

# Eddie, The Collegiate Sophomore McCutchen in the Classroom

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As if following Eddie and Mark to class once wasn't enough, McCutchen, yet again, tries to gain the upper hand, and tries to discover whether Eddie and Mark actually attend formal classes at the University. McCutchen will stop at nothing to try to get Eddie and Mark off the track team. Proving that neither Eddie nor Mark attends formal classes would be McCutchen's ace in the hole.

After practice today, McCutchen trails Eddie and Mark once again, this time at quite a distance. Arriving at the parking lot, Eddie whispers to Mark, "it looks like McCutchen is following us again." Mark whispers back, "let's mess with his ass, and go to that class again. We'll see if he follows us." Eddie replies, "yeah. Let's do that. If he doesn't follow us, we can just head home." Eddie asks Mark, "do you remember where that classroom is?" Mark replies, "I think so. It's the one in that really old building with two sets of double doors on the outside." Eddie and Mark head to the lecture hall, paying no attention to McCutchen, who is following them at a distance.

Arriving at the lecture hall, Eddie and Mark hang around outside for a few minutes, waiting to see if McCutchen will arrive. McCutchen slyly passes by, and does not stop at the lecture hall as Eddie and Mark expect, but rather keeps walking. Mark yells out at McCutchen, "yo, McCutchen! Where are you going? The class meets here, junior!" Not wanting to get busted by Mark for allegedly cutting class, McCutchen turns around, and replies, "oh, yeah. I thought today was Tuesday." Yelling

out to McCutchen, Mark replies, "it's the Prickly Sea Spider bite, junior! I'm telling you. Your adrenal glands are shriveling up! Your brain is shot! You can't even remember what day it is!" McCutchen walks into the lecture hall, and takes a seat in the back row where he now must hide out for one hour. Eddie and Mark also walk in, taking a seat on the back row at the other side of the lecture hall.

After delivering a few administrative messages, Dr. Bancroft begins her lecture, orating, "today, as you probably already guessed, we are going to continue our discussion of how to properly design a transistor audio amplifier. During our last session, we discussed that one good indication of a properly designed amplifier is its ability to drive a capacitive load. The classical example of a capacitive load is the electrostatic transducer. Another example of a capacitive load is the piezoelectric transducer used in some commercially available horn tweeters today. And, a third source of load capacitance, which is quite often overlooked, is the loudspeaker cable itself."

As Dr. Bancroft recaps her last lecture, Eddie whispers to Mark, "we're definitely in an electrical engineering class. This ain't a music class." Mark replies, "you're right about that." The last time they walked into this class a few weeks ago, due to the subject material, Eddie and Mark could not easily discern whether they were sitting in a music theory class or engineering class.

Moving on to new material, Dr. Bancroft continues, "another indicator of an amplifier's perceived sound quality is how well the amplifier behaves when its various stages are overloaded. In the consumer market, this is often referred to as clipping. When an amplifier is overloaded, by definition, one of the stages of the amplification circuit is driven into electrical saturation. When a transistor saturates, a relatively large charge is stored at the semiconductor junction. For the amplifier to recover from its saturated state, this charge must be dissipated. Obviously, the best way to prevent any stage of an amplifier from overloading is to prevent the overload from occurring in the first place. But, as we can easily conclude,

this is not always possible.” Mark whispers to Eddie, “McCutchen isn’t paying attention. He keeps looking over here at us.” Eddie whispers back, “his major is some sort of liberal arts. There’s no way a liberal arts major is going to be sitting in an electrical engineering class.”

Eddie and Mark, also not enrolled in the class in which they are sitting, whisper back and forth, discussing more ways to mess with McCutchen. McCutchen, a bit on the fidgety side, is looking for an opportunity to leave the classroom, but knows he cannot do so without catching the attention of Eddie, Mark, or the professor. In contrast, Eddie and Mark, with nothing pressing on their schedule, take the time to sit back and relax.

Toward the end of Dr. Bancroft’s lecture, the professor announces to her class, “now, let’s take the information that we’ve learned today and apply it to an amplifier design. For our example, consider the case of a simple three-stage audio amplifier. My question to you is which stage of the amplifier would be the worst of the three stages to exhibit an electrical overload?” While Dr. Bancroft’s question is a simple one, silence comes over the class as the students reason to themselves whether it’s better to overload the preamplifier, driver, or the final stage.

Seeing that no student has an answer to her question, Dr. Bancroft surveys the classroom, previously noting that McCutchen has not been paying one bit of attention to her lecture. Pointing to McCutchen, Dr. Bancroft announces, “you, in the back row wearing the skull cap, can you answer my question?” Hoping that he will easily get out of answering Dr. Bancroft’s question, McCutchen, replies, “I don’t know.” Mark whispers to Eddie, “this is really going to be funny. McCutchen doesn’t know shit.” Eddie smiles, knowing that Mark is right. Eddie and Mark sit back, watching as Dr. Bancroft looks as if she is preparing to put McCutchen into a pressure cooker.

Dr. Bancroft asks McCutchen, “can you please tell me, then, if transient intermodulation distortion can occur if the open-loop bandwidth is greater than the signal

bandwidth?" McCutchen replies, "I'm not sure. But, I suppose it could." Dr. Bancroft, and the rest of the class, now knows that McCutchen was either not paying attention during the last class or he was absent. The answer to the professor's question is clearly 'no', for that was the subject of the previous lecture. One criterion to minimize or eliminate transient intermodulation distortion of an amplifier is to design the open-loop amplifier as to have a bandwidth far greater than the audio band it is designed to amplify<sup>1</sup>. If McCutchen were present during Dr. Bancroft's previous lecture, he would have known that.

Now wondering whether McCutchen knows anything at all, Dr. Bancroft asks him the simplest of all electrical engineering questions, "can you, then, please tell me how much current flows through the circuit when one volt passes through a one ohm resistor?" Completely unfamiliar with electrical circuits, McCutchen replies, "I'm not exactly sure. I'd have to work it out." Eddie, understanding basic electrical principles from working with automobiles, yells out, "it's one amp, junior! Everyone knows that." Dr. Bancroft points to Eddie and replies, "thank you." Bothered that McCutchen did not know the answer to her simple question, Dr. Bancroft then asks her class, "and, what would happen should the power source not be able to deliver a current of one amp?" Eddie, the automobile mechanic, replies, "something will fry. That's why they make fuses." Dr. Bancroft replies, "exactly. At least one person in this room has taken Electrical Engineering 101." Dr. Bancroft gives the clear impression that she is ticked off with McCutchen.

Clearly understanding that McCutchen, for one reason or another, should not even be in her class, Dr. Bancroft points to McCutchen, and instructs him, "you, please come up here." Fearing what would happen should he disobey the professor, McCutchen walks to the front of the classroom. Dr. Bancroft quietly asks McCutchen his name,

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<sup>1</sup> This is why a high quality audio amplifier typically has a frequency response of 10 - 100,000 Hz or greater when the audible spectrum is 20 - 20,000 Hz.

finding that he is not even on the class role. Dr. Bancroft then proceeds to ascertain the reason that McCutchen is present during her lecture today.

While Dr. Bancroft questions McCutchen further, Eddie whispers to Mark, "it looks like we're off the hook now. McCutchen won't even dare to come back to this class again." Mark whispers back, "good. And, it gives me something else to mess with him about." Eddie asks, "what's that, bro?" Mark explains, "during track practice, I'm going to point out to him that he's been cutting class. Then, he's going to tell me that he dropped the class. Then, I'll point out that his brain is turning into mush, and that it's the Prickly Sea Spider bite." During their discussion, Eddie and Mark observe that, following McCutchen's brief encounter with Dr. Bancroft, McCutchen heads back to his seat, picks up his stuff, and leaves the lecture hall.

Now that McCutchen is gone, Dr. Bancroft asks her class again, "now, getting back to my original question. In the case of a simple three-stage audio amplifier, which stage of the amplifier would give the worst result should it exhibit electrical overload? Since we're running out of time, I will give you the answer. The answer to my question is actually quite simple. The last stage of the amplifier would be the worst stage to exhibit overload. Under saturation, the quasi-square wave output of the final stage would likely damage the speakers, particularly the high frequency drivers, to which the amplifier is connected. And, I might add, if the amplifier is properly designed, overloading the preamplifier or driver circuits would not saturate the final stage, so the speakers would be protected. Expect this question on the upcoming test in the form of a circuit design problem."

Dr. Bancroft concludes her lecture for the day and class breaks up. Eddie and Mark head to the parking lot, seeing no trace of McCutchen anywhere. Reiterating what he hinted at earlier, Mark tells Eddie, "I'm going to mess with McCutchen next week sometime. He'll never bother us about this shit again." Eddie replies, "good. We need to get rid of him somehow. He's becoming a pain in the ass."

Mark agrees, telling Eddie, “you got that right.” Eddie and Mark have discovered that, for some reason, McCutchen is trying his best to get certain members off of the track team.

The next week, as the team gets dressed for practice, seeing McCutchen walk into the locker room, Mark yells out, “hey, McCutchen! Where have you been? You’ve been cutting class!” Hoping to get out of an embarrassing moment, McCutchen replies, “I had to drop that class.” Not letting McCutchen off the hook so easily, Mark exclaims, “it’s the Prickly Sea Spider bite, junior! Your brain is mush! Your adrenal glands are mush! Your hair is all gone! And now, your liver is failing!” McCutchen, who should not even respond to Mark, replies, “it is not!” Mark exclaims, “it’s stress! I tell you! It’s stress, junior! You can’t even handle stress anymore! You’re turning into a vegetable!”

Overhearing the exchange between Mark and McCutchen, Braden suggests, “maybe his fat ass ought to drop out of track instead. Then, everything will be just fine around here.” Mitchell, who has been ticked off at McCutchen recently, tells Braden, “what did I tell him a few weeks ago? The B vitamins react with the pricklotoxins and form ganglioacetic acid. All that ganglioacetic acid has eaten away at his white matter. Now, he can’t even keep up with his school work.” Disputing Mitchell, McCutchen firmly replies, “I can so!” Mitchell replies, “yeah, right. Keep telling yourself that. See where that gets you. You can’t even run in a straight line anymore. The ganglioacetic acid is now eating away at your cerebellum.” Heading out to the arena, Mark points back at McCutchen, and exclaims, “see? What did I tell you, junior? Do you think I make all this shit up?”