Skills and Knowledge (S&K) Useful in the Workforce - Version 2.1 04-11-2025

Preamble

This document represents a consensus of the ECE Industry Advisory Board and is intended to be updated over time. It was created to provide the faculty and students with a view from industry representatives the skills and knowledge (S&K) which along with the ECE degree can make them more employable, marketable, prepared and successful as they enter the professional job market.

Those S&K are covered in Part One. Part Two then provides suggestions from the ECE IAB members about how those skills and knowledge might be achieved.

Part One

I. *Engineering*
Use fundamental concepts and solve problems that cut across multiple areas of electrical engineering; take on problems that link electrical engineering with other fields; become familiar with how electrical engineering concepts are used in modern technology; acquire the ability to incorporate design margins as appropriate for the application; develop the habit of building data privacy and security into systems; understand the need for and know how to work with industry technical standards.

II. *Concomitant Technical Skills*
Learn how to solve ill-defined problems via client interviews, experimentation, simulations, literature searches and model-building; identify follow-on investigations and necessary resources; understand how a solution fits into the larger system; achieve sufficient competency such that the student can perform in or communicate meaningfully with subject-matter experts in relevant areas of practical applications such as instrumentation, computation, industry-standard software and hardware, coding, data analysis and software, hardware and system verification and validation.

III. *Communication Skills*
Develop the ability to communicate orally and in writing to audiences with diverse technical and non-technical backgrounds; develop the habit of listening, influencing, mentoring and assessing understanding.

IV. *Professional Skills*
Seek to work in diverse teams and generate new ideas; multiply individual effectiveness by developing and utilizing the appropriate professional and social networks; demonstrate ability to understand and apply workplace concepts and practices related to problem definition, statements of work, project management, scheduling, budgeting, business acumen, risk management, intellectual property, safety and legal/regulatory issues; learn how to discern, and integrate into, the company culture; develop the habit of creating value for customers (internal and external); demonstrate life skills such as responsibility, honesty, perseverance, time-management, cultural sensitivity, mutual respect and ethical behavior. Develop conflict resolution skills, acquire the habit of evaluating the social, global and environmental impact of engineering projects. Incorporate long term planning and initiate networking to demonstrate resourcefulness.

Recommendations to the ECE Department to Instill the Above Skills and Knowledge into Its Program.

Part Two

The items below form a non-comprehensive list of suggestions from ECE IAB Board members about how the skills and knowledge described above might be achieved. They relate to the whole college experience, not limited to classroom activities.

1. Use game changing technology and business trends to steer strategic planning of curriculum, extracurricular programs, and student recruiting. Focus hiring and faculty development, course modifications, enhanced program requirements and co-curricular activities that emphasize contact between students and faculty with engineers outside academia and expose them to electrical engineering as applied outside academic settings (Addresses S&K I, IV).
2. Utilize co-curricular activities such as co-ops and student internships, community resources such as economic development organizations and industry speakers and guests to expose students to opportunities as well as to business and professional skills (Addresses S&K I, II, IV).
3.   Through advising, assist students in identifying career paths and direct students to courses and programs that directly support their career objectives (Addresses S&K I).
4. Provide global and cross-cultural perspectives through experiences that promote involvement with globally complex issues in unfamiliar environments, such as spending time abroad (Addresses S&K IV).
5. Build industry partnerships, add industrial projects to the research agenda, and utilize sabbaticals and other opportunities to provide faculty with exposure to the needs and challenges of non-academic organizations (Addresses S&K I, IV).
6. Promote a department and faculty culture that understands current and future trends in non-academic careers in ECE and the students that pursue them and which emphasizes innovation and an entrepreneurial mindset. (Addresses S&K IV)
7. Incorporate application-related topics and industry-standard software, hardware and tools in courses, exercise assignments and lab activities. Train students to go deeper when incorporating off-the-shelf hardware or shareware blocks, to understand their inner workings and what they are designed to do at the lower levels of abstraction (Addresses I, II).
8. Collaborate with other academic departments (biology, medicine, chemistry, physics, business, environmental science, etc.) and campus offices to bring workplace-relevant topical content and experience to engineering students (Addresses S&K II, IV).
9. Expand written and oral communications content to address diverse, technical as well as non-technical audiences (Addresses S&K III).
10. Develop interdisciplinary research, projects, and teaching opportunities that feature authentic experiential learning with clients and mentors that include interdisciplinary experience in fields such as public policy, business, law, medicine, ethics, and communications. Leverage existing capabilities on campus. Offer curricular and co-curricular opportunities to engage students in mini-projects as preparation for a Capstone project experience (Addresses S&K I, II).
11. Develop social consciousness through service-learning such as problem-based community projects that foster an appreciation of the impact of engineering and its role in serving human welfare and the needs of society (Addresses S&K I, IV).
12. Emphasize, develop, facilitate, measure, and reward teaching excellence. Harvest research results in engineering education and online learning and make them available to the teaching faculty. Use experts in the UH College of Education as consultants. (Addresses S&K I, II)

13. Benchmark the universities that have achieved high female ECE graduation rates. Port tactics to UH where applicable. Conduct training of students during orientation on professional behavior and coping skills; refresh the training at the beginning of the Capstone Projects.   Establish a vigorous outreach program that features female ECE students interacting with early middle school students. (Addresses S&K IV)
14. Add to the curriculum the effective, proper and ethical uses of artificial intelligence (AI) by teaching students how to evaluate AI output and enhance the technical quality and clear articulation of engineering results. Provide opportunities in projects to incorporate ethical principles in technical choices and how to effectively evaluate data sets used to train AI tools (Addresses S&K IV).
15. Emphasize fundamentals such as the consistent use of units of measurement, the definition and implementation of accuracy, precision, total error, error margin and confidence intervals for all measurements but especially as they pertain to design margins. (Addresses S&K I)

 The official version of this document is located on the Industry Advisory Board website.

https://www.ece.uh.edu/sites/www.ece/files/files/Skills-Knowledge-Useful-Workforce.pdf

Faculty Interactions Working Group
Industry Advisory Board
April 2025