

Aeroelasticity and Unsteady Aerodynamics in Turbomachinery

Overview

In the modern jet engines and gas turbines, the flow-induced vibration of turbomachinery blades is a serious problem in the sense of performance as well as security. During the development of highly-efficient compressors and turbines today, the vibration problems are getting more important due to the performance improvement through weight reduction and loss reduction. Especially, the shock-related unsteady flow and boundary layer separation are quite essential and complicated factors for those vibrational unsteady flows.

In the lecture course, fundamentals of aero elasticity in flow-induced vibration and related unsteady flow phenomena will be introduced for clear understanding of the practical problems in modern turbomachinery. Some analytical methods of flutter problems and typical experimental techniques will be shown based on the fundamental knowledge. Finally, the experiences of vibration problems and some analysis results will be introduced for practical applications.

The primary objectives of the course are as follows:

1. To provide fundamental knowledge of flow-induced vibrations in turbomachinery often experienced in the development of modern compressors and turbines.
2. The basic analytical and experimental methods for understanding the practical vibrations and unsteady flow phenomena will be given in a comprehensive manner.

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| Modules | Monday, May 6 - Friday, May 10, 2019 Number of participants for the course will be limited to fifty (50). |
| You Should Attend If... | <ul style="list-style-type: none">▪ Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories.▪ Students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions. |
| Fees | The participation fees for taking the course is as follows: Participants from abroad : US \$500 Industry/ Research Organizations: Rs. 10,000 Academic Institutions/Faculty : Rs. 5,000 Students & Research Scholars: Rs. 2000 The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis. |

The Faculty



Dr. Toshinori Watanabe is Professor of the Department of Aeronautics and Astronautics at the University of Tokyo. He received his B.S., M.S. and Ph.D. in Aeronautics from University of Tokyo in 1981, 1983 and 1987, respectively. From 1993, he has been working at the Department of Aeronautics and Astronautics at the University of Tokyo.

His research interest covers jet propulsion system, gas turbines, internal aero-thermo dynamics, aero elasticity, aero acoustics, two-phase flow, bio-fluid mechanics, and related areas of energy technology. Currently, he is leading the researches of aerodynamic instability of compressor, cascade flutter phenomena, broad-band fan noise, liquid propellant behavior in rocket system, and so on, funded by Japanese government and gas turbine, jet engine industries. He has been acting as the Editor-in-chief of the Journal of the Japan Society for Aeronautical and Space Sciences, International Journal of Gas Turbine, Propulsion and Power Systems. At present, he is the President-elect of the Gas Turbine Society of Japan (GTSJ), and an Executive Committee member of Global Power and Propulsion Society (GPPS). For Japanese government, he serves as the Chair of the Committee for Technology Roadmap of Aero-engines, the Vice-chair of Technical Committee for the national project of Environmentally-Friendly Small-size Jet Engine Development, a member of Evaluation Committee for national project of power systems development (IGCC, AHAT, 1700 deg.C class gas turbines), Advisory Committee for nuclear power stations, etc.



Dr. Chetan Mistry is Assistant Professor of the Department of Aerospace Engineering at IIT Kharagpur. Prof. Mistry did his BE (Mechanical Engineering), ME (Turbomachines) from NIT, Surat and PhD from IIT Bombay (Aerospace Engineering). He has more than 15 years of teaching experience at various positions. His area of research is Design and

performance augmentation strategies for turbomachines, Aerothermodynamics of turbomachines, Experimental and Computational (CFD) study of turbomachines, Contra rotating axial flow turbomachines aerodynamics.



Dr. Dipak Kumar Maiti is Professor and Head of the Department of Aerospace Engineering at IIT Kharagpur. Prof. Maiti did his B.E. degree in civil engineering in the year 1991 from Bengal Engineering College (currently IEST), Shibpur under Calcutta University. Subsequently he was awarded M.Tech and PhD degrees from Department of Aerospace Engineering, IIT Kharagpur in the years 1993

and 1997 respectively. He is a national scholarship holder and MHRD scholar during 10+/B.E. and Master/Doctoral programs respectively. His primary research areas are analysis of composite structures under static and dynamic loadings employing various higher-order shear deformation theories, damage modelling of isotropic and composite materials, smart structures, Aeroelasticity / aeroservoelasticity, structural health monitoring, etc. Before joining IIT Kharagpur, he had worked for Aeronautical Development Agency, Bangalore in LCA (TEJAS) project mainly in the area of Aeroelasticity, gust response analysis, vibration analysis of LRUs from qualification point of view.

Course Co-ordinator

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