

University of Zagreb
Faculty of Mechanical Engineering
and Naval Architecture



Ctt
Center for Technology Transfer

STRUCTURAL INTEGRITY AND DURABILITY

Faculty of Mechanical Engineering
and Naval Architecture

Zagreb
April 11, 2017

STRUCTURAL INTEGRITY AND DURABILITY

The workshop "Structural Integrity and Durability" is organized by the Center for Technology Transfer (Ctt) and the Department of Aeronautical Engineering of the Faculty of Mechanical Engineering and Naval Architecture (FMENA), University of Zagreb. Distinguished scientists and researchers from academia and industry will present methods and models for the integrity analysis of structures and components subjected to mechanical and thermal cyclic service loads, where the emphasis is given on practical applications in the industry.

Within the workshop a special attention will be paid to the materials' characteristics as the input data for calculation and analysis of the fatigue life of structures, as well as to software tools and databases where specific parameters values of the commonly used engineering materials can be found, and the interpretation of those values.

Examples of fatigue life analyses and assessment of thin-walled ships and aircraft structures, car and train frame structures, internal combustion engines and power plants will be demonstrated.

AIMS AND OBJECTIVES OF THE WORKSHOP

The workshop is intended for engineers and technicians from the industry involved in the development, design, manufacture and maintenance of structures. The workshop is also aimed at government institutions and university employees who are active in the field, and to all others interested in this topic.

WORKSHOP COORDINATOR

Prof. dr. sc. Željko Božić

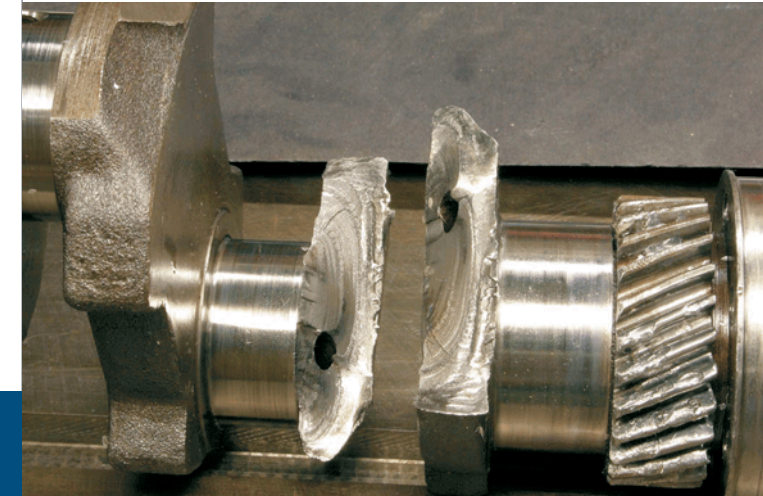
GUEST SPEAKERS

Prof. Dr. sc. László Tóth
University Of Debrecen, University of Miskolc, Hungary

Professor László Tóth accomplished his study at the University of Miskolc, the Faculty of mechanical engineering in the field of Applied Mechanics in 1969. He was teaching for more than 45 years at the University of Miskolc, University of Debrecen and University of Szeged the following subjects: Microstructural Testing Method, Fracture Mechanics, Material Selection, Material Testing, Material Technology, Engineering Design Methods, Fracture Mechanics, Engineering Fracture Mechanics, Life-time Management, Safety, Reliability and Risk. Prof. Tóth managed several international projects including the TEMPUS project entitled "Teaching and Education in Structural Integrity in Hungary". He authored more than 400 papers.

Ing. Jan Papuga, Ph.D.
CTU Prague, Faculty of Mechanical Engineering, Czech Public

Jan Papuga completed his PhD thesis at the Czech Technical University with the topic multiaxial fatigue. He continued his research in the fatigue domain, along with practical fatigue analyses in Evekto Company. Recently he established Fatigue Analysis RI Company. His work is focused on methods applicable both in research and in industry for fatigue analyses based on results of finite element analyses. He developed fatigue solver PragTic, which is available as a freeware from 2006. PragTic also serves as the primary tool for validating various fatigue methods. With the support of Technology Agency of the Czech Republic, he realized the project FADOFF focused among others on gathering a critical number of fatigue experiments useful for validating various fatigue calculation methods.



WORKSHOP PROGRAM

08:00 – 08:45 Registration

08:45 – 09:00 Welcome message

Prof. dr. sc. Zvonimir Guzović, Dean of FMENA
Prof. dr. sc. Mladen Šercer, Director of CTT

09:00 – 10:00 OPENING LECTURE

Prof. dr. sc. Željko Božić

University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Department of Aeronautical Engineering

Structural Integrity and Durability Assessment Models

An overview of methods and concepts commonly used for structural integrity and durability assessment is given. Power law models such as Paris–Erdogan equation and other models commonly used for crack growth prediction are discussed. Micro-mechanics fatigue damage models developed for crack initiation simulation are presented. The effects of residual stresses on fatigue life of structures will be demonstrated. Examples of elastic-plastic fracture mechanics (EPML) analysis and integrity assessment of damaged thin-walled structures will be shown.

10:00 – 11:00 KEYNOTE LECTURE

Prof. Dr. sc. László Tóth

University of Debrecen, University of Miskolc, Hungary

Fatigue at All Scales – Engineering Point of View

Despite the fact, that the expression „FATIGUE“ has been introduced more than 150 years (in 1845) and the first paper on this topic has been published in 1839, the industrial failures due to the alternating loading condition still occur. In order to reduce fatigue problems numerical modelling and simulation methods along with the NDT procedures are applied. This presentation will address the parameters of fatigue resistance in LCF (Manson-Coffin) range, lifetime regime (Basquin) and fatigue crack propagation (Paris) ranges. The crack propagation sensitivity index concept and its practical usefulness in industrial sectors will be demonstrated.

11:00 – 11:20 Coffee break

11:20 – 12:20 KEYNOTE LECTURE

Ing. Jan Papuga, Ph.D.

Czech Technical University in Prague, Czech Public Faculty of Mechanical Engineering

Validation of Fatigue Prediction Models and Fatigue Solvers

The lecture focuses on fatigue of structures and components under multiaxial loading. Some of issues to overcome, if the calculation should simulate it, are described, together with various current approaches to solve the problem. The way the experimental data are treated to be used for validating existing computational solutions is discussed. This experience is generalized and the future prospect of the fatigue calculation methods and of fatigue solvers is discussed. The FADOFF (Fatigue Analysis Documentation OFFice) project and its outputs are described, and its current status quo is explained.

12:20 – 13:30 Lunch break

13:30 – 14:30

Prof. dr. sc. Robert Basan

Faculty of Engineering, University of Rijeka
Department of Mechanical Engineering Design

Resources of Material Parameters of Steels – Overview, Evaluation and Selection

Models of material's monotonic/cyclic stress-strain (Ramberg-Osgood) and fatigue (Basquin-Coffin-Manson model) behaviour. Resources and methods for determination of material parameters. Advantages and deficiencies. Overview of methods for estimation of cyclic/fatigue material parameters from monotonic properties. Solutions based on artificial neural networks. MATDAT materials properties database – web-based resource of detailed information on design-relevant (metallic) materials. Development, content, features and tools.

14:30 – 15:10

Roman Baranja, dipl. ing. mechanical engineering

Mr. sc. Nikola Naranča, dipl. ing. shipbuilding
AVL-AST – Zagreb

Structural Evaluation of the Battery Packages in Passenger Cars

Strength, durability and crash investigations are essential for the battery packs packaging, mounting situation and overall performance. For the purpose of strength and durability investigation, natural frequencies are assessed based on battery pack configuration in the vehicle. A strength analysis with g-loading from significant load cases (such as bad road testing) are performed to evaluate global battery pack deformation and stress/strain distribution. For the crash simulation a generic sled test device is used and acceleration pulses (usually half sine signal) representative for the particular crash load case is applied. These simulation procedures will be demonstrated on real examples from the battery engineering process.

15:10 – 15:30 Coffee break

15:30 – 16:30

Dr. sc. Ante Bakić

INETEC – Institute for Nuclear Technology – Zagreb

Croatian Robots in the Service of Preserving the Integrity of Nuclear Power Plants

Due to high radiation zone near primary circuit of nuclear power plants non-destructive testing are carried out by remotely operated robotic systems. INETEC is one of the world's leading companies that develop these automated systems and use them for providing inspections or selling them to other companies that provide inspections on a large number of nuclear power plants. The successful inspections guarantee the safe operation of nuclear power plants and protect the environment from adverse consequences. Development and production of such complex devices require close cooperation with the technical and natural science faculties in Croatia making Croatia in the ranks of high-tech countries.

16:30 – 16:40 Certificate award to the participants

- **VENUE:** Faculty of Mechanical Engineering and Naval Architecture in Zagreb, East building, Plava dvorana
- **DATE AND TIME:** April 11, 2017; 08:00-17:00
- **PARTICIPATION FEE:** 1,100 Kn + VAT (25 %) Please transfer the fee to the following account: Zagrebačka banka: **IBAN HR7623600001101430801** Payment purpose: **Structural Integrity and Durability** Reference number: **1707**
- For the participants who pay the fee abroad, outside Croatia: Zagrebačka banka, Savska cesta 66, Zagreb Account number: 2100036681; SWIFT: ZABAHR2X IBAN: HR7623600001101430801 Registration form and payment confirmation should be sent via e-mail: melita.zrilic@fsb.hr or per post: Ctt – Center for technology transfer Ivana Lučića 5, 10000 Zagreb, Croatia
- Registration form and payment confirmation should be sent until April 7, 2017
- For further information please contact Mrs. Melita Zrilic: tel: +385 16168567 or e-mail: melita.zrilic@fsb.hr
- Printed materials will be provided for the workshop participants. The participation fee includes lunch and refreshments during coffee breaks. All participants will receive a copy of the Book of Abstracts of the 16th International Conference on New Trends in Fatigue and Fracture held in Dubrovnik, Croatia, 2016.

Name and family name of the participant:

Company name and address:

VAT:

Tel./fax:

E-mail:

Date:

Signature of the person in charge: