Transilvania University of Brașov
INTERDISCIPLINARY DOCTORAL SCHOOL

ADMISSION TO DOCTORAL STUDIES **Session September 2024**

Field of doctoral studies: Mechanical Engineering
Doctoral supervisor: Prof. dr. eng. Mariana Domnica STANCIU

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *Evaluation of the riveting process and the quality of riveted joints in aerospace and other applications*
Contents / Main aspects to be considered - *types of riveted joints; assembly technology; calculation of riveted joints; testing and simulation of complex structures with riveted joints*
Recommended bibliography: Hongwei Zhao, Jiangjing Xi, Kailun Zheng, Zhusheng Shi, Jianguo Lin, Kamran Nikbin, Shihui Duan, Binwen Wang, A review on solid riveting techniques in aircraft assembling, Manufacturing Rev. 7, 40 (2020), https://doi.org/10.1051/mfreview/2020036; C. Lei, Y. Bi, J. Li, Y. Ke, Slug rivet assembly modeling and effects of procedure parameters on the quality of riveted lap joints, Adv. Mech. Eng. 10 (2018) 1–12; Z. Cao, Y. Zuo, Electromagnetic riveting technique and its applications, Chinese J. Aeronaut. 33 (2020) 5–15 J. Papuga, J. Stejskal, Effect of some riveting process parameters on the fatigue life of double-shear lap joints, Eng. Fail. Anal. 134 (2022) 106008, http://dx. doi.org/10.1016/j.engfailanal.2021.106008. https://zenithair.net/riveted-joints/ https://www.goebelfasteners.com/product-category/blind-rivets/
Prerequisites / Remarks: *knowledge of the physical and mechanical properties of the materials used for riveted joints is required; knowledge of working with analysis software solutions; programming knowledge; simulation and experimental testing skills in mechanical engineering*
X☐ Scientific Doctorate (full-time only) **☐ Professional Doctorate – in the fields of Music and Science of sport and physical education (full-time or part-time)**
X☐ without tuition fee (state budget funded) **X☐ with tuition fee or with funding from other sources than the state budget**

TOPIC 2: *Optimizing the structural design of composite blades*
Contents / Main aspects to be considered - *minimum weight structural design for composite and/or metallic main rotor blades subject to aerodynamic performance, material strength, autorotation and frequency constraints; testing constructive variants for dynamic stress*
Recommended bibliography: Kozaczuk, K.J. (2018), "Composite technology development based on helicopter rotor blades", Aircraft Engineering and Aerospace Technology, Vol. 92 No. 3, pp. 273-284. https://doi.org/10.1108/AEAT-12-2017-0260 Voicu, A. D., Hadăr, A., Vlăsceanu, D., Improving the mechanical behavior of a helicopter tail rotor blade through the use of polyurethane foams, Revista de chimie, 70 (11), p. 4123-4127, 2019, Yu, G.; Li, X.; Huang, W. Performance and Damage Study of Composite Rotor Blades under Impact. Polymers 2024, 16, 623. https://doi.org/10.3390/polym16050623 Michał Sałaciński, Rafał Kowalski, Michał Szmidt, Sławomir Augustyn A New Approach To Modelling And Testing The Fatigue Strength Of Helicopter Rotor Blades During Repair Process, Fatigue Of Aircraft Structures, Volume 2019: Issue 11, Pp. 56-67, DOI: 10.2478/fas-2019-0006.
Prerequisites / Remarks: *knowledge of the physical and mechanical properties of composite materials used for aerodynamic constructions is required; knowledge of working with analysis software solutions; programming knowledge; simulation and experimental testing skills in mechanical engineering*
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TOPIC 1: Evaluation of dynamic and acoustic properties of violins with modified interfaces
Content / Main aspects to be considered ◘ vibromechanical properties of unvarnished and varnished resonance wood; ◘ development and implementation of violin testing methodology; ◘ comparative analysis of the dynamic and acoustic properties of violins varnished with different types of varnishes (violin testing, development of analysis programs, statistical analysis)
Recommended bibliography: ▪ Bucur, V. & Arher, R.R. (1984) Elastic constants for wood by an ultrasonic method. Wood Sci Technol 18, 255–265. ▪ Bucur, V. (2006) Acoustics of Wood, 2nd ed., Springer: Berlin, Germany, 173–196. ▪ Buksnowitz, C., Teischinger, A., Müller, U., Pahler, A. & Evans, R. (2007) Resonance wood [Picea abies (L.) Karst.] – evaluation and prediction of violin makers' quality-

grading. J. Acoust. Soc. of Am. (121), 2384–2395.
- Crețu, N., Roșca, I.C., Stanciu, M.D., Gliga, V.G. & Cerbu, C. (2022) Evaluation of wave velocity in orthotropic media based on in-trinsic transfer matrix. Exp. Mech. 62, 1595–1602.
- Danihelova, A., Spisiak, D., Halachan, P., Gergel, T. & Kruzlikova, L. (2015) Physico-acoustical characteristics of usual and unusual wood species, Akustika, (35), 22–27.
- Dinulica, F., Stanciu, M.D. & Savin A (2021) Correlation between anatomical grading and acoustic-elastic properties of resonance spruce wood used for musical instruments. Forests 12(8), 1122.
- Dinulica, F., Savin, A. & Stanciu, M.D. (2023) Physical and Acoustical Properties of Wavy Grain Sycamore Maple (Acer Pseudoplatanus L.) Used for Musical Instruments. Forests, (14), 197.
- J. Milton, J. S. Arnold: "An introduction to probability and statistics: principles and applications for engineering and the computing sciences". Second edition. McGraw-Hill publishing company, New York, USA, 593–599, 1990
- Stanciu, M.D.; Mihalcica, M.ș.a.: Dinamica Viorii (in Romanian Language), Ed. Universității Transilvania din Brașov, (2022).

Prerequisites / Remarks: knowledge of the physical, elastic and acoustic properties of tonewood; knowledge of dynamic analysis based on software solutions; programming knowledge; knowledge of basic acoustics.

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TOPIC 2: Acoustic fingerprinting of stringed musical instruments (violins) based on digitized musical instrument models

Content / Main aspects to be considered

◘ vibromechanical properties of naturally and artificially aged resonance wood;

◘ the development of an innovative experimental platform for acoustic imprinting of stringed musical instruments using as a source of excitation and imprinting, the recorded sounds of musical instruments of national/international heritage that will be constituted in digitized acoustic models;

◘ analysis of the dynamic and acoustic properties of acoustically imprinted violins (violin testing, development of analysis programs, statistical analysis)

Recommended bibliography:

- Jirouš-Rajković, V.; Miklečić, J. Enhancing Weathering Resistance of Wood—A Review. Polymers. 2021, 13, 1980.

- Kuo, M. L. and Hu, N.H. Ultrastructural changes of photodegradation of wood surfaces exposed to UV. Holzforschung. 1991, 45(5): 347–353.
- Froidevaux, J.; Volkmer, T.; Ganne-Chédeville, C.; Gril, J.; Navi, P. Viscoelastic behavior of aged and non-aged spruce wood in the radial direction. Wood Mater Sci Eng. 2012, 7(1), 1–12.
- Kránitz, K.; Deublein, M; Niemz, P. Determination of dynamic elastic moduli and shear moduli of aged wood by means of ultrasonic devices. Materials and Structures. 2014, 47(6): 925–936
- Noguchi, T.; Obataya, E.; Ando, K. Effects of aging on the vibrational properties of wood. J. of Cultural Heritage. 2012; 13(3)S; S21–S25; https://doi.org/10.1016/j.culher.2012.02.008.
- Bucur, V. (2006) Acoustics of Wood, 2nd ed., Springer: Berlin, Germany, 173–196.
- Danihelová, A.; Vidholdová, Z.; Gergeľ, T.; Spišiaková Kružlicová, L.; Pástor, M. Thermal Modification of Spruce and Maple Wood for Special Wood Products. Polymers. 2022, 14, 2813. https://doi.org/10.3390/polym14142813.
- Mania, P.; Gąsiorek, M. Acoustic Properties of Resonant Spruce Wood Modified Using Oil-Heat Treatment (OHT). Materials 2020, 13, 1962. https://doi.org/10.3390/ma13081962.
- Stanciu, M.D.; Mihalcica, M.ș.a.: Dinamica Viorii (in Romanian Language), Ed. Universității Transilvania din Brașov, (2022).

Prerequisites / Remarks: knowledge of the physical, elastic and acoustic properties of wood for musical instruments, as well as knowledge of the effects of natural/artificial aging on the physico-mechanical properties of anisotropic materials; knowledge dynamic analysis software solutions; programming knowledge; knowledge of acoustics; technical skills.

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Doctoral supervisor,

Prof. dr. ing. Mariana Domnica STANCIU

Signature

Coordinator of the field of doctoral studies,

Prof. dr. ing. Sorin VLASE

Signature