

Faculty Innovator Grant 2009
Center for Learning Technologies

Final Report Form

Primary Faculty Name:	Jin Wang
Department:	Math and Statistics
Email Address:	<u>j3wang@odu.edu</u>
Office Phone Number:	683-3916
Project Title: (10 words or less)	Integrate teaching, research and technology in fluid/structure interactions

Other faculty:

Faculty Name:	Department	Email Address	Office Phone Number
Gene Hou	MAE	<u>ghou@odu.edu</u>	683-3728
Miltiadis Kotinis	MAE	<u>mkotinis@odu.edu</u>	683-5939
Shizhi Qian	MAE	<u>sqian@odu.edu</u>	683-3304
Keejoo Lee	MAE	<u>kxlee@odu.edu</u>	683-3733

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1. Describe the specific teaching and learning issues being addressed by the proposal.

Numerical analysis, fluid dynamics and solid mechanics are traditionally different subjects, and are taught in separate courses at different departments. However, there are increasing needs for combined education and research efforts on the analysis and computation of fluid-solid interaction problems. Current graduate and undergraduate curricula do not provide students with sufficient preparations to take on the challenge. Meanwhile, the fast and rich developments in this new area accompany the current state-of-the-art technology in computer modeling, simulation, and visualization. Hence, it is the objective of this project to overcome the curriculum limitation and create a platform that can integrate teaching, technology and research training in this area through a multidisciplinary effort.

2. Describe the revised specific teaching and learning issues being addressed by the proposal (if applicable):

N/A

3. Describe the development activities involved addressing the learning or teaching issue.

This project represents a collaborative effort between 5 faculty members in mathematics and engineering at ODU. The teaching effort starts with fundamental theory and methods in related fields, then proceeds to the research frontier of the fluid-structure interaction problems. The project combines lectures, seminars and independent studies. Students are exposed to both classical and new methods in the fields, and are required to conduct extensive literature survey through homework assignments and course projects. Students also make class presentations on their findings through literature review and independent study.

4. Describe the learning outcomes attained by the project.

The project combines the essential theory and computational methods in numerical analysis, fluid dynamics and solid mechanics, with an emphasis on the interplay of these fields. Students gain knowledge, research training and information technology through the project, and are prepared towards being future researchers, teachers or working professionals in the area of fluid-structure interactions.

5. Describe unexpected outcomes, if any.

N/A

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6. Describe the impact of the completed project on your colleagues, department, college, or community.

The project involves faculty members and students from multi-departments and multi-colleges at ODU, representing a pilot effort in integrating teaching, research and technology in the emerging area of fluid-structure interactions. Such effort will likely have impacts on many applied fields that involve fluid-structure interactions such as ship industry, navy craft operations and design optimizations, as well as wind and wave energy harvesting.

7. Describe how the project can be a model, template, or prototype for use by other instructors.

This project is truly a multidisciplinary effort focused on a new and increasingly important education and research area. It differs from traditional course teaching in that it combines lectures, seminars and independent studies into an integrated teaching, research and technology platform. Students not only gain fundamental knowledge, but also develop creative thinking and independent research skills, all of which are essential to their future research careers. The project thus provides a model for efficient integration of multidisciplinary teaching and research into classroom.

8. Describe the technology used to help address the issues described in the proposal.

The project makes frequent use of computer modeling and simulation to showcase the latest research and technology development in the field. Computer and projector are used in classroom teaching. The lectures, seminars and student presentations are based on a combination of simulation and visualization software, Power Point, PDF, as well as World Wide Web.

9. Describe products, if any, that are a result of the project.

Through the support of this project, a new interdisciplinary graduate course – computational mechanics and fluid-structure interactions (Math725/MAE795) has been created and implemented at ODU since Spring 2010. The course has been well received by faculty and students in sciences and engineering.

10. Describe the future plans for this project, if any.

The faculty members involved in this project will continue their collaboration in teaching, research and technology development in this exciting field of fluid-structure interactions. In addition to the successfully developed graduate course Math725/MAE795, the faculty members are exploring efficient ways to incorporate fluid-structure interactions and their various applications into undergraduate teaching across the colleges of Sciences,

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Engineering, and Education, to deliver these important concepts to the young minds at ODU and to promote the STEM education across multiple colleges at the University.

11. Attach a financial report with updated Budget Plan Matrix.

Final Budget Matrix

Budget Item (equipment, personnel, software, etc.)	Qty	Total Cost	Source of Funds	
			Amount from FIG	Amount from Other Source
Personnel compensation	5	2,400	2,400	0
Computer equipment	1	1,000	600	400