



AUSTIN COMMUNITY COLLEGE

2018 Advanced Technologies and Manufacturing Course Catalog

Developed by the Corporate College at ACC

The Corporate College at ACC

The financial crisis of 2008 forced many major corporations not only to downsize workers, but also functions. Supporting functions that were not considered a core competency of the business—like in-house corporate training—were in many instances dissolved, never to return.

In 2014, Austin Community College (ACC) began a significant innovation in its relationship with the business community. The challenge? To determine if ACC could effectively fill the gap created by the loss of in-house corporate training departments for companies in the advanced technologies and manufacturing industry.

Using funds through a Skills Development Fund (SDF) grant, ACC's Corporate College team designed a workforce training curriculum for workers employed at Samsung Austin Semiconductor's multi-billion dollar facility. Fully 80% of the training focused on technical courses in such advanced topics as robotics, pneumatics, schematics, primary logic controllers, industrial sensors, wafer handling and calibration, gas delivery and maintenance, and electro-mechanical systems. The remaining 20% covered a host of highly coveted business skills in diverse topics ranging from technical writing and statistics to lean manufacturing and a complete leadership development series.

Samsung demonstrated its commitment to the innovative approach by integrating ACC into its Learning Management System, effectively making the community college its "in-house" training department for the duration of a three year project. At the successful completion of the venture, other companies in the advanced technologies and manufacturing cluster such as Applied Materials, NXP Semiconductor, 3M, and other local players began to sign on to the program.

Today, Austin Community College has demonstrated that a new model of community partnership for workforce training has risen from the ashes of the crash of '08. The Corporate College is now positioned to serve these key businesses in a way that better meets the workforce needs of the entire advanced technologies and manufacturing industry cluster in the Greater Austin area.

A True “Fast Track” Curriculum

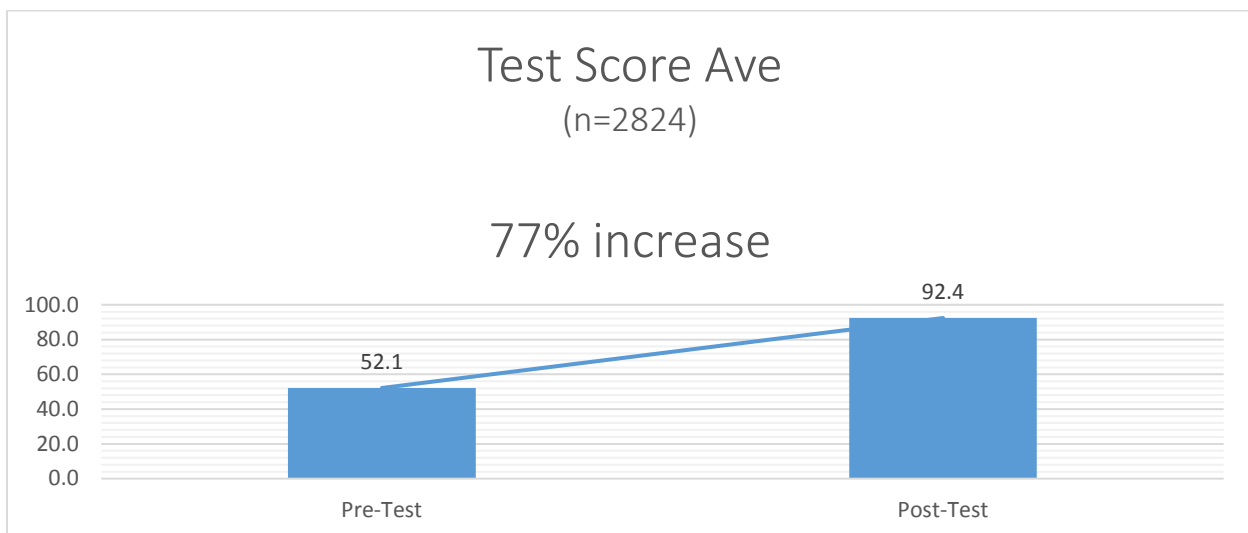
ACC’s Corporate College team has designed a curriculum targeting manufacturing specialists, assemblers, engineering technicians, facilities and maintenance technicians, and a variety of engineering disciplines (non-electrical). The purpose of the curriculum is three-fold:

1. Provide students with a fundamental understanding of the sub-systems present in nearly all advanced technologies and manufacturing environments, including primary trouble-shooting skills.
2. Deliver a slate of ever-evolving specialty and elective courses intended to expand knowledge in specific industry areas.
3. Complement the core and specialty curriculum with a series of elective courses whose purpose is to provide the leadership and communication skills necessary for success.

All courses are delivered in blocks of 4, 8, or 16 hours.

The intent of this “fast track” curriculum is to deliver the same knowledge present in a semester-long equivalent course. Course material has been effectively “winnowed” to produce only essential learning outcomes to maximize training efficiency.

To measure the student’s grasp of the material, pre and post course tests are given. The chart below indicates the improvement rate for nearly 3000 individuals who have taken courses in the curriculum.



Advanced Technologies and Manufacturing Core Curriculum

The core curriculum developed by ACC's Corporate College provides a fundamental understanding of the sub-systems present in most advanced technologies and manufacturing environments, including basic trouble-shooting skills.

The total core curriculum is 112 hours and is delivered in three series:

- 1. Electronics*
- 2. Automation*
- 3. Process Control/Troubleshooting*

Advanced Technologies and Manufacturing Core Curriculum

Electronics Series (32 hours)

Basic Electronics

This eight hour course serves as an introduction to electronic components and concepts that are critical for understanding and troubleshooting many systems. Topics introduced are maximum power transfer and 3phase power. The course includes hands-on labs. The student will be able to:

- Demonstrate key concepts in basic electronics
- Gain competency in using multi-meters and oscilloscope to measure circuit values
- Set up circuits with multiple solid state device

Intermediate Electronics

This sixteen hour course will serve as an overview of electronic components and concepts that are critical for understanding and troubleshooting many systems. This course covers DC circuit analysis for series and parallel circuits and AC analysis for capacitive and inductive networks. Other topics covered are maximum power transfer, 3phase power, and semiconductor devices such as transistors and operational amplifiers. The course includes hands-on labs used to demonstrate key concepts. The student will be able to:

- Analyze both AC and DC circuits
- Use multi meters and oscilloscope to measure circuit values
- Set up circuits with multiple solid state devices and troubleshoot effectively

Industrial Sensors

This eight hour course will introduce sensor and switch concepts and their use in equipment and industrial control/monitoring applications, review the various types of sensors/switches including, but not limited to photo-sensors, proximity switches and limit switches, and provide instruction on the schematic symbols for these devices and how to analyze them in circuits. Hands-on labs will be utilized that demonstrate the function of these devices. The student will be able to:

- Correctly test limit and reed switches
- Correctly wire and test photo-sensors

- Correctly wire and test proximity sensors
- Understand the use of industrial sensors in control/monitoring applications

Advanced Technologies and Manufacturing Core Curriculum

Automation Series (32 hours)

Fundamentals of Schematics

This eight hour course provides technicians and engineers with a broad foundation on elements critical for being able to read, interpret, understand and use schematics as a tool for troubleshooting simple subsystems. The course covers common troubleshooting techniques, basic electronics, open and closed-loop systems, types of signals relevant when interpreting schematics and common schematic symbols; power supplies, switches, relays, pneumatics, motors etc. Hand- on labs will demonstrate the control/power circuit relationships. Students will be able to:

- Identify all components on a schematic by the symbols
- Trace power from a schematic diagram and be able to test it
- Demonstrate basic troubleshooting methodologies
- Define the difference between an open loop system and a closed loop system

Fundamentals of Robotics

This eight hour course provides the student with an overview of the major components in a robotic system and discuss the various robot mechanisms, dynamics and intelligent controls which make up a robotic manufacturing system. Various power sources will be discussed. The student will:

- Discuss the different robotic configurations and work envelopes
- Define the different types of motors used in robotic systems
- Demonstrate the difference between servo and non-servo motors

Basic Pneumatics

In this eight hour course, participants will learn about pneumatic components and their uses in industrial applications. Students will set up and design circuits using cylinders and directional control valves, as well as logic, timing, sequencing and emergency stop functions. Students will be able to:

- Demonstrate operation and application of pneumatic components
- Set up and troubleshoot simple pneumatic circuits

- Discuss basic logic functions

Equipment Communications

This eight hour course will serve as the introduction to the theory and troubleshooting skills needed in the digital data communication field. Topics will include RS-232, RS-422, RS-485, CAN bus, DEVICENET, Ethernet, IP and CIP. Hands on activities will support topics covered and their application to the students work environment will be discussed. Students will be able to:

- Learn the various methods of equipment communications
- Understand how equipment communicates
- Test and troubleshoot various communication devices

Advanced Technologies and Manufacturing Core Curriculum

Process Control/Troubleshooting Series (48 hours)

PLC Motor Control

This sixteen hour course covers programmable logic controllers and their use in industry environments. Students will learn what a programmable logic controller (PLC) does and how it does it, basic ladder logic programming, applications, troubleshooting of ladder logic, and interfacing of equipment. Hands on labs will include equipment integration of motors, controllers and sensors and other devices. The student will be able to:

- List the three sections of a PLC and show how an input signal reaches the processor
- Test and debug basic programs transferred to the controller
- Interface hardware equipment and control its operation

Intermediate Schematics

This sixteen hour course leverages the knowledge and skills obtained in the Fundamentals of Schematics course to be able to understand, interpret, and use actual tool schematics to troubleshoot and fix problems on more complex sub-systems. The course covers schematics in the areas of power, pneumatics, sensors, motors, switches, transformers, and an array of devices that are common to semiconductor equipment. Students will utilize schematics from various tools and involves in-class lecture, discussion, teamwork and lab. The student will be able to:

- Understand schematics and how to use them
- Analyze multiple schematics for troubleshooting
- Trace signals and power through complex systems

Electromechanical Systems

This sixteen hour course is a study of electromechanical devices found in robotic systems. Students will gain practical knowledge and understanding of pneumatic systems, electric motors, valves, sensors, cylinders, control systems, PLCs, ladder logic and other industrial load and control devices. This course teaches those skills through lecture, labs, and class discussions on the application of various electromechanical systems. The student will be able to:

- Understand various load and control devices in electromechanical systems
- Integrate subsystems together and make them work
- Determine how troubleshoot and repair electromechanical system failures

Advanced Technologies and Manufacturing Specialty Curriculum

The Semiconductor Series is the first specialty curriculum developed by the ACC Corporate College team for the advanced technologies and manufacturing industry. It was created specifically to meet the needs of semiconductor clients Samsung and NXP. It focuses on skills required by equipment and process technicians.

The Semiconductor Series complements the Advanced Technologies and Manufacturing core curriculum by offering an additional 56 hours of training in skills required by two important groups of semiconductor industry workers:

- 1. Equipment Technicians*
- 2. Process Technicians*

Advanced Technologies and Manufacturing Specialty Curriculum

Semiconductor Series

Gas Delivery and Maintenance (For Equipment Technicians)

This eight hour course in Gas Delivery and Maintenance (GD & M) training provides an introduction to the gas system components utilized in a semiconductor process tool. Electrical, mechanical and thermal characteristics will be discussed. Gas panel blue prints and schematics will be reviewed. Course will provide a hands-on familiarization and functional knowledge of the common components found in semiconductor process gas systems and how to maintain them. The student will be able to

- Understand each component found in a gas delivery system
- Explain the function and operation of common components
- Use schematics to troubleshoot and maintain gas delivery systems

Semiconductor Process Overview (For Process Technicians)

This sixteen course will introduce the student to the physics of semiconductors and its application to the development of the transistors. Students will learn the basic semiconductor properties, classifications, and the operating principles, design and fabrication of a basic transistor. Models of the transistor will be made to enhance understanding of its fabrication and operation. The student will be able to:

- Understand semiconductor properties and its physical characteristics
- The material's operating principles that make it useful in transistors
- Explain the fabrication of a basic transistor

Wafer Handling Troubleshooting & Calibrations (For Equipment Technicians)

This sixteen hour course will emphasize the programming of industrial robots, development of programming techniques, and the diagnosis of faults in the system. Students will learn to:

- Use the software to perform robot calibrations for all areas of the tool
- Troubleshoot faults during calibrations
- Understand the critical techniques needed to optimize calibrations

CMOS/FinFET Process (For Process Technicians)

This eight hour course will present the complementary metal–oxide–semiconductor (CMOS) device and its fabrication, followed by a review of the nonplanar, double-gate transistor built on a silicon-on-insulator substrate (a.k.a. the FinFET process). The student will review the key characteristics, advantages, disadvantages, and challenges associated with this transition to FinFET. A model will be created to help understand the build and critical characteristics of the FinFET device. The student will be able to:

- Understand how a CMOS and a FinFET device is built
- Explain the advantages, disadvantage and constraints of FinFET over CMOS
- Understand the critical characteristics in the FinFET manufacturing process

Electrical Characterization of Devices (For Process Technicians)

This eight hour course will explore the electrical properties of nano-electronics and how they directly impact the performance of integrated circuits. This course offers a comprehensive view of the general strategy and dedicated methods for electrical characterization. Students will identify relationships between characterization systems, manufacturing, and test equipment as it applies to quality control. Designed to be practical and provide helpful guidance for conducting proper measurements. Physical models will be made using 3-D printing devices to supplement understanding of nano-scale measurements. Students will learn how to:

- Identify the electrical properties of nano devices
- Understand the impact of manufacturing in device performance
- Use test equipment to accurately collect measurement data

Advanced Technologies and Manufacturing Elective Curriculum

The elective curriculum for Advanced Technologies and Manufacturing offers a variety of specialty classes. Developed at the request of various industry clients, these courses meet the training needs of technicians of all types in the manufacturing industry.

There are two categories of classes:

- 1. Technical Skills Development*
- 2. Personal Skills Development*

Please note: The courses listed in this elective catalog are not exhaustive. Additional offerings are available upon request.

Advanced Technologies and Manufacturing Elective Curriculum

Technical Skills Series

Boilers Part 1

This sixteen hour course provides students with a detailed understanding of the full range of boiler functionality to ensure the safest daily operations of industrial boilers and boiler equipment. Students will be able to:

- Understand Boiler Codes and Terminology
- Apply Feed water Chemistry
- Optimize Maintenance
- Perform Refractory Inspections
- Conduct Troubleshooting and Repair

Boilers Part 2

This sixteen hour course is Part 2 of the Boilers curriculum. Students will focus on the optimal operation of industrial boilers and boiler equipment. Students will be able to:

- Understand a wide range of boiler safety applications
- Conduct boiler operations at increasing levels of efficiency
- Reduce boiler operation costs
- Distinguish among design types (industrial water tube, vertical fire tube, coiled steam generators, condensing boilers, and gas turbines)

EPA 609 Refrigeration Certification Review

This sixteen hour course will serve as an introduction to the EPA 609 certification process for learners.

The course will review exam topics, certification exam format, test strategies and grading. Students will be able to:

- Understand various devices and equipment
- Discuss key topics in industrial refrigeration
- Display good test-taking strategies

HVAC Part 1

This sixteen hour course prepares students to service, troubleshoot, and repair HVAC systems in an industrial environment. Trainees will:

- Learn to troubleshoot climate control systems
- Understand basic refrigeration systems
- Comprehend A/C design and layout
- Learn to maintain commercial refrigeration and heating systems

HVAC Part 2

In the sixteen hour Part 2 of the HVAC curriculum, students will:

- Learn the types of motors and capacitors common to industrial systems
- Review commercial wiring diagrams and schematics
- Learn to maintain cooling towers
- Troubleshoot all system components

Hydraulics

In this eight hour course, students will be introduced to the fundamental principles of fluid power components, circuits, and systems, while examining the benefits and limitations of fluid power compared with other power transmission technologies. Students will:

- Learn how fluid power compares to other transmission technologies
- Explore fluid power conduits
- Understand the fluid properties of compressibility and inertia
- Understand the function of Accumulators, Seals, and Servo-valve

Industrial Print Reading

This sixteen hour course is designed to assist students in reading and understanding industrial prints.

Topics include:

- Key terms and industry language
- Flow, loop, and electrical diagram basics
- Dimensioning

- Tolerancing
- Machine specifications
- Instrumentation and control drawings

Optics and Lasers

This eight hour course will be an introduction to optics and lasers. Topics include the properties of light, optical positioning, light sources, laser safety, geometrical and physical optics, principles of lasers and operational characteristics of lasers. The course will also cover optical detector and optical fiber communications. This course will also look at the application of optics and lasers in the fabrication of semiconductor devices. The student will be able to:

- Analyze optoelectronic components and circuits
- Explain the operation of lasers as light sources
- Understand fiber optic communications and basic laser fundamentals

DOE for Technicians

This eight hour course teaches Design of Experiments (DOE) to process technicians. This branch of applied statistics deals with planning, conducting, analyzing and interpreting controlled tests to evaluate the factors that control the value of a parameter or group of parameters. Students will:

- Learn the key factors influencing the industrial process
- Determine what settings in the process will deliver acceptable performance
- Evaluate the key interactions in the process
- Apply a screening protocol to narrow the variables being assessed
- Develop a surface design to model the response

Statistics for Process Technicians

This eight hour course will cover components of statistics including techniques of data collection, analysis, and interpretation of numerical data as applied to statistical control and presentation. It will stress proper application and sampling for ensuring quality control. Students will be able to:

- Sample and analyze data effectively
- Calculate control limits and identify out of control conditions
- Understand the benefits of statistical process control in manufacturing

Advanced Technologies and Manufacturing Elective Curriculum

Personal Skills Series

Technical Writing

The eight hour course is designed for all technical staff. The primary goal is to provide students with the ability to effectively write Standard Operating Procedures, pass-downs, and other company documents in a clear, complete, accountable, and accurate manner. The student will review basic grammar and writing skills and discuss common mistakes in writing. The student will be able to:

- Review basic grammar and recognize common mistakes
- Learn methods for developing writing, proofreading, and eliminating ambiguity
- Learn how to use flowcharting to support technical communication

Leadership Essentials Development

The Leadership Essentials Development curriculum offered by ACC Corporate College is a modular program that enables delivery in easily consumable blocks of classes. Each component in modules 1-4 is delivered in four hour segments, or can be combined with a second module in a daylong, eight hour seminar format. Module 5, the capstone to the program, is best delivered in a single, seven hour session. The entire essentials development program is 39 hours in length.

Module One – Foundational Necessities

Communicating for Success (4 hours)

This foundation course helps leaders communicate effectively so they can spark action in others. The course teaches leaders the communication essentials required to handle the variety of challenges and opportunities they encounter every day in the workplace and beyond.

This class addresses primary communication issues leaders too often overlook such as:

- The necessity of demonstrating empathy to employees
- Why ongoing feedback is critical to team success
- The correlation between results and employees who feel valued

Resolving Workplace Conflict (4 hours)

The ever evolving challenges of the business world is a breeding ground for conflict. While conflict can lead to discoveries such as new ideas and innovative breakthroughs, it can, if allowed to escalate, result in damage to critical working relationships.

This course teaches leaders how to recognize the signs of escalating conflict and take appropriate action to minimize damage by focusing on coaching and mediation.

Module Two – Leadership Imperatives

Executing Strategy at the Front Line (4 hours)

In order to achieve their business strategies, organizations count on leaders at the frontline to understand and execute the top priorities for their team.

Participants will explore best practices for accountability, such as determining and communicating accountability—including consequences. Tools that enable leaders to capture their top priorities, progress and outcome measures, and those accountable for achieving the priorities will be explored.

Maximizing Team Performance (4 hours)

The leadership nightmare: a strong team that continues to underperform.

Managers can misdiagnose the root causes of team conflict or less-than-optimal team performance when they consider only the capabilities or character of individual team members. Often there are more systemic conditions that undermine a team's cohesiveness, collaboration, or ability to achieve goals.

This course focuses on how leaders can work with their teams to build the infrastructure that enables maximum performance. Leaders gain experience in diagnosing and applying the five Team Success Factors—Results, Commitment, Communication, Process, and Trust.

Module Three – Decision Making and Influence in Business

Making High Quality Decisions (4 hours)

Sound decision making in today's tough business environment demands much more than just coming up with or picking the best alternative or option. It requires analyzing potential problems or opportunities and making sound judgments based on analysis.

Using an engaging simulation, this course teaches a logical decision-making process that addresses the critical elements that result in high-quality business decisions. Participants will develop the skills and confidence to generate options and compare them to important decision criteria, and to select the best course of action. Utilizing this process will also help individuals avoid the pitfalls that often undermine high-quality decision making.

This course is designed to:

- Prevent individuals from jumping immediately to evaluating alternatives instead of using creative-thinking approaches to identify all potential alternatives.
- Enable leaders to detect the early signs of problems or opportunities.
- Help leaders avoid failures associated with improper assessment of risk and reward before decisions are made.

Strategies for Influence (4 hours)

An inability to develop a strategy for successfully influencing others is ultimately catastrophic for a leader. Whether it's an innovative breakthrough or a simple process improvement, making it happen generally requires commitment from others in the organization.

Participants in this course will learn essential strategies for effectively capturing people's attention, transforming their perspectives, and gaining their commitment to taking action.

This course is designed to enable leaders to:

- Capture stakeholders' attention, gain their commitment, and make things happen.
- Leverage their personal power to gain other's commitment to take action on promising ideas and alternatives that achieve business results.
- Implement new ideas, improvements, and alternatives that will have the greatest impact on organizational objectives.

Module Four – Delegation and Change Management

Delegating with Purpose (4 hours)

Delegation is a critical skill for leaders in today's "do more with less" business environment. Fewer resources, changing motivations, virtual employees, and global workforces are just a few of the challenges leaders face as they attempt to meet ever-increasing workplace demands.

In this course, leaders learn to identify the tasks they need to delegate, select the most appropriate individuals, assess capabilities and commitment, and plan the delegation discussion. That discussion includes the level of decision-making authority, amount of support, and methods for monitoring progress and measuring results.

This course enables leaders to:

- Achieve key business results by leveraging the entire team's abilities.
- Build the team's capabilities and capacity through developmental delegations.
- Free up time to focus on mission-critical responsibilities.

Driving Change (4 hours)

Here's a hard truth for business leaders: 70 percent of workplace change initiatives fail.

For these critical initiatives to be successful, organizations need leaders who are able to turn resistance into commitment and inspire team members to take ownership of change.

This course focuses on the skills and resources leaders need to accelerate the process of implementing change with their team members and to create an agile work environment where people are more open to change.

This course enables leaders to:

- Accelerate the process of making change happen.
- Minimize the potential negative effects change can have on productivity, morale, and collaboration.
- Turn resistance into commitment and inspire team members to take ownership of change.
- Clearly communicate the business rationale and benefits of change for the team and the organization.

Module 5 – Business Acumen

Making Sense of Business – A Simulation (7 hours)

Employees are more likely to support organizational initiatives and objectives if they understand the rationale behind management decisions and realize how they can add to the company's success.

Unfortunately, many don't always understand how and why business decisions are made.

In this engaging business simulation, participants run a business hands-on to realize how and why decisions are made.

This course enables leaders to:

- View business from the perspective of an owner and see how their jobs affect the overall business.
- Explain the “whys” behind management decisions and organizational initiatives.
- Make better job decisions because they have a big-picture view of business.

The Corporate College at ACC operates with the intention of meeting the needs of the business community that we serve. We routinely custom develop a wide array of specialized courses for our clients. Please feel free to inquire about courses that interest your organization by contacting Randy Floyd, Advanced Technologies and Manufacturing Program Manager at The Corporate College at ACC.

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