Phase I and II of the PFFTA program proved very useful in developing this class. There are quite a few of the techniques I learned and applied to my class.

Intro to Calculus can be a very hard course - it covers a huge amount of material within very short time and if students are not familiar with most of the concepts it can be overwhelming.

The student body is highly non-homogeneous. On one hand we have the students who are preparing to take Calculus I - they are motivated and have a reasonably good background in math. On the other hand we have the students who take this class for general math credit, many of whom have already failed this class once or twice (sometimes three times).

The instructor is thus presented with the problem to present all the material in a limited amount of time to a highly diverse audience, so these are the techniques I employed,

1. Small videos of the concepts - Students learn at different pace and have different learning styles - to accommodate the diversity I sometimes sent links to videos from the Khan Academy website related to the concepts we study.

2. Slides - I did a few classes using slides at the end of the year. They save a lot of time in the classroom, students generally like them better, because they get to write less. With slides there is always danger of the students attention drifting away. For this reason add a lot of (clicker) questions / problems / examples for which the students need to focus back onto the matter at hand.

3. Online quizzes - Since we cover a lot of material it is very important to keep up. Furthermore, it is no use to try to build up on something covered the previous week if the students have not worked with the material and have no started their homework yet. This is why we employed the online quizzes. The comprise of a few multiple choice questions, usually conceptual questions. Students were supposed to complete those in the time between the last class for the week (on Friday) and the beginning of the first class of the new week (on Monday).
4. Active learning - I feel that a pure lecture-based class in math works better for higher level classes and with highly motivated students. This is why I dedicated some time in which the students would stop just listening to the lecture and try to work with the concepts on their own. These methods provided incentive for coming to class, feedback from the students as to how well they understand the current material and addressed different learning styles.

(a) clickers - these provide immediate feedback about how well students are grasping the concept. I usually asked more conceptual questions or questions on something I knew students struggle with and use it as an excuse to reexplain the concept. These are time consuming - depending on the questions one may spend 5-10 minutes of lecture time.

(b) worksheets - unfortunately I never made these formal - I tried the once in class - wrote the left hand side of some trigonometric identities (e.g. \(\sin(2x)\)) and asked students to simplify them, while I walked around the room and answered questions and checked their work. The seemed to enjoy this and I think it is very good approach to teaching trigonometry, but unfortunately rather slow.

(c) Matematica visualizations - sketching functions can be time consuming especially when doing transformations (shifting up/down, reflecting). Matematica has a wonderful feature that can help with this - changing some parameters will dynamically show the new graph.

5. Engaging students - here comes in to play my teaching philosophy and my own teaching style. I believe that mathematics contrary to popular belief can be fun. I am a big fan of RPG games so I tried to turn math problem solving into the likes of a game - I ask questions and the students answer. If they are stuck I give them a hint. Here is an example: We need to sketch a polynomial function.

Q: "What is the first thing we want to do?"
A: "Find the roots of the polynomial."
Q: "Ok, why?"
A: "They give us the x-intercepts."
Q: "Wonderful, how do we do this?"
A: "Errr"
Q: "There is a theorem... tells us something about the roots in relation to some of the coefficients, it is still on the board."

This string of questions leads the students to the solution - and in fact with a little help they solve the problems on their own, realizing that they have all the information already to handle the problems and hopefully when working on their own they will go through the same thought process.

I believe I have at least partially succeeded as one of my students at the end of the semester told me "This is the first time I had fun studying
6. Course website - The course used Blackboard for the online quizzes (blackboard automatically grades them and records the grades) and announcements, but I also developed a course website which is publicly available and has all course materials. While it increases the amount of work for the instructor, the website is useful if students find themselves locked out of their Blackboard accounts or are new students who for some reason have not set up a Blackboard account yet.

7. Misc documents - Many of the students struggle with this course (and not only this one) for the simple reason that they don’t know how to learn or what to expect on an exam. Interestingly enough they don’t expect problems similar to examples solved in class to appear on exams. That’s why I developed some documents with tips on how to prepare for an exam, topics that will appear, sample problems/test.