Curriculum vitae for Michael Muskulus

PERSONAL INFORMATION

Family name, First name:	Muskulus, Michael		
Date of birth:	04.11.1974	Sex:	Male
Nationality:	German		
Researcher identifier (ORCID):	https://orcid.org/0000-0001-8826-8164		
URL for personal webpage:	https://www.ntnu.edu/employees/michael.muskulus		

HIGHER EDUCATION/OTHER TRAINING

	Subjects/degree/	Name of institution, country
2010	Applied mathematics / **PhD**	Mathematical Institute, Leiden University, The Netherlands
2003	Theoretical physics / **Dipl.-Phys.** (MSc)	Hamburg University, Germany

POSITIONS

Current Position

	Job title/name of employer/country
2014-	**Professor** for offshore wind technology / Department of Civil and Environmental Engineering / Norwegian University of Science and Technology NTNU / Norway

Previous positions held

	Job title/name of employer/country
2013-2014	European Academy of Wind Energy (EAWE) https://eawe.eu/ - **President**
2012-2014	**Associate professor** for offshore wind technology / Department of Civil and Environmental Engineering, Norwegian University of Science and Technology NTNU, Norway
2010-2012	**Postdoctoral fellow** / Department of Civil and Transport Engineering / Norwegian University of Science and Technology NTNU / Norway
2004-2009	**PhD student** / Mathematical Institute, Leiden University / The Netherlands
2003-2004	**Researcher** / Max Planck Institute for Meteorology, Hamburg / Germany

PROJECT MANAGEMENT EXPERIENCE

	Project/topic/role in project/funding from
2021-	X-ROTOR: X-shaped Radical Offshore wind Turbine for Overall cost of energy Reduction (XROTOR) EU RIA / **Work package leader** and PhD supervisor / European Commission H2020
2019-	FLOAting Wind Energy netwoRk (FLOAWER) EU MSCA ITN / **Task leader** and PhD supervisor / European Commission H2020
2018-	Engineering speed modelling of realistic fatigue for all the individual turbines in wind parks by representative pre-calculations (NEXTFARM KPN) / **Local project leader** and supervisor / Research Council of Norway
2014-2018	Advanced Wind Energy Systems Operation and Maintenance Expertise (AWESOME) EU MSCA ITN / **Work package leader** / European Commission H2020
2014-2018	Advancing BeYond Shallow WaterS (ABYSS DSF): Optimal design for offshore wind turbine support structures / **Local project leader** and PhD supervisor / Danish Council for Strategic Research

2014-2017	Integrated Research Programme on Wind Energy (IRPWIND) / **Partner contact** and **task leader** / European Commission FP7
2012-2017	Norwegian Centre for Offshore Wind Technology (NOWITECH FME) / **Vice-chair Scientific Committee**, **Task leader** and PhD supervisor / Research Council of Norway
2011-2015	High Power, High Reliability Offshore Wind Technology (HiPRwind) / **Work package leader** / European Commission FP7
2012-2013	Innovative foundation structure for offshore wind turbines IPN / **Local project leader** and researcher / Research Council of Norway

EXPERIENCE FROM NATIONAL/INTERNATIONAL COLLABORATION/NETWORKING

	Activity or project / tasks and responsibilities / context/programme/framework of the collaboration and names of key partners (companies, institutions)
2021-	Norwegian Research Center on Wind Energy (NorthWind FME) – Member Scientific Advisory Board
2018-	Nordic Offshore Wind Research & Innovation Centre (NOWRIC) https://www.sintef.no/en/projects/nowric/ – Vice-chair NTNU
2018-	NTNU Team Wind https://www.ntnu.edu/energy/wind-power - Vice Chair
2017-	NTNU Coordinator for European Energy Research Alliance (EERA) JP Wind
2012-	European Academy of Wind Energy (EAWE) https://eawe.eu/ Partner contact and board member
2012-2016	NTNU Faculty of Engineering Science and Technology – Strategic Research Area Manager for Offshore Wind

OTHER MERITS RELEVANT TO THE PROJECT
Supervision of graduate students and research fellows

	No. of	MSc/PhD/Postdoc	Notes
2012-	35+	Master students	
2012-	15	PhD students	13 as main supervisor (4 on-going), 2 as co-supervisor
2012-	4	Postdocs	All as main supervisor (1 on-going)

Teaching activities

	Teaching position – topic, name of university/institution/country
2012-	TBA4275 "Dynamics response to irregular loads" (Random vibrations) at Master level
2012-	BA8607 "Design of offshore wind turbines" at PhD level (Graduate course)
2007-	Lectures at summerschools (on dynamical systems and optimization of wind turbines)

Other relevant professional experiences (selection)

Year	Description - Role
2018-	HanseWissenschaftsKolleg Institute for Advanced Study, Delmenhorst, Germany – Scientific Advisory Board Member
2016-2018	Renewable Energy Marine Structures (REMS) Center for Doctoral Training, Cranfield & Oxford University – Advisory Board Member
2015-2017	Wind Center for Doctoral Training, Strathclyde University – External Examiner
2015-	Wind Energy Science journal – Associate editor
2015-	External examiner for 16 PhD defences (DTU Wind Energy, Leibniz University Hannover, Cranfield University, VU Brussels, TU Delft, GeorgiaTech, Aalborg, Universität Stuttgart, University of Zaragoza, Polytechnic Institute of Paris)

2014-	Grant application reviewer for Innovation & Technology Fund ITC (Hongkong); SUPERGEN WindHub (UK); Research Foundation Flanders FWO (Belgium); Israel Ministry of Science, Technology & Space; Scientific Commission of the State of Niedersachsen (Germany); HC Ørsted PostDoc Programme at DTU (cofunded by Marie Curie Actions); EuroTech PostDoc programme
2013-2019	European Wind Energy Association EWEA / WindEurope – Science & Research Topic Leader and Scientific Programme Coordinator of EWEA/WindEurope conferences (WindEurope Annual Event, WindEurope Offshore Wind)
2013-2016	Journal of Ocean and Wave Energy – Editor
2012-	International Ocean and Polar Engineering Conference (ISOPE), Renewable Energy & Environment Symposium – Technical Programme Committee member and co-chair
2012-	EERA Deep Sea Offshore Wind R&D Conference (EERA DeepWind) – Conference Co-Chair
2004-	Reviewer for 30+ international journals and 6+ international conferences

KEY EXPERTISE

Structural dynamics, load simulation and design: Extensive experience with vibrations of structures and the structural design of wind turbines, especially on fixed-bottom steel support structures (jackets, monopiles). Wide knowledge of theoretical aspects of dynamics and expensive experience in modelling and analysing wind turbines by computer simulation. Worked extensively with alternative concepts (e.g. floating wind turbines, vertical axis wind turbines, turbines on full lattice towers, etc). Practical knowledge of identification of structural properties from signals, e.g. for fatigue damage prediction and monitoring in wind turbines, including relevant issues of data analysis and programming (in Fortran, C++, Python, Matlab, R, Julia).

Initiating and leading new research initiatives: Pioneered computer-aided optimization of wind turbine structures and demonstrated that it is feasible in practice. The first research group in the world to use gradient-based optimization with analytical sensitivies for optimization of support structures. Moreover, some relevant contributions to fatigue monitoring of wind turbines, with some pioneering uses of statistical models in wind energy. Now trying to use this to address uncertainties, aiming to demonstrate reliability-based design optimization of wind turbines in practice.

Wide, general knowledge of wind energy: Scientific Track Chair for the largest European wind energy conference (WindEurope Annual Event) since 2012, resulting in broad, high-level knowledge of what is going on in wind energy research (e.g. from developing the scientific conference programme together with the industry). Jury member for WindEurope conference poster awards. Co-organizer and committee member for various conferences in wind energy (e.g. EERA DeepWind R&D Seminar, ISOPE Renewable Energy & Environment Symposium, Wind Energy Science conference).

International relations: NTNU's representative in the European Academy of Wind Energy (EAWE), the premier European network for the promotion of wind energy science. Extensive international contacts through this network. Involved in high-level work on knowledge gaps, leading to publication in Science.

Educational experience: Successfully participated in NTNU's pedagogic competence programme (PedUp, 200 hours). Almost a decade experience in teaching the design of wind turbines and the science of wind energy to students (at master and PhD level). Contributions to various summerschools (e.g. on floating wind turbines). Two years of experience with recording lectures for offline viewing and distance-learning, including the use of discussion forums, online exercise groups, and online oral exams. Preparation of fully illustrated 170+ pages of lecture notes for a course on mechanical vibrations.

PUBLICATIONS

Total number of publications: 140 (51 journal articles, 89 conference papers or book chapters)
2803 citations, h-index **29**, i10-index **73** (Google Scholar)
Full publication list: https://app.cristin.no/persons/show.jsf?id=33309

Short-list of 10 most important publications:

1. Stieng LES, **Muskulus M**: *Reliability-based design optimization of offshore wind turbine support structures using analytical sensitivities and factorized uncertainty modeling*. Wind Energy Science, 2020. vol. 5, pp. 171-198. https://doi.org/10.5194/wes-5-171-2020
2. Veers P, Dykes K, Lantz E, Barth S, Bottasso C, Carlson O, **et al**.: *Grand challenges in the science of wind energy*. Science, 2019. vol. 366, pp. eaau2027. https://doi.org/10.1126/science.aau2027
3. Matha D, Lemmer F, **Muskulus M**: *Offshore wind turbines with bottom-fixed or floating substructures*. In: *Wind energy modeling and simulation – Volume 2: Turbine and System* (ed. P Veers), IET, 2019. chapter 5. https://doi.org/10.1049/PBPO125G_ch5
4. Watson S, More A, Reis V, Baniotopoulos C, Barth S, Baroli G, **et al**.: *Future emerging technologies in the wind power sector: a European perspective.* Renewable & Sustainable Energy Reviews, 2019. vol. 113, 109270. https://doi.org/10.1016/j.rser.2019.109270
5. Ziegler L, Cosack N, Kolios A, **Muskulus M**: *Structural monitoring for lifetime extension of offshore wind monopiles: Verification of strain-based load extrapolation algorithm.* Marine Structures, 2019. vol. 66, pp. 154-163. https://doi.org/10.1016/j.marstruc.2019.04.003
6. Seyr H, **Muskulus M**: *Decision support models for operations and maintenance for offshore wind farms: A review*. Applied Sciences, 2019. vol 9, pp. 278: 1-30. https://doi.org/10.3390/app9020278
7. Oest J, Sandal K, Schafhirt S, Stieng LE, **Muskulus M**: On gradient-based optimization of jacket structures for offshore wind turbines. Wind Energy, 2018. vol. 21, pp. 953-967. https://doi.org/10.1002/we.2206
8. van Kuik GAM, Peinke J, Nijssen R, Lekou D, Mann J, **et al**: *Long-term research challenges in wind energy – a research agenda by the European Academy of Wind Energy*. Wind Energy Science, 2016. vol. 1, pp.1-39. https://doi.org/10.5194/wes-1-1-2016
9. **Muskulus M**: *Simplified stochastic rotor load models and fatigue damage estimation for offshore wind turbines*. Proceedings of the Royal Society London A, 2015. vol. 373, 20140347. http://dx.doi.org/10.1098/rsta.2014.0347
10. **Muskulus M**, Verduyn-Lunel S: *Wasserstein distances in the analysis of time series and dynamical systems*. Physica D, 2011. vol. 240, pp. 45-58. https://doi:10.1016/j.physd.2010.08.005

AWARDS

- Seven best conference paper / poster awards (co-authored with graduate students) at major international conferences: COMADEM 2017, OMAE 2016, EERA DeepWind 2015, EWEA Offshore Conference 2014, DeepWind 2012, IPMI 2009, BIOMAG 2008.

FELLOWSHIPS

- Short-term fellow 2017 on "Support structure optimization of offshore wind turbines", HanseWissenschaftsKolleg Institute of Advanced Study, Delmenhorst, Germany.