How to become a well-skilled mechanical design engineer?

The first thing to understand is that just having an engineering degree is only the start. You need a lot more than this before you can consider yourself to be a "well skilled mechanical design engineer".

Also, it's important to know that there are lots of people who can consider themselves as such without a degree of any kind. However, the degree is a good place to start, because it gives you "technical literacy", and leaves you with skills that you can't really acquire any other way

If you have the means, and the opportunity, I also recommend getting a graduate degree, because many fortune 500 companies won't really consider you without one.

That said, it's only then that your journey can really begin. In order to become really proficient at design, I think a path something like this is best:

1. Develop CAD and engineering layout skills. These are not "drafting" skills, but proficiency, and an intuitive feel, for working with shape, proportion, and solving spatial allocation problems. A lot of design is adjusting and balancing things to make everything fit, and this is an acquired skill. When you get good at this you will develop a sort of personal style, which will often times be recognizable, and you will learn to recognize work done by the unskilled at a glance.

2. You need to become very familiar with all of existing technology that relates to your field. You need to understand how things have been done in the past, before you can develop new methods that are yet unseen to the world.

3. You need to get as much "hands-on" experience as you can. It helps a lot if you have outside interests that let you use your hands; things like restoring cars, designing and building model airplanes, racing motorcycles, etc. This kind of experience is critical, because it will give you a more "common sense" view of the world.

4. You should learn as much as possible about the Design Process itself. There are a lot books that you can read that will teach you this, and knowing, and following, a formal process is the difference between being an amateur or being a professional. Things like DFMEA's, and PFMEA's, design reviews, how to manage product safety hazards, etc...

5. You should learn as much as you can about multi-objective numerical optimization. This is something that's going to become a lot more important to know about in the future. For instance, you should know about Parameter Design Spaces, Space Filling DOE's, Response Surface Meta-Modelling, Pareto Boundaries, Attribute Trade-off Spaces, etc...

6. You should learn about Systems Modelling, Model Based Systems Engineering, Attribute Performance Modelling, and Causal versus Acausal Modeling.

7. You need to learn about Critical Parameter Management, Tolerance Analysis, and Probabilistic Design.

8. Getting "Six Sigma Black Belt" certified is also a must do requirement. This will teach you about DOE's, Components of Variation, SPC, etc...

9. And finally, you should become as familiar as you can with CAE Simulation Based Design Methods. Things like FEA (Finite Element Analysis) Stress, Deflection, and Modal Analysis, Dynamics Analysis, CFD (Computational Fluids Analysis) Analysis, Moldflow Analysis, Metal Forming Analysis, etc...

Currently, most of this stuff has to be picked up on the job, but in the future I think engineering schools will start to incorporate some of it in their curriculum. Regardless though, even if academic courses are available, reduction to practice in the work environment is the key to becoming proficient.