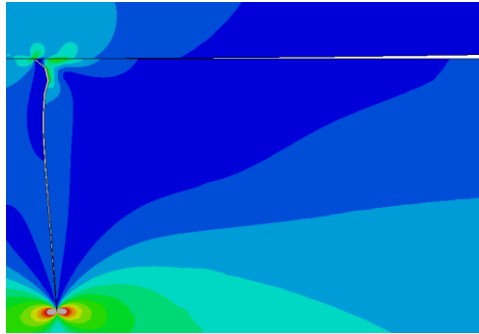


## FFW 2021



### Conference Programme

Venue: Online via MS Teams

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# The 9th International Conference on Fracture Fatigue and Wear (FFW 2021) August 2-3, 2021, Online conference

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**Prof. Magd Abdel Wahab**  
Ghent University, Belgium

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## KEYNOTE LECTURE

### Monday 2 August 2021

**Time:** 10:15 am to 11:00 am

**Keynote speaker:** Professor Luca Susmel

**Affiliation:** Professor of Structural Integrity, the University of Sheffield, UK

**Title:** Critical plane and critical distance approaches to assess damage under variable amplitude fretting fatigue loading



#### Abstract:

This paper summarises an attempt to formulate a design approach suitable for predicting the finite lifetime of mechanical assemblies subjected to constant/variable amplitude fretting fatigue loading. The proposed design methodology makes use of the Modified Wöhler Curve Method (MWCM), applied in conjunction with the Theory of Critical Distance (TCD) and the Shear Stress-Maximum Variance Method ( $\tau$ -MVM). In particular, the TCD (applied in the form of the Point Method) is used to take into account the damaging effect of the multiaxial stress gradients acting on the material in the vicinity of the contact region. The time-variable linear-elastic stress state at the critical point is then post-processed according to the MWCM which is a bi-parametrical criterion that estimates fatigue lifetime via the planes experiencing the maximum shear stress amplitude. Finally, the  $\tau$ -MVM is used to calculate the stress quantities relative to the critical plane whose orientation is determined numerically by selecting the plane containing the direction experiencing the maximum variance of the resolved shear stress. Further, this direction is also used to perform the cycle counting by directly applying the classic Rain-Flow Method to post-process the resolved shear stress. The overall accuracy and reliability of the proposed approach is checked against a large number of new experimental results that were generated in the Sheffield Structures Laboratory under variable amplitude fretting fatigue loading.

#### Biographical Sketch:

Luca Susmel studied his undergraduate degree in the Department of Mechanical Engineering at the University of Padova, Italy, and completed his PhD between Padova and Dublin, Ireland.

From 2001 to 2011 he spent at least six months every year lecturing and doing research in the Department of Mechanical and Manufacturing Engineering at Trinity College, Dublin. In 2005, he was appointed Associate Professor in Structural Integrity at the University of Ferrara, Italy. He joined the Sheffield Department of Civil and Structural Engineering in 2011 to continue his research on the fatigue and fracture behaviour of engineering materials, components and structures.

Since 1998 Luca has focussed his attention mainly on problems related to the structural assessment of engineering materials and components. By working both in Italy (University of Padova, University of Ferrara, University of Udine), in Ireland (Trinity College, Dublin) and in the UK (University of Sheffield) he has devised several novel engineering methods suitable for designing components (experiencing stress concentration phenomena of all kinds) against static, dynamic, and fatigue failures. Luca's modus operandi involves taking a conjoint theoretical and experimental approach to cracking problems and all the design methods he has formalised so far have been fully validated through systematic experimental work. Luca has unique expertise in designing notched and welded components against constant and variable amplitude multiaxial fatigue.

The work done in the above research areas has led to a large number of scientific articles published in international peer-reviewed scientific journals as well as to a book devoted to multiaxial fatigue

assessment. His scientific papers have attracted significant interest from the international scientific community, as it is evidenced by his h-index as well as by the total number of citations. He is a member of the Editorial Boards of the two leading international journals in the fatigue and fracture field, namely "International Journal of Fatigue" and "Fatigue & Fracture of Engineering Materials & Structures". Luca is also the Associate Editor of "Frattura ed Integrità Strutturale: The International Journal of the Italian Group of Fracture" and the Editor-in-Chief of "Theoretical and Applied Fracture Mechanics" (published by Elsevier) which is one of the top journals in the fracture mechanics field.

In terms of the transfer of his research outcomes into engineering practice, in recent years Luca's expertise has been sought on many occasions by a number of European and non-European structural engineering companies that have successfully applied the approaches developed by Luca to design real components and structures.

Luca's work has applications beyond traditional structural civil engineering. For example, in the past, he collaborated with General Motors (via American company ADACS Inc.) on the fatigue design of engines, and with Italian Company Filippi on the determination (in their Olympic medal winning boats) of the loads being applied by athletes during rowing.

## CONFERENCE PROGRAM SUMMARY

### Monday 2 August 2021

Time	Session
10:00 am to 10:15 am	Opening address
10:15 am to 11:00 am	Keynote lecture
11:10 am to 1:20 pm	Fatigue 1
1:20 pm to 2:00 pm	Break
2:00 pm to 4:20 pm	Fracture 1

### Tuesday 3 August 2021

Time	Session
09:30 am to 11:10 am	Fracture 2
11:10 am to 11:20 am	Break
11:20 am to 1:20 pm	Wear 1
1:20 pm to 2:00 pm	Break
2:00 pm to 2:30 pm	Posters session
2:30 pm to 2:45 pm	Conference closing address

**Monday 2 August 2021**

10:00 am to 10:15 am	<b>Opening address:</b> <u>Prof. Magd Abdel Wahab</u> , Ghent University, Belgium
10:15 am to 11:00 am	<b>Keynote lecture:</b> Critical plane and critical distance approaches to assess damage under variable amplitude fretting fatigue loading, <u>Professor Luca Susmel</u> , the University of Sheffield, UK
<b>Session Fatigue 1</b>	
11:00 pm to 11:20 pm	FFW1241: Change in Surface Topography of Structural Steel under Cyclic Plastic Deformation, <u>Aleena Saleem</u> , Hiroshi Tamura, and Hiroshi Katsuchi
11:20 am to 11:40 am	FFW1233: Pose optimization of stop hole for fretting fatigue crack propagation, <u>Qingming Deng</u> , Magd Abdel Wahab
11:40 am to 12:00 am	FFW1226: Numerical analysis of the effect on wear on crack propagation in fretting by linear elastic fracture mechanics, <u>S. Wang</u> and M. Abdel Wahab
12:00 pm to 12:20 pm	FFW1220: Comparative study of crack initiation criteria for flat–flat contacts subjected to fretting fatigue of drive-train components, <u>Denny Knabner</u> , Sebastian Vetter, Lukáš Suchý and Alexander Hasse
12:20 pm to 12:40 pm	FFW1191: Assessment of a Thermal Fatigue Test Using Open Source CAE and Elastic FEA-based Simplified Method, <u>Shosuke Mivahira</u> and Terutaka Fujioka
12:40 pm to 1:00 pm	FFW1189: Simple Fatigue Crack Propagation Evaluation by Enhanced Reference Stress Method using Open-Source CAE, <u>Bohua Li</u> and Terutaka Fujioka
1:00 pm to 1:20 pm	FFW1186: Fatigue Life Prediction under Interspersed Over-load in Constant Amplitude Loading Spectrum via Crack Closure and Plastic Zone Interaction Models - A Comparative Study, Chandra Kant, <u>G.A. Harman</u>
1:20 pm to 2:00 pm	<b>Break</b>
<b>Session Fracture 1</b>	
2:00 pm to 2:20 pm	FFW1234: Analytical expression of stress intensity factor in cylindrical objects, <u>Levan Antashvili</u> , Teimuraz Namicheishvili
2:20 pm to 2:40 pm	FFW1222: Shear failure analysis with modelling multiple discontinuities in a concrete beam using XFEM, <u>A. Faron</u> and G.A. Rombach
2:40 pm to 3:00 pm	FFW1238: Tuning the mechanical properties of the viscoelastic materials, for the improvement of their adhesive performance, Elena Pierro, Luciano Afferrante and Giuseppe Carbone
3:00 pm to 3:20 pm	FFW1217: Modeling of adhesive contact of elastic bodies with regular microgeometry, <u>Yulia Makhovskaya</u>
3:20 pm to 3:40 pm	FFW1194: Fracture Micro Mechanism of Cryogenically Treated Ledeburitic Tool Steel, <u>Peter Jurčí</u> , Jana Ptačinová and Ivo Dlouhý
3:40 pm to 4:00 pm	FFW1184: Strength of solder and adhesive joints of copper sheets, Anna Rudawska, <u>Jakub Szabelski</u> , Izabela Miturska and Elżbieta Doluk
4:00 pm to 4:20 pm	FFW1182: Fracture and Wear Resistance of Tubular Expansion Mandrel, <u>Sayyad Zahid Qamar</u> , Tasneem Pervez

## Tuesday 3 August 2021

Session Fracture 2	
09:30 am to 09:50 am	FFW1192: Fatigue Behaviour and Microstructural Study of A286 Precipitation-Hardened Superalloy for a Jet Turbine Disk, <b><u>Beatriz González Caballero</u></b> , M Pilar Valles González, María García-Martínez, Ana Pastor Muro
09:50 am to 10:10 am	FFW1235: Prediction of surface roughness model in turning of AISI 4140 steel using factorial design and artificial neural network, Yusuf Şahin, <b><u>Acar Can Kocacıcak</u></b> , Senai Yalçınkaya
10:10 am to 10:30 am	FFW1232: Unloading of low velocity impact between elastic and elastic-plastic bodies, <b><u>Chuanqing Chen</u></b> , Magd Abdel Wahab, Qiao Wang, Xiaochun Yina
10:30 am to 10:50 am	FFW1213: Mode I crack in elastically identical bimaterial joined by under-matched weld interlayer: a new theoretical model, <b><u>Sunil Bhat</u></b> and H. Adarsha
10:50 am to 11:10 am	FFW1179: Design of an experiment to analyze modal parameters in a crack and without crack conditions in the presence of thermal and mechanical vibration, <b><u>Khangamlung Kamej</u></b> and Muhammad A. Khan
11:10 am to 11:20 am	<b>Break</b>
Session Wear 1	
11:20 am to 11:40 am	FFW1236: A Numerical Study on Fretting Wear of Inconel 718 Alloy Processed by Ultrasonic Nanocrystal Surface Modification, <b><u>Chao Li</u></b> , Ruslan Karimbaev, Shengjie Wang, Auezhan Amanov and Magd Abdel Wahab
11:40 am to 12:00 pm	FFW1218: Numerical fretting wear simulation of deep groove ball bearing under radial variable load, <b><u>David Cubillas</u></b> , Mireia Olave, Iñigo Llavori, Ibai Ulacia, Jon Larrañaga, Aitor Zurutuza and Arkaitz Lopez
12:00 pm to 12:20 pm	FFW1203: Contribution Self-Lubrication Mechanism of New Antifriction Copper-Based Composites in the Vehicles' Heavy-Loaded Friction Units, <b><u>Krzysztof Jamroziak</u></b> and Tetiana Roik
12:20 pm to 12:40 pm	FFW1198: Wear behavior of bovine and porcine bone vs biocompatible synthetic materials, case of knee prosthesis, <b><u>M. Castillo Sánchez</u></b> , D. Zarate Lara, M. Velázquez Vázquez, G. Rodríguez Castro, L. H. Hernández Gómez
12:40 pm to 1:00 pm	FFW1170: Wear particle dynamics drive the difference between repeated and non-repeated reciprocated sliding, <b><u>Feng-Chun Hsia</u></b> , Fiona M. Elam, Daniel Bonn, Bart Weber and Steve E. Franklin
1:00 pm to 1:20 pm	FFW1165: Mild wear at multi-asperity interfaces: the role of contact pressure, <b><u>Cyrian Leriche</u></b> , Feng-Chun Hsia, Steve Franklin, Bart Weber
1:20 pm to 1:40 pm	FFW1227: Influence of graphene-based nanostructures morphology on the tribology properties in zirconia composites, <b><u>Carmen Muñoz-Ferreiro</u></b> , Rocío Moriche, Ángela Gallardo-López, Rosalía Poyato, Felipe Gutiérrez-Mora
1:40 pm to 2:00 pm	<b>Break</b>
2:00 pm to 2:30 pm	<b>Poster presentations + Discussions</b>

## Tuesday 3 August 2021

Poster session	
2:00 pm to 2:30 pm	FFW1242: The geometric and tribometric characterization of the friction components of an artificial hip joint, <b>Magdalena Niemczewska-Wójcik</b> , Adam Gąska
	FFW1219: Durability of Cement Mortars with a High Proportion of Mineral Admixture after Bacterial Environment Exposure, <b>Adriana Estokova</b> , Michaela Smolakova and Alena Luptakova
	FFW1178: Impact of Mechanical Treatment on Strength of Steel Adhesive Joints, <b>Anna Rudawska</b> and Magd Abdel Wahab, Izabela Miturska, Jakub Szabel-ski, Eżbieta Doluk, Dana Stančeková
	FFW1166: Modifying a Coffin-Manson curve of an aluminium alloy AlSi9Cu3 by considering an effect of macro porosity, Dejan Tomazincic, <b>Jernej Klemenc</b>
	FFW1239: Numerical and Experimental Investigation of Shape Complexity in Metal Extrusion, Josiah Cherian Chekotu, <b>Sayyad Zahid Qamar</b> and Sayyad Basim Qamar
2:30 pm to 2:45 pm	<b>Conference closing address – Prof. M Abdel Wahab</b>

## FFW 2021

### INSTRUCTIONS TO SPEAKERS

- Your online oral presentation should not exceed **15 minutes**. If your presentation stretches over **15 minutes**, you must end your presentation to ensure strict adherence to the programme.
- Your presentation will be followed by a Question and Answer (Q/A) session not exceeding **5 minutes**.
- Please upload a pre-registered video presentation in your submission system. This pre-registered presentation will be used as backup and for voting for the best oral presentation award.
- All uploaded pre-registered videos will be available on the conference website:  
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### INSTRUCTIONS TO POSTER PRESENTERS

- Please design your poster in one A4 paper.
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- During the poster's session Question and Answer (Q/A) is planned, and posters presenters are requested to be available to answer the questions.