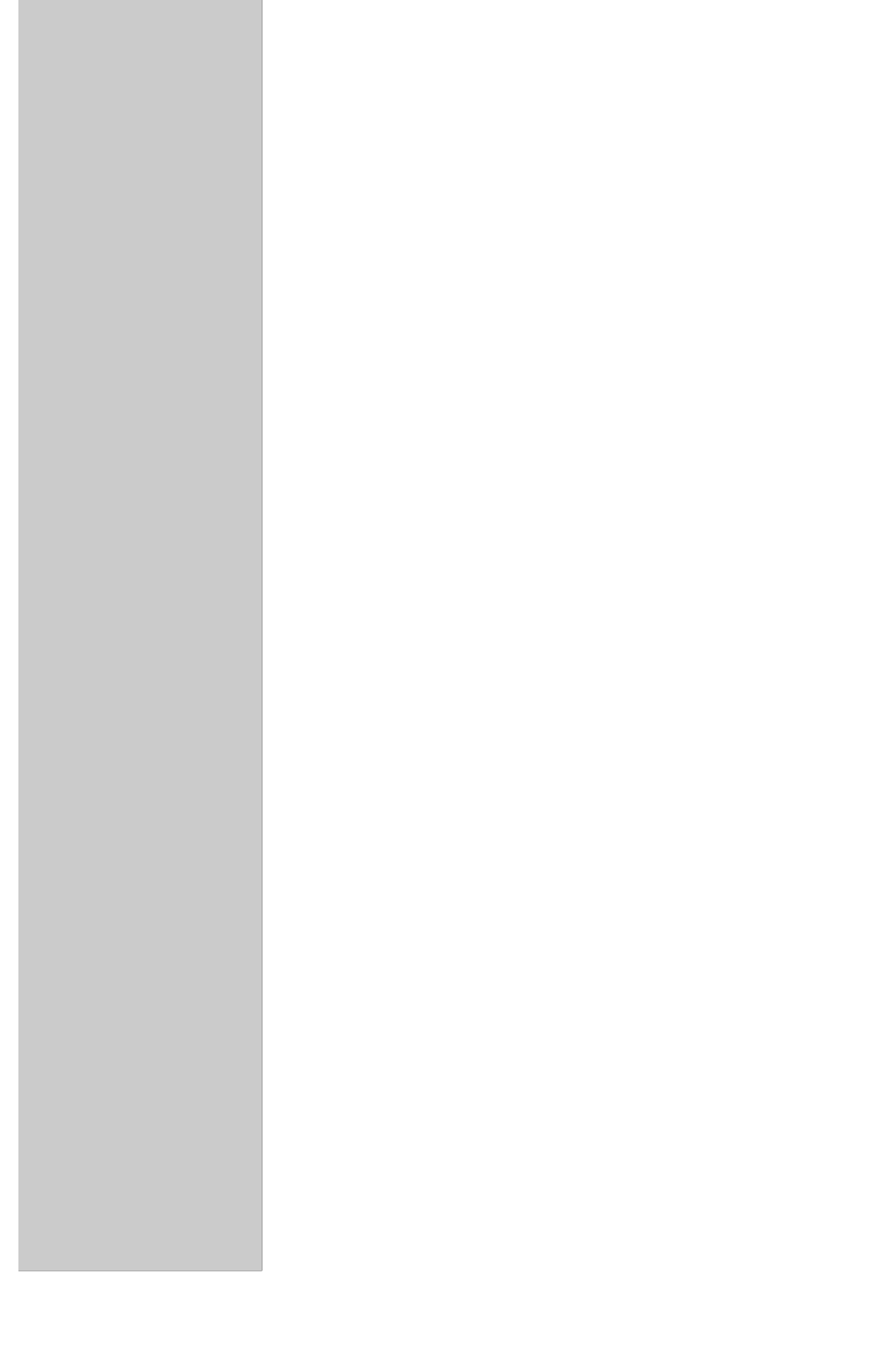
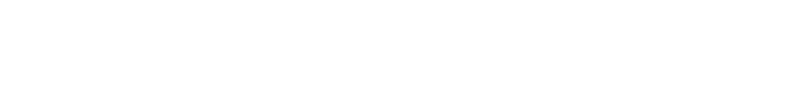
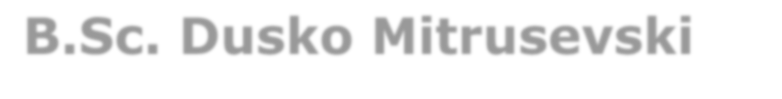


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|  |  | Heat transfer and fatigue calculation  * + Recommendation for heat transfer calculation   + Recommendation for fatigue calculation  Cavitation, corrosion and abrasion  * + Design recommendation considering cavitation, corrosion and abrasion   + Recommendation to avoid malfunction because of cavitation, corrosion and abrasion  Critical speed  * + Recommendation for critical speed improvement criteria  Testing of the pumps |
| 3 | Lecturer(s) | **Duško MITRUŠEVSKI, dipl.ing**., Head of design, SM PUMPS |
| 4 | Type of course | Lecture |
| 5 | Course duration | 1– 2 days/ topic |
| 6 | Course material | Printed (hard copy), digital media |
| 7 | Presentation | Power point, overhead projector, lecture |

**Training Course PUMPS**



**B.Sc. Dusko Mitrusevski**



**Position Consultant**

**Major functions**

**Education**

**Experience**

R&D manager MZT Skopje 1983-1986

Reaearch associate in Pump department in Turboinštitut 1986 - 1995

Managing Director of Makfluid 1995-2008

Consultant SM Pumps 2009-2022

University of Skopje Faculty of Mech. Eng.,

* 1. **c.,** *1980*

Development more than 250 model pumps different types, for

* + - Nuclear application,
    - Oil&Gas application acc.to API 610, API685
    - Industry,
    - Irrigation,
    - Water transport.

R&D for axial thrust balancing devices for high pressure pumps,

R&D for important design criteria for heavy duty process pumps, special pump design

* + - Cavitation
    - Critical speed
    - Recirculation free range
    - Structural analysis,
    - Thermal analysis
    - Fatigue analysis

Optimization and energy saving in pumping systems, Troubleshooting and pumps refurbishment

**Published works** 23 published articles in IAHR conferences,

National conferences, and international Journals,

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