What's the Difference between MATH 286 and MATH 415?

Course Content Comparison:
The first noticeable difference between (Introduction to Differential Equations Plus) MATH 286 and (Applied Linear Algebra) MATH 415 is that MATH 286 is a required course for ECE majors while MATH 415 is not. Although not required, MATH 415 fulfill a technical elective requirement.

The main reason why only MATH 286 is required is because the middlemost portion of the class deals heavily with some linear algebra techniques. This linear algebra portion of the class relies heavily on matrices and linear systems and eigenvalues. The more advanced linear algebra techniques covered in MATH 286 include multiple eigenvalue solutions, generalized eigenvalues, matrix exponentials and linear systems, and nonhomogeneous linear systems. Overall, these topics are a good introduction to linear algebra. However, these topics cover a relatively small subset of what linear algebra has to offer.

The beginning of MATH 415 is fairly straightforward since the introductory linear algebra techniques are covered in MATH 286. While MATH 286 teaches you the basics of Gaussian Elimination and solving systems, MATH 415 covers more advanced topics such as vector spaces and subspaces. The four fundamental subspaces are never really mentioned in MATH 286, and yet they prove to play a pivotal role in linear algebra. Overall, both classes are heavily theoretical. MATH 415 tends to be even more on the theoretical side than MATH 286.

Workload comparison:
In both classes, weekly written homework assignments are given. In some sections of MATH 415, WebAssign assignments are also given. The WebAssign assignments are usually more straightforward and less abstract with the written homework. Therefore doing the WebAssign normally prepares you well for the written homework's conceptual questions. While MATH 415 assignments are heavily conceptual at times, MATH 286 assignments are usually straightforward computationally. MATH 286 tends to require more of a time commitment since the later chapters are more complex than the MATH 415 material.

MATH 286 tends to require more work and the exams are more difficult. However, there is no overall curve for MATH 415 while there is usually one for MATH 286. Individual exams however in MATH 415 are curved accordingly.

Other Concerns:
The more advanced topics covered in MATH 415 are useful if you plan on taking classes that rely heavily on linear algebra concepts, such as CS 418 (Interactive Computer Graphics), ECE 470 (Introduction to Robotics), CS 450 (Numerical Analysis), and some of the more advanced courses in Signal Processing and Quantum Mechanics. While MATH 415 manages to stay fresh most of the time, the topic of eigenvalues and linear systems is hit hard in both classes. One thing is for sure, you will become really good at solving matrices and eigenvalue based systems after having taken both classes.

Since MATH 286 does not require any prior linear algebra knowledge, it is not necessary to take MATH 415 first. In fact, taking MATH 415 after MATH 286 is a great approach since it builds off of the concepts presented in MATH 286.

Finally, note that taking MATH 415 is not a necessity. MATH 286 provides enough linear algebra for most practical purposes. However, if you plan to take classes that are heavy on advanced linear algebra, MATH 415 will give you an edge that MATH 286 does not provide.