>> Hi and welcome to module five of an introduction to engineering mechanics.

>> Before we start today's module, I just wanted to look at an overview of the course again.

>> We've gone through the first major topic already, which is forces and expressing the forces of a vector in 2D and 3-dimensional >> components. >> The next topic which we'll start with this module is particle equilibrium, or looking at the balance of forces on a particle. >> So, the learning outcomes for today are, first, to state Newton's first law of motion, which you should be able to recall from your, your background in Physics. >> And then to express the 2D and 3D equilibrium equations that re-, re-, result from, an application of Newton's 1st Law. >> And finally we're going to learn about a graphical tool that we're going to use in applying the equations of equilibrium to real world problems. >> And I'll go through the rules on how to draw a free body diagram, and sketch that free body diagram. >> Which is a a very important equilibrium, excuse me, a very important tool in engineering mechanics.

>> Okay, so first of all, what I'd like you to do is research the, Newton's First Law of Motion, or review Newton's First Law of Motion, and take a few minutes and write down in your own words what Newton's first law states. >> Now that you've answered that question, let's look at a definition of Newton's First Law of Motion. >> So a particle that's at rest or moving along a straight line with constant velocity will remain in that state when it's not subjected to an unbalanced force. >> And we call this static equilibrium. >> And so, as a result of that statement, of Newton's First Law for a particle we can come up with this Static Equilibrium Equations. >> Which state that [COUGH], the forces, the sum of the forces, vectorily are equal to zero on >> The particle if it's to remain in this, in this state of rest or constant velocity. >> And so in two dimensions, we can break that down into scalar equations for two orthogonal directions. >> We might use x and y coordinates or we might use parallel and perpendicular componenets. >> But the only >> we'll only come up with 2 independent equations in that case and 3 dimensions will have 3 independent equations. >> A balance of forces in the X, and the Y, and the Z direction.

>> So let's now as a last step in this module look at a , a, a procedures for drawing something that's called a free body diagram or a graphical tool for applying the equations of equilibrium, We're going to use this throughout this course. >> So the first step is apply or identify the particle or body of interest that we're, we want to apply equilibrium to. >> and so in this case, we have this point right here. >> In which we have a tension of the cable that's acting up the left at a, at a 40 degree angle. >> And we have another tension in this cable that's acting up to the right at a 50 degree angle. >> And then we have a. >> Weight down of 10 pounds. >> So the body or particle of interest that we're interested in, is this point right here, which is the intersection of these forces. >> So I'm going to draw that down here. >> I just draw it as a pointer or particle. >> And once we've done that, we sketch the particle free of constraints. >> And so we look it as if it's disconnected from the rest of the world. >> Okay. >> Standing there by itself as a particle. >> And then we apply any external forces that are acting on it. >> and so in this case as I mentioned we have a >> Tension up and to the left in this cable, which I'll call, tension one. >> And, we have a tension up and to the right in this cable, which I'll call tension two. >> And then, we have a weight down, which is 10 lbs. >> And the last step in our free-body diagram is to add dimensions. >> And, so in this case the dimensions we have are these angles, which are 40 degrees, and 50 degrees.

>> And, so that's a, that's a good free body diagram. >> You'll find the ability to draw this type of diagram will help us tremendously in applying the equesions, the equations of equilibrium, to find for instance, the tension in these two cables in future problem. >> That's it for today's module. >> Thanks.