



**MEMORANDUM OF UNDERSTANDING
BETWEEN
UNIVERSITY OF SOUTH CAROLINA
AND
KUBAN STATE UNIVERSITY**

In order to promote educational excellence, academic ties and international cooperation, **the University of South Carolina (USC, USA)** and **Kuban State University (KubSU, Russia)**, hereafter referred to individually as "Party" or collectively as "Parties", agree to establish academic and scholarly collaboration in areas of mutual interest.

A. COOPERATION

1. The institutions seek to promote activities which may include:
 - Collaborative research, lectures, symposia and cooperation in training projects for specific areas of interest;
 - Faculty and scholar exchange between the two universities;
 - Exchange of undergraduate and/or graduate students;
 - Encouragement of units to explore initiatives such as student, faculty and research scholar exchanges to promote cross-cultural learning and research;
 - Exploration of topics for joint proposals for international funding;
 - Initiation of discussion for cooperative development of courses and academic programs.
2. The institutions shall decide, through consultation, the specific areas and details of cooperation within the framework of this Memorandum of Understanding.
3. Some areas may need additional consultation with faculty and academic units to explore potential mutually beneficial collaborative research projects and require additional agreements. One such specific area of collaboration is included in the attached Appendix to this Memorandum of Understanding (MOU).

B. TERMS AND CONDITIONS

1. This Memorandum of Understanding (hereafter "Agreement") shall be effective upon approval and signature by both parties.
2. This Agreement shall continue in full force and effect for three years from the date of the last signature on this Agreement. The Agreement shall be automatically renewed for another three year term unless terminated.
3. Either Party may terminate this Agreement by providing sixty (60) days written notice to the other Party. Where specific initiatives have been contracted, the contract will supersede this Agreement for the purposes of the specific initiative.

C. REVIEW

The principals of this Agreement will review and align the efforts established under this Agreement on a regular basis, as required.

D. PROPRIETARY INFORMATION

During the term of this Agreement, the Parties, to the extent of their right to do so and as is required for each to perform its obligation hereunder, may exchange proprietary and confidential information. The rights and obligations of the Parties with respect to the exchange of proprietary and confidential information would be defined pursuant to the separate Non-Disclosure Agreement (NDA) signed by the Parties.


E. OBLIGATION OF THE PRINCIPALS

The Memorandum of Understanding is not a contractual obligation between the two principals; and in no way shall conflict with, modify, or negate clauses of any contracts which have been or are to be negotiated between the principals. Each Party will bear all costs, risks, and liabilities incurred by it, arising out of its obligations and efforts under this Agreement.

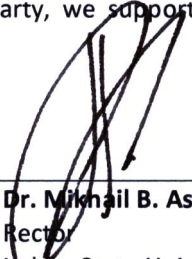
The Parties agree to consult periodically concerning the status of these explorations and other relevant matters.

This Agreement is written in English and Russian; the two versions shall hold equal merit.

While no specific commitment is made by either party, we support and sign this Memorandum of Understanding in recognition of our mutual interests.

 4-15-13

Date
Dr. Harris Pastides
President
University of South Carolina

 4-25-13

Date
Dr. Mikhail B. Astapov
Rector
Kuban State University

APPENDIX

to the Memorandum of Understanding between University of South Carolina and Kuban State University

This Appendix is to define cooperative efforts to develop fundamental and applied research in mechatronics, structural dynamics, applied mathematics and computer modeling of wave processes as well as to create and capitalize on business opportunities in the area of structural health monitoring (SHM), damage detection, and failure prevention.

A. BACKGROUND

1. University of South Carolina:

The Laboratory of Active Materials and Smart Structures (LAMSS), Department of Mechanical Engineering, College of Engineering and Computing, University of South Carolina is recognized worldwide as a center of expertise in the modeling, experimentation, and understanding of structural health monitoring, damage detection, and failure prevention. The LAMSS book *Structural Health Monitoring with Piezoelectric Wafer Active Sensors* (Elsevier, 2008) and the LAMSS journal articles and conference papers are widely cited around the world. LAMSS has developed expertise in the use of piezoelectric wafer active sensor (PWAS) transducers for multi-mode guided wave (GW) interrogation and damage detection. Currently, LAMSS is extending its research into the use of embedded fiber optics technology for online measurement of strains and guided waves. Recently acquired unique equipment for detecting ultrasonic waves in the hundreds of kHz range with fiber Bragg grating (FBG) will be utilized to develop novel guided wave interrogation techniques combining piezoelectric wave generation with FBG optical detection at multiple locations. Another novel and unique fiber optics technology being currently studied consists of optical distributed sensing interrogation that can detect strain values along an optical fiber embedded in the composite with high spatial location resolution and almost continuous locations. LAMSS is developing self-sensing smart structures to determine the presence of service induced damage resulting from accidental impact and/or fatigue.

2. Kuban State University:

The Institute for Mathematics, Mechanics and Informatics (IMMI), Kuban State University is internationally recognized thanks to the investigation into elastodynamic wave processes in complex structures. The research is based on the fundamental mathematics and a thorough preliminary analytical study that involves such tools as integral transforms, complex variables, asymptotic analysis, and residue technique. Such an approach results in efficient low cost computer models and physically clear insight into wave phenomena which provides a specific competitive advantage in international scientific cooperation.

The SHM oriented studies of PWAS excited guided wave propagation and diffraction in composite structures with local inhomogeneities have an important place among the IMMI research. The theoretical methods and computer models developed in this field have been experimentally validated in the course of international collaborative studies with SHM research groups at the Universities of Karlsruhe, Hamburg and Siegen (Germany). Those joint studies have won grant supports from various Russian and European science foundations (RFBR, INTAS, DFG, DAAD, Visby Foundation, NATO research programme and others). The results obtained have been published in leading international scientific journals, presented at authoritative forums and awarded by such competitive scientific awards as the State Prize of Science and Technology (Russia, 2002), DFG Mercator Professorship (Germany, 2007-

2008), Medals of the European Academy (2012) and the Russian Academy of Science (2013). Along with the international links, KubSU develops cooperation with the Russian aviation industry, in particular, with the All-Russian Institute of Aviation Materials (VIAM). In 2012 year a joint KubSU-VIAM laboratory for climate tests was created. Among others, it is aimed at the development of wave non-destructive methods of material condition monitoring.

In education, a set of special courses for under- and postgraduate students has been developed and given within the Applied Mathematics Specialty in 2001-2012 years. Accumulated experience allows it to resume this teaching at the Department of Computer Science and Applied Mathematics and / or at the Physics and Technology Department.

B. RELATIONSHIP OF THE PARTIES

The Parties agree, as appropriate, to collaborate in the theoretical and experimental fundamental research towards the development of practical implementation methodologies and equipment in the area of structural health monitoring, damage detection, and failure prevention. The collaboration may take any of the forms as described in the overarching MOU.

C. RESPONSIBLE PRINCIPALS

1. University of South Carolina

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Dr. Harris Pastides
President
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