ME240B

ADVANCED MARINE STRUCTURES II

Mondays and Wednesdays 4:00 pm – 5:30pm, in 87 Evans Hall

INSTRUCTOR

Dr. Tao Xu   taoxu@taoxu.com

OFFICE HOUR   Mon, Wed, 5:30pm-7:00pm
                                                              5112 Etcheverry Hall

COURSE GRADE

The grades for the course will be based on the following:

Class Participation	10%
Homework:	30%
Midterms (2)	30%
Term Paper or Oral	30%

USEFUL REFERENCES

There is no required text for this class. The books listed below will complement the material learned in this course and are highly recommended:

1. Alaa Mansour and Donald Liu, Strength of Ships and Ocean Structures, Principle of Naval Architecture (PNA), SNAME, 2008.

   This book can be purchased from Amazon.com for $118.18.

2. Alaa Mansour, An Introduction of Structural Reliability Theory, Ship Structure Committee Report SSC-351

   This book can be downloaded from www.shipstructure.org

COURSE SYLLABUS

LECTURE	DATE	SUBJECT	HWK	READINGS
#1	Wed-01/22	Introduction & Representation of Sea Surface Random Process		Section 2.1 .1 (SSC)
#2	Mon-01/27	Stationary and Erdogic Process Examples of Random Processes	HW#1	Section 2.1.2 (SSC)
#3	Wed-01/29	Decomposition of a Stationary Random Process – Spectral Density		Section 2.1.3 (SSC)
#4	Mon-02/03	Additional Statistics of a Random Process		Section 2.1.4-2.1.5 (SSC)
#5	Wed – 02/05	Short-term and Long-term Ocean Environment	HW#2	Section 2.1.7-2.1.9 (SSC)
#6	Mon-02/10	Dynamic Response of a Ship as a Rigid Body		Section 2.2.1 (SSC), Section 2.5 (PNA)
#7	Wed-02/12	Motion of the Ship	HW#3	Section 2.6 (PNA) Sections 2.2.2 (SSC)
#8	Wed – 02/19	Short-term Predictions of Wave Loads		Sections 2.3-2.5 (SSC)
#9	Mon – 02/24	Long-term Predictions of Wave Loads	HW#4	Section 2.7 (PNA)
	Wed – 02/26	Midterm (1)		
#10	Mon – 03/03	Combined Extreme Loads acting on a Marine Structure		Section 2.6 (SSC) Sections 2.7-2.8 (PNA)
#11	Wed – 03/05	Nonlinear Responses		
#12	Mon – 03/10	Basic Reliability		Section 4 (SSC)
#13	Wed – 03/12	System Reliability		Section 8 (SSC) Section 5.5 (PNA)

#14	Mon – 03/17	Analysis of Uncertainty		Section 3 (SSC) Section 5.1 (PNA)
#15	Wed – 03/19	Reliability Analysis - I		Section 5 (SSC)
#16	Mon – 03/31	Reliability Analysis - II	HW#5	Section 5.2 (PNA)
#17	Wed – 04/02	Reliability Analysis – III		
	Mon – 04/07	Midterm (2)		
#18	Wed- 04/09	Failure Analysis Procedure		
#19	Mon- 04/14	Failure Analysis Procedure (Continued)	HW#6	
#20	Wed – 04/16	Target Reliability and Partial Safety Factors		Section 6 (SSC)
#21	Mon – 04/21	Monte Carlo Simulations		Section 7 (SSC)
#22	Wed – 04/23	Fatigue Reliability		Section 9 (SSC)
#23	Mon – 04/28	Life Cycle Reliability and Risk		
#24	Wed – 04/30	Presentations		

Reference Books

- Alaa Mansour and Donald Liu, Strength of Ships and Ocean Structures, Principle of Naval Architecture (PNA), SNAME, 2008.
- Alaa Mansour, An Introduction of Structural Reliability Theory, Ship Structure Committee Report SSC-351

References

Ocean Environment

1. Cartwright, D. E., and Longuet-Higgins, M. S. (1956). The statistical distribution of the maxima of a random function. Proceedings of the Royal Society of London, Series A 237, 212–232.
2. Ochi, M. K. (1978). Wave statistics for the design of ships and ocean structures. Transactions, SNAME, Vol. 86, 47–76
3. Rice, S.0., (1954) "Mathematical Analysis of Random Noise," Bell System Technical Journal, Vol. 23, 1944; Vol. 24, 1945.

Ship Motion and Loads

1. Faltinsen, O.M. (1990). Sea Loads on Ships and Offshore Structures.Cambridge University Press, Cambridge, UK
2. St. Denis, M., and Pierson, W. J. (1955). On the motion of ships in confused seas. Transactions, SNAME, 280
3. Wehausen, J.V., (1971). Motion of Floating Bodies, Annual Review of Fluid Mechanics, 3, 231-268

Structural Reliability

1. Hasofer, A. M., and Lind, N. (1974). Exact and invariant second moment code format. Journal of Engineering Mechanics Division, ASCE, Vol. 100, 111–121.
2. Ang, A. H-S., and Tang, W. H. (1975). Probability Concepts in Engineering Planning and Design. New York: John Wiley & Sons.
3. Madsen, H.O., Krenk, S., and Lind, N.C. (1986) Methods of Structural Safety. Prentice-Hall, Inc., Englewood   Cliffs, New Jersey
4. Mansour, A.E. (1972) Approximate Probabilistic Method of Calculating Ship Longitudinal Strength. Journal of Ship Research, Vol. 18, pp.203-213

Failure Analysis Procedure

1. Mansour, A. E., Wirsching, P. H., Lucket, M. D., Plump- ton, A. M., and Lin, Y. H. (1997). Structural safety of ships. Transactions, SNAME, November.

Fatigue Reliability

1. P.H. Wirsching, Y.N. Chen (1988). Considerations of probability-based fatigue design for marine structures, Journal of Marine Structures, Vol. 1, and Issue 1, pp 23-45

2. T. Xu, R. G. Bea, R. Ramos, O. Valle, (1999) Uncertainties in the Fatigue Lives of the Tubular Joints, OTC Paper # 10849, Proceedings of the Offshore Technology Conference, Houston TX,

Life Cycle Reliability and Risk

1. Bea, R.G., (1994). Evaluation of Alternative Marine Structural Integrity Programs, Journal of Marine Structures, Vol. 7, Issue 1, pp-77-90
2. Xu, T. et al (2001). Risk Based 'Optimum' Inspection for FPSO Hulls, Proceedings of the Offshore Technology Conference, OTC Paper 12949, Houston, TX