

## **WIP-Certification for Adult Learners and Industry Professionals for Continuous Professional Development**

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## **Introduction**

Learning never ends and there is no age limit to grow yourself. At Sam Houston State University (SHSU), we have experienced these many times. Most of the students of Engineering Technology (ETEC) department at SHSU have always been first generation or working professionals or returning students after years of gap. We value this a lot and acknowledge the need for it to mitigate future skill needs. The ETEC department is working tirelessly to introduce new educational opportunities for students to be more prepared for industry professionals via some certification programs. Few examples are National Occupational Competency Testing Institute (NOCTI) certification for Fuji Automatic Numerical Control (FANUC) robot operating license for Electronics and Computer Engineering Technology (ECET); National Center for Construction and Education Research (NCCER) certification for different degree programs and modules; Agile certification for industry professionals to grow; PE exam eligibility and preparation for Mechanical Engineering Technology (MET) students and/or professionals; and Project Management Professional (PMP) certifications for Construction Management (CM) students. The goal is to address the challenges faced by the students, adult learners and working professionals for continuous professional development.

## **Automation, Robotics and Manufacturing - ECET and MET Certification**

The technology is evolving rapidly, and smart manufacturing systems are being integrated, automated, and widely utilized in the industry [1]. In modern manufacturing facility, industrial robots are used for material handling, painting, assembly etc. The goal of such certifications in field of automation and manufacturing is to address the skill gap and meet the needs of future automation and manufacturing work within the next 10 years [2]. The US automation and manufacturing industry continues to upgrade to Industry 4.0 [3] and the digital automation of processes is the focus.

FANUC America partnered with NOCTI and developed the national certification programs that is recognized by the industry. The program includes two levels of FANUC Certified Robot Operator (FCR-O1 & FCR-O2). It also offers two levels of FANUC Certified Technician (FCR-T1 & FCR-T2) that indicates an operator level of skills and knowledge. These certification programs have been developed for students and adult learners. The primary author is FANUC certified instructor [4] and can certify the students enrolled in his “Industrial Robotics” class plus any adult learners. There is a training site in Houston, TX; however very limited seats and majority of the time the trainees from industry or others must travel out of state for the required certification and training. Through this initiative, the ETEC department at \*\*\*\* is trying to provide alternate site for training and certification exam though NOCTI to build competent and credible workforces. The primary author is recognized as site coordinator for NOCTI and can oversee the certification exam and issue required certificates for people who will pass the online/in-person exam. Usually, students or professionals register by paying a certain fee (see Table 1) and must pass the exam with 70% score. The FANUC has its’ own manual for such trainings, and we need not to develop any new ones. The “Roboguide” software can be utilized for virtual training as well.

The FE exam in mechanical engineering is a crucial standardized test that evaluates the technical knowledge of recent graduates or students in this field. It is aimed at assessing the candidate's understanding of various subjects such as thermodynamics, mechanics, materials science, fluid mechanics, and control systems. The exam consists of 110 multiple-choice questions, which must be completed in 5 hours and 20 minutes and is administered by the National Council of Examiners for Engineering and Surveying (NCEES) in a computer-based format. An open-book policy is followed, and a reference manual is provided to the candidates during the test. Since passing the FE exam is a requirement for taking the PE exam, which is a necessary step in becoming a licensed Professional Engineer, it is highly recommended that students take the exam while they are still in college. To encourage and prepare students for the FE exam, the authors plan to provide them with special tutoring and mentoring sessions on a weekly or biweekly basis, facilitated by experienced faculty members. This will help students to gain a better understanding of the exam topics and increase their chances of passing the exam successfully.

### **NCCER - Engineering Design Certification**

The National Center for Construction Education and Research (NCCER) is a non-profit education foundation established by more than 125 construction CEOs and academic leaders. With curricula for over 70 crafts offered in over 6,000 NCCER-accredited training and assessment locations across the United States, NCCER provides training and assessment programs for various craft and maintenance areas. These programs help students and professionals enhance their knowledge and skills and build the confidence to succeed in the construction industry. The Engineering Technology (ETEC) department at Sam Houston State University has several NCCER-certified instructors, some of whom are authors of this paper. These instructors aim to integrate full or partial modules of NCCER's training programs into various hands-on courses taught in the ETEC curriculum, enabling students to acquire recognition for specific skill areas. The student's records are tracked through NCCER's Registry System, which allows organizations and companies to monitor their employees' qualifications via a secure database. NCCER offers certification for its training programs, and some of the ETEC faculty are already certified and can certify students, faculty, and adult learners accordingly. The training typically takes four days, eight hours per day, totaling 32 hours, and culminates in a final day of presentations and an online exam with a passing mark of 70%.

The ETEC and ECET faculty at Sam Houston State University are also exploring integrating NCCER certification into their curriculum. For example, a student studying electrical engineering technology at Sam Houston State University (SHSU) who wants to specialize in the electrical installation trade can take the NCCER Electrical Level 1 modules as part of the ETEC department's course. Upon completing the training modules, the student can earn a certification in each module area of Electrical Level 1 or a certification card after completing the entire Level 1 book. This official credential demonstrates their knowledge and skills to potential employers. NCCER certification can be included in resumes and job applications, and employers recognize the value of this credential. By offering NCCER certification programs, SHSU's ETEC department enables students to achieve recognition for their specific skill areas and stand out in a competitive job market.

Additionally, NCCER's training programs can benefit employers as well. By hiring certified employees in specific craft areas, companies can be confident in their employees' knowledge and skills, leading to improved productivity, safety, and quality of work. Companies can also use NCCER's Registry System to track their employees' certifications and ensure they have the qualifications to perform their jobs. Moreover, integrating NCCER certification into academic curricula can help bridge the skills gap in the construction industry. As the demand for skilled workers in the construction industry continues to grow, there is a need for educational institutions to provide students with the knowledge, skills, and confidence that are required for success in this field. By incorporating NCCER's training programs into their curricula,

academic institutions can equip students with the practical skills and industry-recognized certifications employers highly value. NCCER's training and certification programs offer a valuable opportunity for students and professionals in the construction industry to enhance their skills and knowledge. By integrating these programs into academic curricula, institutions like Sam Houston State University can help prepare their students for successful careers in this field and provide employers with a skilled and certified workforce.

### **Agile - Industrial Engineering Certification**

In the past decade the Agile approach to technology development has spread rapidly, causing organizations to invest in ongoing professional development for their workforce to be competitive and survive digital transformations. Though the start of Agile is anchored to the Agile Manifesto published in 2001, at its core, Agile is a mindset and approach for technology development based on a set of values and principles, composed of; short iterative learning cycles, valuing human communication, welcoming change, and delivering working technology. Virtually all sectors of the economy have or are incorporating digital transformations at some level in their organization, and in the products and services they provide. Effectively managing this digital transformation is where Agile provides a unique competitive advantage leading to better outcomes, more satisfied teams, less errors, and overall efficiency. Since Agile was not taught in universities ten years ago, organizations are heavily investing in Agile professional development and trying to quickly educate their workforce to adopt Agile as an underlying approach to their overall digital transformation projects. Agile workshops and certifications for professional development take on various forms. Professionals with no exposure to Agile are exposed to workshops to immerse themselves in the values, principles, and practices, with the goal to quickly gaining skills to be part of effective Agile teams, conversant in terminology, approach, and digital lifecycle. In the core Agile sessions, the fundamentals of Agile history, mindset, values, principles, and practices are taught to the attendees. They are exposed to case scenarios allowing them to learn various roles and apply Agile to digital development to in-class case studies. While those teams who have been using Agile are exposed to and trained on global best practices to continuously improve their Agile approach and continuously adopt frameworks to stay competitive. These advanced Agile sessions are customized to various industry sectors or common functional areas across industry through case studies and scenarios, and once again attendees are exposed to and tested on best practices and approach to digital development projects.

The workshop will typically be led by a certified Agile coach or trainer, and will include a mix of lectures, group discussions, and hands-on activities. In the first part of the workshop, the participants will learn about the Agile Manifesto and how it differs from traditional project management approaches. Next, the workshop will delve into the specific techniques and tools used in Agile, such as Scrum, Kanban, and user stories. Participants will learn how to apply these techniques to their own projects and teams and will have the opportunities to practice using them in a simulated project scenario. The workshop will also cover common challenges and pitfalls in implementing Agile, as well as strategies for overcoming them. Participants will learn about common roadblocks and how to avoid them, as well as how to foster a culture of collaboration and continuous improvement within their teams. Throughout the spectrum of Agile professional development, the goal is to focus on adopting an Agile mindset to technology projects, building strong Agile values, adopting Agile principles, and applying Agile practices customized to the environment and need of the organization. For certification on Agile from Sam Houston State University, our intention is that the participants will have to pass in-house Agile examination and ETEC Department at SHSU will maintain a list of certified Agile participants (those that have taken the workshop and passed the exam). Table 1 shows a comparison of different Agile certifications provided by different vendors.

Table 1: A comparison of different certification [5]

NAME	DIFFICULTY	COST	ACCREDITATIONS	QUESTIONS	DURATION	PASS
SAFe Agile	Expert	\$3000	N/A	45	90 mins	77%
AWS	Beginner	\$100	+400,000	60	90 mins	70%
NCCER	Beginner	\$100	+400,000	40	240 mins	70%
PE	Expert	\$350	32,000/year	80	480 mins	64%
FE	Intermediate	\$175	80,000/year	110	360 mins	75%
PMP	Difficult	\$575	N/A	180	230 mins	50%
NOCTI/FANUC	Intermediate	\$150	N/A	153	180 mins	70%

## PMP – Construction Management Certification

In construction projects, numerous parties, such as architects/designers, contractors, and suppliers, carry out a variety of construction activities for the duration of the projects. The keys to a successful construction project are managing these activities and facilitating effective communication between the parties. Therefore, the industry has a high demand for project management skills, which are essential throughout the entire construction project process. This also applies to college graduates seeking entry-level positions as site engineers or project engineers in the construction industry. Promoting certificate programs, such as the Project Management Professional (PMP) certification, would be a highly effective way for the department to assist Construction Management majors in entering the workforce with greater preparedness and competitiveness. The PMP certificate, offered by Project Management Institute, is a globally recognized certification in project management. The certification tests skills in three primary areas: the ability to effectively lead and motivate project team members throughout the duration of the project; the ability to use predictive, Agile, and hybrid approaches to determine the optimal method of working for each project; and the ability to demonstrate the success of projects and their impact on overall strategic organizational goals [6]. The plan is to help students prepare for the 180-question certification exam by providing a short summer workshop or semester-long workshop that is also open to non-students preparing for the exam. During the workshop, the department plan to invite guest speakers from the construction industry to explain to participants how the certification will benefit their future careers. By the end of the workshop, all participants will have a better grasp of the exam's contents and be able to advance their careers and increase their earning potential in the construction industry.

## Current and Future Work

At present, the ETEC department is working with SHSU online to setup the online payment process for adult learners to register and be certified. NCCER and FANUC/NOCTI certification is already in place for the students, and Agile certification is almost ready. Our future goal is to continue working and hopefully by the end of 2023 have everything setup and ready for all above mentioned certifications.

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