Course Description

With an increased focus on climate change comes increasing pressure on all industries to reduce CO2 emissions through improved efficiency, and the maritime industry is no exception. It has been proposed that through a combination of ultra slow speed and complementary propulsion technologies, the efficiency of the world shipping fleet can be increased to a point where the following emissions targets can be met:

• By 2020: Greenhouse gas emissions are reduced by 30% compared to 1990 levels.

• By 2050: Greenhouse gas emissions are reduced by 80% compared to 1990 levels.

This course surveys the technical challenges presented by slow speed shipping including: Reduced directional stability and other sea keeping issues; Hull, machinery and propeller design changes and; the consequences of introducing sail-assist technologies. The course facilitates the transfer of knowledge from the FP7 financed research project ULYSSES (http://www.ultraslowships.com/) to the wider community. The target audience includes: PhD students, MS students towards the end of their studies, and engineers working in the maritime and maritime consulting industries.

The course syllabus includes lectures on both reduced speed issues for existing ships and design considerations for new slow speed ships. Technical topics include: Added resistance due to wind and waves; Generic modelling principles for predicting power, fuel consumption and emissions; Ultra slow speed hull and propeller design; Manoeuvrability; Modern wind propulsion; Machinery and engine issues; Alternative fuels; plus two overview lectures on efficiency and green ship technologies. Two afternoon visits are also planned to: The R & D facilities of MAN Diesel, Copenhagen; and the ship model basin of Force Technology, Lyngby. A series of exercises illustrating the lecture material will form an integral part of the course. Acceptable solutions to these exercises, plus a more in depth report problem, must be submitted to receive credit for the course.

Organizers

Harry B. Bingham and Hans Otto Kristensen, DTU Mechanical Engineering.Technical University of Denmark.

Lecturers

Bo Cerup Simonsen, A.P. Møller Maersk A/S, Denmark.
Jan Otto de Kat, A.P. Møller Maersk A/S, Denmark.
Jesper Kanstrup, Knud E. Hansen A/S, Denmark.
Leo de Vries, Wärtsilä, The Netherlands.
Alan Klanac, As2Con, Croatia.
Harry B. Bingham, DTU.
Hans Otto Kristensen, DTU
Plus as yet to be specified lecturers from:
Haldor Topsøe, A/S, Denmark.
MAN Diesel A/S, Denmark.
Force Technology A/S, Denmark

Work Load

70 hours. (25 hours in class plus approx. 45 hours to complete the exercises and report.).

Credit and Evaluation

ETCS points: 2.5. Evaluation: Pass/fail

Language

All lectures will be given in English.

Registration Fee

200 Euro, but free for registered students at accredited universities and ULYSSES project members.
Registration includes: Refreshments during the breaks; lunch each day; and the Wednesday night dinner.

Deadline

The submitted request for registration must be received by the course secretariat no later than **July 30th, 2012.**

Registration

Please contact Kari Haugland k.haugland@mat.dtu.dk for registration.

Location:

Building 101A ground floor, Meeting room S09
Technical University of Denmark
Anker Engelundsvej 1, 2800 Lyngby

Accommodation

There are a limited number of rooms available on the DTU Campus for students at a charge of 200 DKK/night. Please contact Kari Haugland

Other accommodation in Lyngby:
http://www.lyngbyhostel.dk/GPW-artikel.asp?lan=dk&id=1 (Bicycles can be rented to come to DTU.)
http://www.post-pub.s-10.dk/default.asp?pid=70 (Bus or 20 minutes walk to DTU)
http://www.fortunen.dk/ (Bus to DTU)
http://www.scandichotels.com/Hotels/Countries/Denmark/Copenhagen/Hotels/Scandic-Eremitage/ (Central Lyngby)

The official tourist site:
http://www.visitcopenhagen.com/book-your-stay

Internet Resources

For facts on the Technical University of Denmark and visitors' information: http://www.dtu.dk.
ULYSSES -Ultra Slow Ships Project:
www.ultraslowships.com

Schedule

Monday 20th August

09.00 - 10.00	Registration
10.00 - 11:00	Keynote presentation by Bo Cerup Simonsen, vice president, Maersk Maritime Technology
11.00 - 12.00	Lecture on added resistance (wind and waves) by Harry Bingham, Associate Professor, DTU
12.00 - 13.30	Lunch
13.30 - 14.30	Lecture on propulsion design for slow speed by Leo de Vries, General Manager, Wärtsilä
14.30 - 14.45	Break
14.45 - 17:00	Exercises on added resistance and propeller design by Harry Bingham, DTU and Leo de Vries, Wärtsilä

Tuesday 21st August

09.00 - 09.45	Lecture on generic modeling principles for tankers and bulk carriers for prediction of power, fuel oil consumption and exhaust gas emissions by Hans Otto Kristensen, senior researcher, DTU
09.45 - 10.00	Break
10.00 - 10.45	Lecture on ultra-slow speed ship design by Alan Klanac, director, As2Con
10.45 - 11.00	Break
11.00 - 12.00	Exercise on ultra-slow speed ship design by Alan Klanac, director, As2Con
12:00 - 13:30	Lunch
13:30 - 14:15	Lecture on maneuverability by a FORCE Engineer
14.45 - 17:00	Visit to FORCE

Wednesday 22nd August

09.00 - 09.45	Lecture on ultra-slow ship design (continued) by an As2Con Engineer
09.45 - 10.00	Break
10.00 - 10.45	Lecture on machinery issues for slow steaming by a Maersk Maritime Technology Engineer
11.00	Departure for MAN Diesel
12.00 - 12.45	Lunch at MAN Diesel
12.45 - 13.15	Introduction to MAN Diesel R/D activities, by a MAN Diesel Engineer
13.15 - 13.45	Slow steaming issues from MAN Diesel's point of view by a MAN Diesel Engineer
14:15 - 15.15	Visit to MAN Diesel's test engine laboratory
15.15 - 17.00	Visit to Diesel House
19.00	Dinner in Copenhagen

Thursday 23rd August

10.00 - 10.45	Lecture on wind propulsion by Jesper Kanstrup, Knud E. Hansen A/S
10.45 - 11.00	Break
11.00 - 11.15	Presentation of the report problem for those seeking 2.5 ECTS points for the course
11.15 - 11.45	Methanol as alternative fuel for ship propulsion by a Haldor Topsøe engineer
12.00 - 13.30	Lunch
13.30 - 14.15	Green ship technologies from a practical point of view by Jan Otto de Kat, senior director Maersk Maritime Technology
14.15 - 14.30	Closing remarks

DTU Mechanical Engineering
Department of Mechanical Engineering

DC AMM

DTU

The Technical University of Denmark

Ph.D.-course

Energy Efficient Shipping Through Ultra-Slow Steaming

Kgs. Lyngby, Denmark

August 20-23, 2012

Organized by:
Department of Mechanical Engineering
Technical University of Denmark

SEVENTH FRAMEWORK PROGRAMME

Ulysses