Computer Methods of Analysis of Offshore Structures
Prof. Srinivasan Chandrashekarn
Department of Ocean Engineering
Indian Institute of Technology, Madras

Module - 02
Lecture - 11
Ice load and earthquake load

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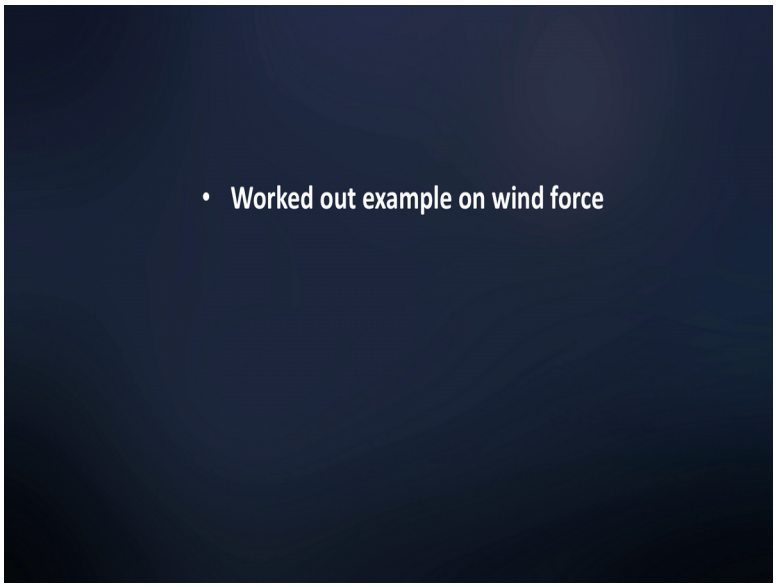

Friends, we will check with the next lecture which is lecture 11 in module 2, where we are going to discuss about ice loads and earthquake loads on offshore structures. Just as an overview what we have so far seen, we have computed examples of wave load acting on offshore cylinders.

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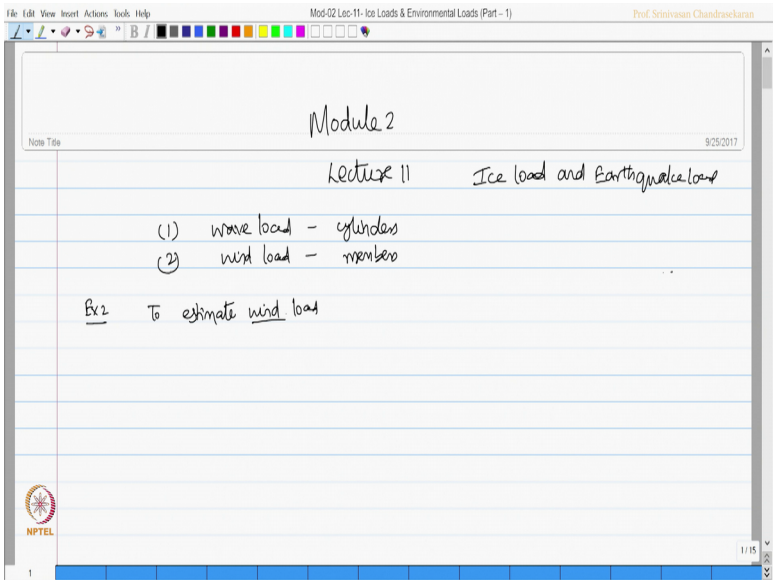

We have computed wind loads acting on offshore members, we will do one more problem I will just work out one more problem for wind load estimate.

Let us say I have a drilling derrick on this dimension, which is supported on a deck.

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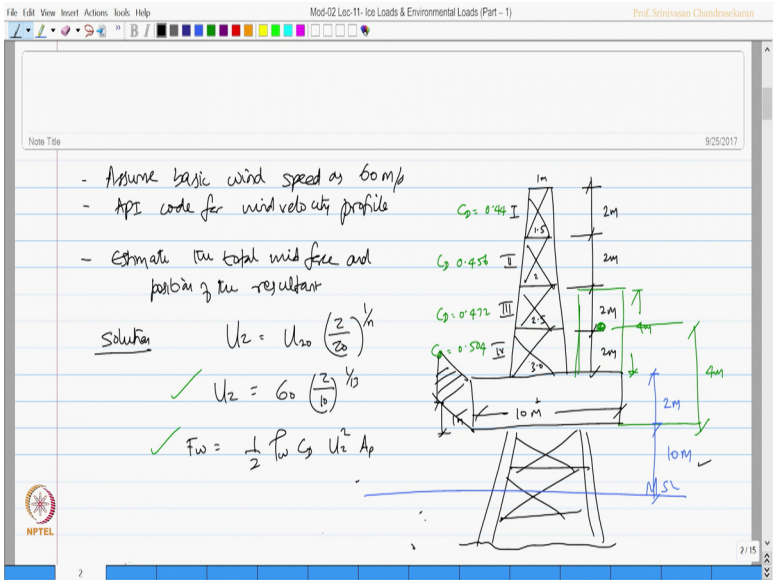

Which in turn is supported by a jacket leg and so, let us say this is my mean sea level, I have a very good air gap. So, I say this is my dimension of 10 meters and the deck is about 2 meters and I divide this in 4stages.

So, this is stage 1, stage 2, stage 3 and stage 4 each one is our 2 meters, and there is a living quarter nearby on the deck which I am marking in green which is about 4 meters, the data given is CD for segment 1 is 0.44, for segment 2 it is 0.456, for segment 3 it is 0.472 and for segment for it is 0.504 which is given the data and it says that assume basic wind speed as 60 meter per second follow API code for wind velocity profile and estimate the total wind force and its position.

The general equation we know is Uz is u z naught z by z naught 1 by n, we are going to use o1 by n s 13. So, z by 10 that is z term height 1 by 13 is used. So, the wind force at any point of z is given by half rho CD U z square and the projected area using this equation.

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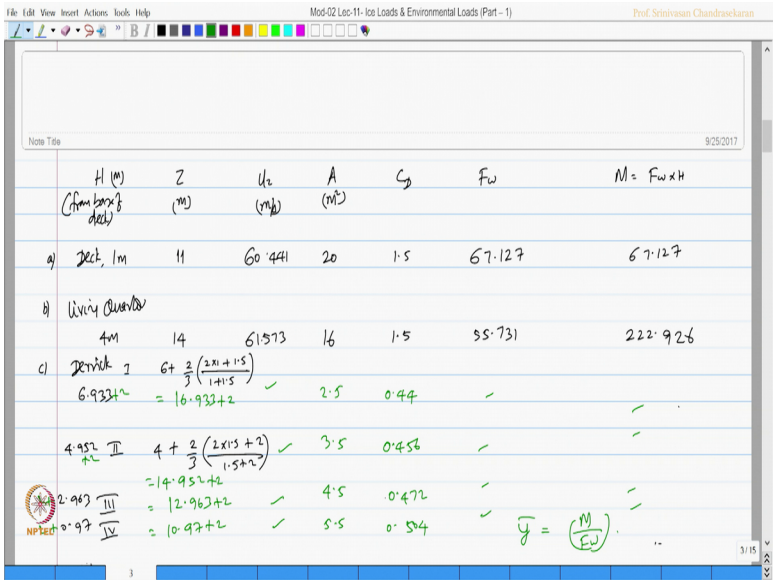

Let us try to find different dimensions H z let us say Uz projected area CD and wind force and the moment which is wind forced into height.

The height is measured from the base of the deck. So, let us say for the deck height is 1 meter you can see from the figure, from the base of the deck this is 1 meter and z of course, is 11 meter because this is 10 meter from their muscle right 11 meter therefore, substituting from the equation U z is given by this equation and F w is given by this equation using this Uz is going to be 60.441, projected area for the deck you know this is 10 meters. So, if I say this may projected area this is 10 and 20. So, 10 by 10 meter. So, it is going to be 20 meter square, this is meter square this is meter per second, this is in

meter this also in meter 20 CD is taken as one point for a rectangular. So, I get Fw as 67.127 and F w into H is also 67.127.

Now, there is a living quarter. So, it is 4 meters you can see here cg of the living quarters is 2 meters from here, but from the base of the deck this height is going to be 4 meters. So, 4 meters. So, add 10 to it further; so 14 meters. So, this becomes 61.573 this is 16 meter there is a 4 meter square 16 meter square; so 1.5 again rectangular. So, this is 55.731 and this is 222.926.

Now, for the derrick there are 4 stages. So, stage 1, stage 2, stage 3 and stage 4; stage 1is in the top and stage 4 is in the bottom, you know the derrick dimensions are given like this, this is 1 meter, this is 1.5, this is 2, this is 2.5 and this is 3. If that is the case for let us say unit 1 that is unit 1, I want to find the Cg which will be from the top of the deck is going to be 6 meters plus two third off 2 into 1 plus 1.5 by 1 plus 1.5 this is simple trapezoidal equation formula one meter 1.5. So, 6 meter is this value 2 plus 2 plus 2 6 meter, 2 plus 2 plus 2 6 meter plus Cg from the base; so 6 plus two-third off 2 and 2 1 1.5 plus 1.5 which gives me this value as 6.933 meters.

Similarly, for 2 is going to be 4 plus you can see here this 2 meter and this 2 meter, 4 plus two third off 2 into 1.5 plus 2 by 1.5 plus 2 which comes to 4.952 meters similarly for 3 and 4 one can work out this value as 2.963 meters and 0.97 meters.

Now I want to find the value of z. So, z value is going to be these are all entered here let us say this is 6.933 this is 4.952 this is 2.963, this is .97 therefore, the z value which I am entering here in green is 16.933, 14.952, 12.963 and 10.97 for which I have to add plus 2 meters, this plus 2 is added because they measuring from the bottom of the deck from here. So, this is two meters I get the value.

So, I can always find the use it value I do not think any difficulty will be there here and area projected will be for the case 1 is 2.5, 3.5, 4.5 and 5.5 which are given. So, CD cm CD is already worked out is already given in this problem. So, let us enter them back 0.44, 0.456, 0.472 and 0.504. So, one can work all Fw and m. So, why bother certain will be m by F w one can calculate this.

So, it is a very simple demonstration of estimating the wind force on a derrick, at any point of interest we have worked out at the cg of these places and then we found the resultant of this. So, it is very easy to estimate and write a simple program for this.