Course Objectives
Seabed and structure interaction involves processes such as flow around and forces on structures (including flow induced vibrations of slender bodies), scour and backfilling processes, as well as liquefaction processes around marine structures. The past three decades have witnessed substantial advances in this field. The objective of this course is to disseminate the recent knowledge. The course has the following learning objectives:

Learning Objectives
A student who has met the objectives of the course will be able to:
• describe flow and force processes in the presence of cylindrical structures,
• describe hydroelastic (flow-induced) vibrations of slender structures such as marine pipelines and flexibly-mounted cylinders
• explain drag, inertia, lift forces in currents and in waves
• describe scour around marine structures including offshore wind turbine foundations and pipelines
• describe wave-induced seabed liquefaction around marine structures
• explain various modes of failures due to scour as well as liquefaction
• perform calculations related to scour and liquefaction around marine structures

Language
All lectures will be given in English.

Organizer
B. Mutlu Sumer, DTU bld. 403, office no. 125, Tel.no: (+45) 45 25 14 23, mail: bms@mek.dtu.dk

This course is offered as part of the activities of the DCAMM International Graduate Research School.

Course lecturers
Charles H.K. Williamson, Professor, Cornell University, USA.
Richard Whitehouse, Technical Director and Professor, HR Wallingford, UK.
B. Mutlu Sumer, Professor, Technical University of Denmark.

Internet resources
For information about teaching and research at the DCAMM departments: see http://www.dcamm.dk.
For facts on the Technical University of Denmark and visitor's information see: http://www.dtu.dk.
For information on the University of Aalborg see: http://www.aau.dk.

Participants
The course is designed for Ph.D. students and final-year Graduate students.

Work Load
Each day (Monday-Friday) there will be lectures 8-12 and 13-17. Friday afternoon there will be a visit to the Hydraulics Laboratory of DTU Mechanical Engineering.

Study Material
Notes will be handed out.

Evaluation and Diplomas
To pass the course, active participation in all activities is required, as well as electronic submission of reports in the following two weeks.

Grades: Pass/Fail. ECTS points: 2.5.

Registration:
Ask for a registration form from the DCAMM-course Secretariat, attn.: Kari Haugland, Department of Mathematics, Technical University of Denmark, Building 303S, DK-2800 Lyngby, Denmark. Tel.: (+45) 45253031, Fax: (+45) 45881399, E-mail: dcamm@mat.dtu.dk.

Registration fee:
There is no registration fee for students enrolled at universities and public research institutions. For researchers employed at universities and public research institutions the registration fee is 250 EURO. This covers hand-outs, coffee and social events. For all other participants the registration fee is 750 EURO.

Deadline:
Applicants should submit their registration to the course secretariat no later than 15th July, 2010. You will receive confirmation within a week after this date.

Housing:
There are a limited amount of rooms available on the premises of the Technical University of Denmark (DTU). These will be offered free of charge to students and otherwise at a cost of 25 EURO per night. Accommodation in hostels/hotels can also be arranged by the participants themselves, see the Wonderful Copenhagen website at www.woco.dk.

Scholarships:
For Ph.D.-students enrolled at non-Danish universities and research institutions outside the EU, we can offer a limited number of scholarships in order to facilitate participation, covering lodging (see above) and extra living costs with a per diem amount of 25 EURO. Travel expenses will not be covered. Your CV and a short letter of recommendation from your Ph.D.-supervisor should then be sent in together with the application form.

Cover illustration:
• Top: Flow around a near-wall cylinder (Sumer, Jensen & Fredsøe, 1991, JFM, 225, 271-300)
• Middle: Scour around a pile, numerical simulation (Roulund, Sumer, Fredsøe & Michelsen, 2005, JFM, 534, 351-401)
• Bottom: Pipeline floatation accident due to liquefaction of seabed soil (Damgaard, Sumer, Teh, Palmer, Foray & Osorio, 2006, J. Waterway, Port, Coastal, and Ocean Eng. ASCE, 132, 300-309)
The **Danish Center for Applied Mathematics and Mechanics**, DCAMM, is an informal framework for internationally oriented scientific collaboration between staff members at a number of departments at the Technical University of Denmark (DTU) and Aalborg University (AAU). The departments cooperating within DCAMM are:

- Dept. of Informatics & Mathematical Modelling, DTU
- Dept. of Mathematics, DTU
- Dept. of Mechanical Engineering, DTU
- Dept. of Civil Engineering, AAU
- Dept. of Mechanical Engineering, AAU

DCAMM is an informal construction. The day to day activities are coordinated by the secretary of the Center, while the formal governing body of DCAMM is the Scientific Council.

The **DCAMM International Graduate Research School** functions within the standard framework of the Ph.D. education at the Technical University of Denmark (DTU) and at Aalborg University (AAU). Ph.D.-students associated to the School are full members of DCAMM through their departments and are enrolled in relevant Ph.D.-programmes at DTU and AAU.

The School's role is to provide for an interdisciplinary framework for education of young researchers in an international research environment, and the activities are supported by Danish Agency for Research, Technology and Innovation (FUU).

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**DANISH CENTER FOR APPLIED MATHEMATICS AND MECHANICS**

Ph.D.-course

**Seabed and Structure Interaction**

at

Technical University of Denmark, Lyngby, Denmark

**August 16th – 20th, 2010**

Organized by:
Department of Mechanical Engineering, Technical University of Denmark

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**Technical University of Denmark**
**University of Aalborg**