The Engineering Job Market Is Changing: Are Students Prepared?

Industry experts reveal what they're really looking for when hiring recent engineering graduates

SOLID *Professor*

In this Guide

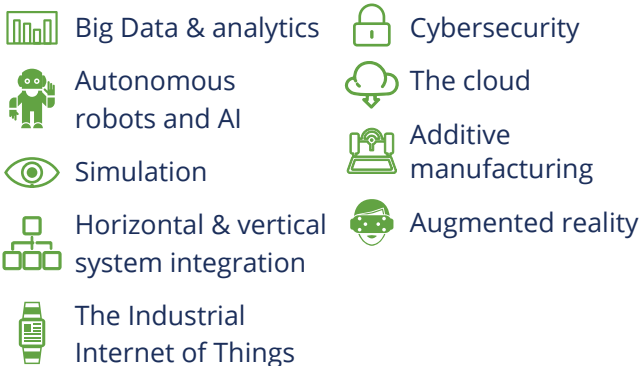# Where Are the Qualified Engineering Candidates?

A look into one of the biggest challenges facing the engineering community

As self-proclaimed engineering nerds, we always keep a pulse on the industry: what's changing, what's staying the same, and what's causing tension. **And in the past few years, the tension has centered around how to fill thousands of open engineering jobs with qualified candidates.**

While this seems like a "good" problem to have, it's actually turning into a hiring nightmare. Not only are companies struggling to fill the widening knowledge gaps left by a retiring workforce, but the incoming employees aren't adequately trained to deal with Industry 4.0.

Remind me: What exactly is Industry 4.0?

With the rise in digital technology, it's now possible to gather and analyze data across machines faster than ever before, which enables businesses to produce higher-quality goods at reduced costs (BCG). Here's what's driving it:

- Big Data & analytics
- Autonomous robots and AI
- Simulation
- Horizontal & vertical system integration
- The Industrial Internet of Things
- Cybersecurity
- The cloud
- Additive manufacturing
- Augmented reality

However, as industry experts and educators recognize that this hiring crisis exists, both seem to be pointing at the other to solve it. "Companies should create more on-the-job training to get new employees up-to-speed," some say. While others respond, "Education should be preparing students for the modern workplace."

As a neutral third party, we're here to say: It's everyone's problem

The bottom line: the country needs engineers, and everyone must work as hard as they can to supply that need. Each company is responsible for upskilling their employees and onboarding them in a manner that makes sense for that organization. Meanwhile, education must give students the skills and training they need to be successful in the workplace.

For this guide, we scoured the internet, talked to experts, and did our own research to give you a better picture of what the industry is looking for in recent grads. We've also included some bonus content to help your students land their first job.

Meet our panel of experts

To get more personalized insights into the industry's hiring challenges, we talked to a diverse set of SolidProfessor members, including

- **Carla Ashley**, Training Coordinator at Knight Enterprises LLC
- **Seth Miley**, Mechanical EIT at SGW Designworks, LLC
- **Mike Puckett**, Senior Manager of the World Wide Certification Program at SOLIDWORKS
- **Greg Serio**, Founder of The People of Manufacturing

What's causing tension in the industry today?

The situation: There are tens of thousands of engineering positions that need to be filled over the next 10-20 years (BLS).

The problem: The supply of qualified engineering graduates doesn't meet the demand for jobs.

The solution: More on-the-job training for new hires, an increase in apprenticeships for high school and two-year college students, and a shift in how schools prepare students for a career in engineering.

The 10,000-Foot View: What's Driving the Engineering Hiring Crisis?

And how engineering hiring has changed in response

At-a-Glance: Hiring Changes in the Engineering Community

- More apprenticeships and training for younger employees
- Seeding the market sooner with academic partnerships
- Increasing reliance on credentials and specific skill sets

Let's start with the big picture: What's actually happening in the industry to cause this hiring crisis?

There are five main factors impacting engineering hiring today:

Demographics: The Baby Boomers are starting to retire en masse. Two of the fastest-growing engineering fields also have the largest proportion of older workers: 25% of workers are 55+ in industrial engineering and petroleum engineering. And when the Baby Boomers leave, so does their institutional knowledge, creating a gap that companies are already struggling to fill.

Lack of talent: Respondents to the Engineering360 survey state that recruiting new talent is a big challenge, especially for their design teams. Respondents cite absence of qualified, motivated engineering candidates as the biggest roadblock. They talk about things like "lack of motivated hires" or "lack of experience and commitment from new engineers."

Shifting roles of engineering teams: As companies continue searching for new ways to cut costs (e.g., the emergence of the design to cost methodology), teams must do more with less. Leaner teams must communicate effectively with each other to make sure all work is getting done efficiently and correctly. Plus, younger team members must have the communication skills to be client-facing. Spoiler: employers don't think that graduating engineering students have the communication skills they need to be successful in either of these situations.

Lack of specialized knowledge: While older, knowledgeable team members are retiring, companies are zeroing in on performance and productivity. This means fewer resources, leaner staff teams, and more difficult timelines for completing projects, all while maintaining critical product quality standards. Currently, younger, less experienced engineers have a difficult time thriving in this type of environment, as they lack the necessary specialized knowledge and hands-on experience to jump right into a new role.

Recent grads are drawn to specific, saturated industries: Millennials and younger workers are increasingly seeking out jobs in technology, financial services, and architecture. However, they aren't joining industries like oil & energy or manufacturing, even though they have some of the most prolific hiring needs. This leaves a huge hole in the talent pool for those industries that are frequently overlooked by the younger generation.

In response to these factors, hiring is shifting. Many large corporations are trying to seed the market by providing training programs for younger and younger students. Some, like Northup Grumman, have created partnerships with local high schools and universities to help prepare students for a career at their company.

Companies are also looking into creating apprenticeships and more robust training programs to get entry-level employees in the door and up-to-speed. They're relying slightly less on four-year degrees and, instead, looking at the specific skill sets students bring to the table through their micro-degrees, credentials, and certifications.

How has engineering hiring changed?

Ashley: We'll take a lot of students with an associate's degree out of high school who have some experience. We've come to the conclusion that we need to train our own because we have so much competition in the area from SpaceX, NASA, Blue Origin, and more. We are approaching hiring and training differently than we did in the past.

Puckett: Micro-degrees, credentials, and certifications are emerging. And while they aren't necessarily taking the place of a Bachelor's degree, they might! Overall, job opportunities are boundless right now. The problem is that companies are struggling to hire people. They need students who are mechanical and can work with their hands. The problem is that there's a misunderstanding that mechanical or manufacturing jobs are dirty and grimy, but that's not the reality.

Serio: I hear employers say, 'I can't find good people.' And the people say, 'I can't find a good job.' It's like a man and a woman at a bar staring at each other but they need a friend to say, 'Hey, go talk to each other.' I'm kind of that person who's telling the employer and employee to go meet each other. Employers have a hard time reaching the people who would be interested in a job with them.

> **"** **Overall, job opportunities are boundless right now. The problem is that companies are struggling to hire people.**

The 10-Foot View: What Can Educators Do about the Hiring Crisis?

PART 1: Help engineering students gain the skills they need to be successful in the modern workplace

At-a-Glance: Skills Engineering Students Need

Soft skills: Communication, teamwork, attention to detail, motivation, willingness to learn, interpersonal skills, and leadership are all highly valued by engineering employers. Candidates need to be able to explain how they've gained those skills both on their resume and when asked situation-based interview questions. Bonus points for those who've gained these important skills from a combination of extracurricular experience and school coursework.

Hard skills: GD&T, mathematics, critical thinking, design software proficiency, industry knowledge, hands-on experience with machining, product design, and real-world application of knowledge are important hard skills. Employers are looking for students who've gained these skills through school coursework, extracurricular activities, internships, certifications, and hands-on experience.

Sources: Association of Graduate Recruits, Machine Design, Interesting Engineering, Engineering.com, our panel of experts

As an educator, you have an incredible impact on the skills your students develop. And in many cases, you're their only lifeline to the professional engineering world. So, you're in a great position to help them navigate the rocky waters of preparing for and securing a successful career in engineering. Plus, your department will thank you for all of the job placements your graduating students will earn!

To get a better idea of the skills employers are looking for in engineering candidates, we can turn to the Association of Graduate Recruits survey. The survey asked companies to rate the quality of applications they receive on a scale from 1-6 (one being poor and six being very good), and the average ranking was a 4.4. Engineering applications, however, landed at a cool 3.9, quite below the average and well below the "very good" rating.

While factors like poor written communication skills are at play, the study highlights that engineering applications tend to focus on generic technical skills when employers instead want to see the specific skills students have that are applicable to that position. Furthermore, employers also look for soft skills, which graduating students don't tend to include on their applications. And they want to see that candidates have acquired these skills outside of just their regular school course work.

These responses are very much analogous to those from our experts, who emphasized the importance of soft skills and real-world, hands-on experience.

What skills are recent graduates commonly missing?

At-a-Glance: Engineering students tend to be missing practical, hands-on skills, like working on a machine floor; GD&T; being able to apply knowledge to real-world situations; and communication.

Ashley: Our interns fresh out of college aren't trained. We're trying to create a program where they spend some time on the machine floor to get them up-to-speed on how we do processes. When they come in green, it's pretty mandatory that they are trained to understand the process.

Miley: Everyone hasn't had enough training in drawing and tolerancing! Incoming workers can usually do pretty basic engineering and modeling, but making the jump between that and manufacturing and molding is needed. It's about being able to apply what you know to be able to do your job. And then if you have the skills to make it, you need to be able to communicate it.

> **Everyone hasn't had enough training in drawing and tolerancing!**

What hard skills are required for recent grads?

At-a-Glance: mathematics, including tolerances and geometry; GD&T; CAD software experience; product design; machining; Microsoft Office suite.

Ashley: We do hire people with no experience so we can mold them. If they are looking to become a machinist, we have an apprenticeship program they can get into. To qualify, they need to have some time on the machine or working with their hands. Usually, our hiring managers are looking for them to have mathematics and an understanding of tolerances and geometry. If they have

SOLIDWORKS experience, that makes a big difference. Coming in the door with some GD&T experience and SOLIDEDGE is a plus, too. If they have experience with a software that's close to SOLIDWORKS, we may test them to see how they do or if they can work through it.

Miley: I would say being able to apply what you know to do your job. We're not designing gear trains or complicated systems. We're creating stuff where it's really subjective what it can look like and how you can make it. It's more about taking the idea and making sure that someone can make it. But when we're hiring, we don't really look at the hard skills as much — we realize that if you have an engineering degree, you can probably pick up on things.

Puckett: Recent grads need to know product design, machining, and at least one CAD software. It's also important to understand Microsoft Word, Excel, PowerPoint, and Outlook, too.

What soft skills do recent grads need?

At-a-Glance: communication; motivation; personal skills; interviewing skills; positive social media presence; ability to take instruction

Ashley: We look for communication and the ability to be proactive, such as identifying an issue and having the ability to look at it as a challenge instead of waiting on someone to assign it to them. Nearly all of our entry-level employees have computer skills, but we often find, especially in the younger generation, that they are missing basic communication skills — even personal skills on a foundational level.

Miley: Communication! We work for clients who are nontechnical people, so we have to communicate through meetings, phone calls, and presentations. We have to be able to distill the design down so they can understand it enough to get on board.

> **Recent grads need to know product design, machining, and at least one CAD software.**

Puckett: Students need to know how to interview. They should know how to build a LinkedIn profile and act on social media. When I hire recent grads, I Google them and look at their lifestyle. Grads also should know how to interact with people and listen. If they are graduating high school or college, they sometimes don't look forward to taking instruction again.

Serio: Communication and understanding that people communicate differently. I study manufacturing where the average age is about 54 years old. The younger generation has high levels of communication without saying a word, and now they're interacting with someone who would rather pick up their rotary phone and talk in person. I tell the students that it's up to them to adapt to their manager and their employer's communication style, and they have to do it in order to tap into their knowledge. Students can't control their environment, only themselves.

PART 2: How students can prepare for the interview process

At-a-Glance: An Engineering Resume That Has It All

☑ **Do's:** Companies look for experience outside of the classroom, including FIRST Robotics, Vex Robotics, working with machines, internships, experience at manufacturing plants, certifications, or volunteering at a Fab Lab or MakerSpace.

☒ **Don'ts:** Advise students to avoid relying solely on their school coursework for their resume — they need to include outside opportunities. They shouldn't leave out soft skills, and, again, they should avoid attributing them to school work alone; they need to show that they've had other experiences.

Having the right skill set is imperative for engineering students looking to land their first job. But it's about more than just the skill set — it's increasingly about how graduates acquired it. Companies aren't looking for another cookie-cutter engineering student. They want career-ready employees who've had experiences outside of the classroom. Having an internship, being on a robotics team, doing hands-on work — these are the kinds of opportunities employers want to see.

Employers know it takes a great deal of intelligence and a strong work ethic to earn an engineering degree; now, they want to know if students have the real-world experience to be able to jump into a new job and start making a positive impact right away. That's what the current, frenzied job market demands. So, while your students are getting book smart in the classroom, you can encourage them to get real-world smart on the side.

What experience should graduates have on their resumes?

At-a-Glance: FIRST or Vex Robotics, working with machines, internships, hobbies, certifications, volunteering at a Fab Lab or MakerSpace, getting involved on a shop floor

Ashley: Experience with robotics — like FIRST or Vex — is a big thing right now because we have an automation and robotics department. We also look for experience working on machines, either as a maintenance person or mechanic. When we get students that come out of college, we put them on the floor and have them work with machinists. Students with past internship experience in manufacturing is a plus.

Miley: We get a lot of resumes that look exactly the same. A lot of people want to talk about their school and classes, but everyone who goes to school [for engineering] takes the same classes. Extracurricular activities and internships are what I look for — people who have done practical things. For example, maybe a student

got an internship or got involved working on a shop floor. Inspection projects in their internships are useful. Getting an interview is about what you have done beyond taking classes.

Puckett: Get certifications and participate in activities that aren't required by your school. Show that you have a desire to learn and be clear about your choices. Try a hobby like FIRST Robotics. Volunteer at a Fab Lab or MakerSpace. Be able to show something that you've designed and built.

> **Extracurricular activities and internships are what I look for — people who have done practical things.**

Serio: FIRST Robotics, Vex Robotics, SolidProfessor, and certifications are great. With SolidProfessor, it's kind of like a candy store because students can figure out exactly what they want to get into. In the process, students have the opportunity to earn software certifications. Getting a certification is what the industry looks for because it says that the SOLIDWORKS brand, for example, recognizes your expertise. And those big, heavy-hitting brands mean a lot.

Where do you typically find new, entry-level employees?

> **At-a-Glance:** Indeed, Glassdoor, LinkedIn, college websites, internships with partner companies

Ashley: We typically use job boards and do a lot of searching on Indeed and Glassdoor. Some of our past college interns will come back as full-time employees once they graduate. We also have a grant to work with the Veterans of Florida. Every job we have, we post on the Veterans job board as well. Sometimes our jobs get posted on college websites.

Miley: It depends on the role we're hiring for. If we're looking for a mid-level or high-level person, we search online for someone with more experience. Everyone we've hired for an entry-level position we've known through an internship with us or we've gotten a reference from one of our partner companies, so they can tell us what the individual can do. That way, we aren't just evaluating someone based on an hour-long interview.

Serio: I go to LinkedIn. I tell students that if they're going to be looking for a job, they need to build a LinkedIn profile that shows their personal brand. The profile should show who they are and confirm who their resume says they are. Everyone is connected at this point, so if you want to talk to someone, just reach out. If they don't answer, move on to the next person. If you're too afraid of hearing 'no,' you'll never even start trying.

> **Everyone we've hired for an entry-level position we've known through an internship with us or we've gotten a reference from one of our partner companies.**

What are some common interview questions?

Your engineering students should be prepared to answer a lot of situational questions (e.g., "Tell me about a time you solved a design problem"). Students can pull from their experiences working on classroom projects, robotics teams, internships, jobs, volunteer opportunities, and more. Here are some sample questions they should be prepared to answer:

1. Tell me about the most challenging engineering project you've worked on.

2. Describe a written technical report or presentation you had to complete.

3. Have you ever had an experience with a difficult client, employer, or employee? How did you handle the situation?

4. Explain a time you had to use logic to solve an engineering problem.

5. What processes do you follow to catch any mistakes in your work?

6. What engineering skills have you learned or improved upon in the past six months?

7. What software packages are you familiar with? What's the most interesting skill you have in one of those software programs?

8. Describe a time you used problem-solving skills to figure out a design problem?

9. What is your most successful engineering project?

10. How do you stay current with the latest technology?

11. Why are you interested in this role? Why are you interested in working at this company?

12. Describe a time you had to work on a team and something didn't go well. What would you do differently?

13. Tell me about a time you got negative feedback on your work. How did you respond?

14. What strengths do you have that make you a good engineer?

15. What will be the biggest challenge for you in this position?

16. Describe your ideal manager.

17. What are your salary expectations?

18. Where would you like to be in your career five years from now?

19. Do you have security clearance to work on classified projects?

What advice do you have for graduating students?

Ashley: It's pretty common for students to get hired out of high school if they have the right experience. If an entry-level worker is looking to get into machining, they really need to do some kind of vocational class or have some related experience under their belt. Whatever position they are applying for, they need to have something within that job skill description. That can be working in a local machine shop, some type of automotive store — anything where they have some experience with using their hands. As far as college graduates go, a mechanical engineering education is very helpful for the product we produce.

Miley: Make sure you're doing something extracurricular! Get involved in some kind of club, hobby, internship, or job so you can show things you've actually done and you can communicate about problems you've solved. Look into machining and other opportunities that'll give you practical skills. And pay attention to detail. Lack of attention to detail costs our clients money, so the most impressive thing to me is if you can demonstrate that you are paying attention to everyone. If you're noticing problems, even if you don't know how to solve them yet, that's great!

Puckett: Buck the system! Don't feel like you're bound to the old school ways. Unless you want to design bridges or buildings, I don't think mechanical engineering degrees are required anymore. 50% of the employees hired by Apple don't have college degrees.

Serio: Go fail! Get it over with and fail with a smile. I'm so blessed to know what I know based on sheer volume of failures. Go fail and be nice to yourself when you do.

> **Get involved in some kind of club, hobby, internship, or job so you can show things you've actually done and you can communicate about problems you've solved.**

An Easy Tool to Help You Prepare Your Students for the Workforce

Built by engineers, for engineers, SolidProfessor leverages industry knowledge to give students the training they need

Implementing vast, sweeping changes to the way you teach engineering probably isn't practical. But small tweaks and updates to your curriculum can make a huge difference in your students' career readiness.

SolidProfessor's online training and engineering tutorials make it easier than ever to ensure your students have developed the real-world skills and credentials employers are looking for. How do we know? **SolidProfessor is the premier training tool used by professional engineering teams across the country. These are the skills companies are training their employees on right now.**

Our online courses cover the subject matter engineering hiring teams look for when finding candidates. Here's just a small example:

- Geometric Dimensioning & Tolerancing: Mentioned time and time again as a crucial skill to have in the workplace, GD&T is quickly becoming one of our most popular courses.

- Design for Manufacturing: This course helps students develop the knowledge they need to move product beyond design and into manufacturing, giving them a better idea of how to implement their design skills into real-world situations.

- Certified SOLIDWORKS Associate Preparation Course: This CSWA certification preparation course gives students all the knowledge and skills they need to confidently pass their CSWA exam.

- Inventor User Certification Exam: This certification preparation course provides students with the exam structure, test taking strategies, and practice exams.

- Engineering Graphics and Spatial Visualization: These lessons help students learn how to conceptualize and communicate their drawings and models.

SolidProfessor Online Training Resources

- 40+ software platforms covered in SolidProfessor's online training courses

- 660+ online CAD, CAM, BIM, and engineering methods courses

- 1,500+ hours worth of online training

- 220+ Technical Certificates

SolidProfessor's Engineering Network

- 3,450+ total schools
- 66,000+ total students
- 15,000+ engineering team users
- 7,000+ professional users

SolidProfessor offers more than 220 Technical Certificates

Through SolidProfessor's Technical Certificates, students can show employers that they have specific engineering skills ranging from Flow Simulation to Sculpting in Meshmixer, Design for Additive Manufacturing, 3D Printing with MakerBot, and much more.

SolidProfessor's Technical Certificates help close the skills gap, showing employers that students have the specific training required for their industry. This also helps lessen the amount of on-the-job training required by employers. Plus, students have the satisfaction of adding new credentials to their repertoire!

Are you interested in learning more about using SolidProfessor for career readiness?

We'd love to talk to you and learn more about your program's needs! Please contact us through any of the following:

✉ info@solidprofessor.com

📱 619-269-8684

💻 Fill out the form on our Schools web page

> **SolidProfessor's Technical Certificates help close the skills gap, showing employers that students have the specific training required for their industry.**