

ACAP

Austin Competency Analysis Profile

Bioinstrumentation

Conducted

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Preface

Austin Community College would like to express our sincere appreciation to our business, industry, labor, and community partners who donated their time and expertise toward the identification and validation of competencies in the following Austin Competency Analysis Profile.

Introduction

The ACAP (Austin Competency Analysis Profile) initiative comes out of the Instructional Development Services of Instructional Resources and Technology at Austin Community College. This initiative is ACC's primary source for Competency-Based Curriculum development, providing a connection between our academic and workforce programs and the needs of business and industry.

The ACAP is a process for analyzing an occupation to develop curriculum. The product is a competency list, employability skills, and academic skill levels that have been developed and validated by subject matter experts who perform the occupation. This list will be used to develop programs that address the needs of business and industry by equipping our students with the entry skills required in a workplace environment.

A CAP Process Overview

What are Austin Competency Analysis Profiles (ACAPs)?

Austin Competency Analysis Profiles (ACAPs) are competency lists for academic and workforce programs verified by expert workers, or Subject Matter Experts. These lists evolve from a well-established job analysis process involving business, industry, labor, and community agency representatives from throughout the Austin area.

How is an Austin Competency Analysis Profile used?

Each ACAP identifies the occupational, academic, and employability skills (or competencies) needed to enter a given occupation or occupational area. The ACAP not only lists the competencies but also clusters those competencies into broader units and details the knowledge, skills, and attitudes (competency builders) needed to perform each competency.

Within the competency list are two levels of items: core and advancing. Core items, which are essential for entry-level employment, are required to be taught—the concept of advancing items will only be introduced to students. Advancing items are those needed beyond entry level in a given occupation, and are designated as “Advanced [A].” If core competencies or competency builders are present in an “Advanced” unit, then they are designated as “Core [c].”

Educational institutions may add as many units, competencies, and/or competency builders as desired to reflect local employment needs, trends, and specialties. Local advisory committees are actively involved in the identification and verification of additional items. Faculty members formulate their courses of study using the varied contents of the ACAP. Faculty also monitor gains using many forms of assessment.

ACAP: Bioinstrumentation

Technician

Biomed Technician

Cryogenic Technician

Occupational Competencies

The following Occupational Competencies have been identified and verified by a panel of subject matter experts currently employed in the field of Bioinstrumentation. This panel of experts has determined that these skills will adequately prepare students for *entry level* positions in this field. The *Competencies* are grouped into units. *Competency Builders* are included to help identify the knowledge, skills and attitudes students need to perform each competency. These *Competencies* and *Competency Builders* are designed to be the basis for curriculum development to ensure business and industry input that is relative and meaningful to the workplace. These *Competencies* are intended to include all basic, necessary skills for this occupational area, but may be supplemented with additional competencies as faculty and advisory committee members see the need to do so.

Key Terms:

Competency—an observable and measurable behavior that has a definite beginning and end; can be performed within a limited amount of time; consists of two or more competency builders; and leads to a product, service, or decision.

Competency Builders—the skills, knowledge, and attitudes (written in measurable terms) needed to perform a given competency.

Entry Level—position of employment that requires no previous experience, but may require some training and/or specific skills, knowledge, or attitudes.

ACAP: Bioinstrumentation

Unit 1	Safety
Unit 2	Test Bench Operations
Unit 3	General Electronics
Unit 4	Computer Hardware and Software
Unit 5	Technical Communication Skills
Unit 6	Electro-mechanical Systems
Unit 7	Regulatory Compliance (Federal, State, Local)
Unit 8	Bio-medical Equipment
Unit 9	Equipment Management

Occupational Competencies

ACAP: Bioinstrumentation

Unit 1 Safety

Competency 1.1 Follow safety procedures

Competency Builders:

- 1.1.1 Work safely with all types of circuits and components to avoid shock
- 1.1.2 Choose proper tools for procedures
- 1.1.3 Use hand tools and equipment correctly and safely
- 1.1.4 Apply safety-grounding systems (lightning arresters, ground-fault interrupters, etc.)
- 1.1.5 Wear protective clothing and equipment as required (safety glasses, etc.)
- 1.1.6 Identify facility bio-safety standards and protocols
- 1.1.7 Locate all safety equipment (eye-wash station, fire extinguishers, decontamination shower, etc.)

Competency 1.2 Handle hazardous materials properly

Competency Builders:

- 1.2.1 Interpret Material Safety Data Sheet labels to apply the necessary personal protective equipment (PPE)
- 1.2.2 Identify location of Material Safety Data Sheet (MSDS) manual
- 1.2.3 Follow established procedures for use and storage of hazardous materials
- 1.2.4 Follow established procedures for disposing of hazardous materials
- 1.2.5 Identify situations that require MSDS reference (such as decontamination, spills, new materials or equipment, fluids or chemicals in the systems, personal allergies, etc.)
- 1.2.6 Follow established procedures for accidental exposure

Competency 1.3 Comply with relevant safety standards and regulations

Competency Builders:

- 1.3.1 Comply with OSHA/federal standard
- 1.3.2 Follow other industry/company specific safety regulations

Competency 1.4 Apply specific medical safety practices

Competency Builders:

- 1.4.1 Report incidents (needle sticks, sharps, etc.)
- 1.4.2 Identify medical bio-hazards
- 1.4.3 Identify hazards of biological pathogens
- 1.4.4 Wear appropriate PPE for the situation

Unit 2 Test Bench Operations

Competency 2.1 Perform assembly operations

Competency Builders:

- 2.1.1 Practice damage-prevention procedures (ESD grounding devices, gloves, etc.)
- 2.1.2 Use proper troubleshooting techniques
- 2.1.3 Use hand and power tools for basic assembly
- 2.1.4 Solder/de-solder using proper equipment and techniques, such as through-hole and surface mount devices
- 2.1.5 Make solderless connections
- 2.1.6 Disassemble, repair, and re-assemble parts on printed circuit boards

Competency 2.2 Interpret/apply information from appropriate resources

Competency Builders:

- 2.2.1 Identify components using data books or electronic resources and cross reference/technical manuals
- 2.2.2 Interpret electronic schematics, technical drawings, flow charts and diagrams
- 2.2.3 Record and interpret performance data using curves, tables and graphs
- 2.2.4 Interpret color codes and other component descriptors
- 2.2.5 Interpret site electrical and environmental surveys for support of sensitive electronic devices (e.g. temperature, electromagnetic field, current flow)

Competency 2.3 Analyze electronic systems

Competency Builders:

- 2.3.1 Analyze technical requirements of electronic devices
- 2.3.2 Assess signs and symptoms of malfunctions
- 2.3.3 Calibrate testing instruments to prescribed specifications
- 2.3.4 Test faulty systems using proper test equipment
- 2.3.5 Troubleshoot /diagnose malfunction based on normal functional operation of electronic unit and systems
- 2.3.6 Inspect components of equipment for accuracy of assembly, installation and for defects such as loose connections and frayed wire
- 2.3.7 Calibrate medical equipment to prescribed specifications
- 2.3.8 Verify the accuracy of performance

Competency 2.4 Test circuits

Competency Builders:

- 2.4.1 Assess voltage breakdown limitations of probes and test equipment
- 2.4.2 Use isolation transformers in working with non-isolated test equipment

Competency 2.5 Employ appropriate tools for the situation

Competency Builders:

- 2.5.1 Trouble shoot problem using an oscilloscope
- 2.5.2 Trouble shoot problem using a multi-meter
- 2.5.3 Identify need for calibration of the tool
- 2.5.4 Check for leakage current (ESI)

Unit 3 General Electronics

Competency 3.1 Summarize the properties of DC circuits

Competency Builders:

- 3.1.1 Determine resistance and conductance of DC circuits
- 3.1.2 Troubleshoot and repair DC series, parallel and bridge circuits

Competency 3.2 Summarize the properties of AC circuits

Competency Builders:

- 3.2.1 Troubleshoot and repair AC capacitive and inductive circuits
- 3.2.2 Use transformers in AC circuits
- 3.2.3 Design AC frequency selective filter circuits
- 3.2.4 Troubleshoot and repair AC polyphase circuits

Competency 3.3 Summarize the principles of solid state devices

Competency Builders:

- 3.3.1 Troubleshoot circuits using diodes, transistors, SCR's and TRIACs
- 3.3.2 Troubleshoot and repair solid state sensors
- 3.3.3 Troubleshoot and repair circuits containing single stage amplifiers

Competency 3.4 Summarize the principles of Analog Circuits

Competency Builders:

- 3.4.1 Apply the principles and operations of multistage amplifiers
- 3.4.2 Apply the principles and operations of linear power supplies and filters
- 3.4.3 Apply the principles and operations of operational amplifier circuits
- 3.4.4 Apply the principles and operations of audio power amplifiers
- 3.4.5 Apply the principles and operations of regulated and switching power supply circuits
- 3.4.6 Apply the principles and operations of sinusoidal and non-sinusoidal oscillator circuits
- 3.4.7 Apply the principles and operations of RF circuits

Competency 3.5 Summarize the properties of digital circuits (A)

Competency Builders:

- 3.5.1 Compare integrated circuit (IC) logic families
- 3.5.2 Troubleshoot and repair linear Integrated and combinational logic circuits
- 3.5.3 Incorporate flip-flops and related devices into digital circuits
- 3.5.4 Troubleshoot and repair arithmetic-logic circuits
- 3.5.5 Troubleshoot and repair MSI Logic circuits
- 3.5.6 Troubleshoot analog and analog to digital circuits
- 3.5.7 Troubleshoot digital display circuits
- 3.5.8 Solve power distribution noise problems

Competency 3.6 Summarize the principles of Microprocessors (A)

Competency Builders:

- 3.6.1 Identify essential microprocessor components
- 3.6.2 Troubleshoot microprocessor interfaces (i.e. PIA)
- 3.6.3 Use programming devices to program, monitor, and edit the instructions in programmable controllers
- 3.6.4 Troubleshoot operation of programmable controller

Unit 4 Computer Hardware and Software

Competency 4.1 Identify hardware components of a microcomputer

Competency Builders:

- 4.1.1 Identify digital computer system components on a simple block diagram
- 4.1.2 Identify the input and output devices, peripherals, and storage devices
- 4.1.3 Identify motherboards, BUS architectures and CMOS
- 4.1.4 Identify CPU types and components
- 4.1.5 Identify memory types (i.e. RAM, CACHE, ROM)

Competency 4.2 Assemble and disassemble a microcomputer

Competency Builders:

- 4.2.1 Configure BIOS (CMOS setup)
- 4.2.2 Identify hardware components for use/compatibility
- 4.2.3 Configure hardware components
- 4.2.4 Assemble hardware components
- 4.2.5 Troubleshoot and repair hardware components

Competency 4.3 Troubleshoot and install an operating system

Competency Builders:

- 4.3.1 Compare and evaluate operating systems including UNIX, Windows, MAC, etc.
- 4.3.2 Configure operating system, device drivers, peripherals and environment settings

- 4.3.3 Troubleshoot operating system configuration
- 4.3.4 Repair/reinstall operating system

Competency 4.4 Troubleshoot and install networking systems

Competency Builders:

- 4.4.1 Troubleshoot connectivity
- 4.4.2 Repair/Reinstall networking configuration
- 4.4.3 Identify hardware and software components of a basic network

Unit 5 Technical Communication Skills

Competency 5.1 Compose technical reports and documentation

Competency Builders:

- 5.1.1 Write corrective action reports
- 5.1.2 Write a preventative maintenance report
- 5.1.3 Write procedural documentation
- 5.1.4 Use computer based applications (word, excel, powerpoint, etc.)
- 5.1.5 Write engineering change requests (ECR)
- 5.1.6 Report service action through log entries or customer reports

Competency 5.2 Give an oral presentation (A)

Competency Builders:

- 5.2.1 Apply oral communication techniques appropriate to the situation
- 5.2.2 Use visual media to support an oral presentation such as presentation software (Powerpoint)

Competency 5.3 Locate and interpret technical materials, references

Competency Builders:

- 5.3.1 Access resources via library, internet, equipment manuals, data manuals, etc.
- 5.3.2 Use relevant information to perform work functions and solve problems such as troubleshooting and configuration sections, flowcharts, schematics, specifications, etc.

Unit 6 Electro-mechanical Systems

Competency 6.1 Troubleshoot hydraulic and pneumatic systems

Competency Builders:

- 6.1.1 Identify hydraulic and pneumatic system components
- 6.1.2 Compare hydraulic and pneumatic systems
- 6.1.3 Interpret schematics of hydraulic and pneumatic systems
- 6.1.4 Test system components

Competency 6.2 Troubleshoot motor control and computer system interfaces

Competency Builders:

- 6.2.1 Identify servomechanisms, motors, and motor control circuits including power distribution systems, relays and relay circuits, protection circuits, types of motor controllers, types of motors (poly-phase motors, single phase motors)
- 6.2.2 Identify parts of a mechanical power transmission system including measuring instruments, compound and reverted gear trains, internal and planetary gear trains, helical and bevel gear trains, rack and pinion mechanisms, worm and wheel mechanisms, block and screw mechanisms, and counter rotating mechanisms and differentials, etc.

Unit 7 Regulatory Compliance (Federal, State, Local)

Competency 7.1 Maintain up to date regulatory codes

Competency Builders:

- 7.1.1 Access regulatory codes on line
- 7.1.2 Identify manuals, bulletins, and other sources of updates of regulatory codes

Competency 7.2 Apply regulatory codes to all work

Competency Builders:

- 7.2.1 Identify responsibilities with EOC and JCHAO
- 7.2.2 Recognize individual responsibilities and accountability to accurate documentation

Unit 8 Bio-medical Equipment

Competency 8.1 Maintain biomedical equipment (Lasers, Pumps/Injectors, Defib, Patient Monitor, Blood warmer, Incubators, Microscopes, Sterilizers)

Competency Builders:

- 8.1.1 Perform a PM on biomedical equipment
- 8.1.2 Troubleshoot biomedical equipment
- 8.1.3 Repair biomedical equipment
- 8.1.4 Identify types of sensors found in biomedical equipment
- 8.1.5 Identify biomedical equipment where remote access is possible (for service, to access logs, etc.)

Competency 8.2 Interpret block diagrams for biomedical equipment (VADs, Anesthesia, Ventilators, Pacemakers)

Competency Builders:

- 8.2.1 Describe the basic function of equipment
- 8.2.2 Identify the clinical purpose of the equipment

Competency 8.3 Interpret block diagrams for Imaging and RAD (Ultrasound, CT, MRI, RF, Cath Lab, Nuc Med)

Competency Builders:

- 8.3.1 Describe the basic function of equipment
- 8.3.2 Identify the clinical purpose of the equipment

Competency 8.4 Interpret block diagrams for Lab (Slide strainers, Chemistry Analyzers, Cell Counters, Urinalysis, Ventilation Hood, Centrifuge)

Competency Builders:

- 8.4.1 Describe the basic function of equipment
- 8.4.2 Identify the clinical purpose of the equipment

Unit 9 Equipment Manager

Competency 9.1 Maintain equipment following scheduled intervals (Preventative Maintenance—PM)

Competency Builders:

- 9.1.1 Review logs/records to determine last scheduled work
- 9.1.2 Identify materials needed for scheduled maintenance
- 9.1.3 Perform maintenance
- 9.1.4 Record maintenance
- 9.1.5 Perform a PM interval risk assessment
- 9.1.6 Report malfunctions requiring industry (safety) alerts

Competency 9.2 Repair equipment as appropriate

Competency Builders:

- 9.2.1 Identify client's complaint
- 9.2.2 Reproduce the problem
- 9.2.3 Determine parts and materials needed for the repair
- 9.2.4 Perform the repair
- 9.2.5 Test the repair
- 9.2.6 Record action taken

Competency 9.3 Maintain records/logs on equipment

Competency Builders:

- 9.3.1 Identify storage system of records/logs
- 9.3.2 Retrieve past records/logs
- 9.3.3 Record all maintenance requests, complaints, actions taken, etc.
- 9.3.4 Inventory equipment

Employability Competencies

Employability Competencies are underlying skills, including work habits and ethics, essential to the workplace and personal growth. SCANS (Secretary’s Commission on Achieving Necessary Skills) are the basis for these competencies and are included in all programs based on an ACAP (Austin Competency Analysis Profile). These skills are taught with the intention of providing the student with a well-rounded understanding of workplace expectations in areas not specific to a particular occupation, in an attempt to develop a valuable employee.

ACAP: Bioinstrumentation

Unit 1:	Resources
Unit 2:	Interpersonal
Unit 3:	Information
Unit 4:	Systems
Unit 5:	Technology
Unit 6:	Basic Skills
Unit 7:	Thinking Skills
Unit 8:	Personal Qualities

Unit 1: Resources

Competency 1.1 Manage time effectively

Competency Builders:

- 1.1.1 Select relevant, goal-related activities
- 1.1.2 Rank activities in order of importance
- 1.1.3 Allocate time to activities
- 1.1.4 Identify tasks to be completed
- 1.1.5 Develop and follow an effective, workable schedule based on accurate estimates of such things as importance of tasks, time to complete tasks, time available for completion, and task deadlines, without wasting time
- 1.1.6 Identify possible impact of schedules on other activities
- 1.1.7 Evaluate and adjust a schedule

Competency 1.2 Manage money effectively

Competency Builders:

- 1.2.1 Prepare or use budgets including making cost and revenue forecasts
- 1.2.2 Record details to track budget performance
- 1.2.3 Adjust budget appropriately when needed
- 1.2.4 Allocate money to include accurately preparing and using a budget according to a consistent and orderly accounting method
- 1.2.5 Calculate future budgetary needs based on projected costs and revenues
- 1.2.6 Track the extent to which actual costs and revenues differ from the estimated budget, and take appropriate and effective action

Competency 1.3 Manage material and facility resources effectively

Competency Builders:

- 1.3.1 Store resources such as materials, supplies, parts, equipment, space or final products in an order that makes the best use of them
- 1.3.2 Allocate materials and facility resources to include carefully planning the steps involved in the acquisition, storage, and distribution of resources
- 1.3.3 Acquire, transport, and store material and facility resources safely and efficiently
- 1.3.4 Maintain material and facility resources in good condition
- 1.3.5 Distribute material and resources to the end user

Competency 1.4 Manage human resources efficiently

Competency Builders:

- 1.4.1 Assess people's knowledge, skills and potential
- 1.4.2 Identify present and future work load
- 1.4.3 Match individual talents and workload effectively
- 1.4.4 Monitor performance and provide feedback actively

Unit 2: Interpersonal Skills

Competency 2.1 Participate as a member of a team

Competency Builders:

- 2.1.1 Work cooperatively with others
- 2.1.2 Contribute to group with ideas, suggestions, and efforts
- 2.1.3 Complete personal share of tasks necessary to complete a project
- 2.1.4 Encourage team members by listening and responding appropriately to their contributions
- 2.1.5 Build on individual team members' strengths
- 2.1.6 Resolve differences for the benefit of the team
- 2.1.7 Take personal responsibility for accomplishing goals
- 2.1.8 Challenge existing procedures, policies, or authorities responsibly

Competency 2.2 Teach others

Competency Builders:

- 2.2.1 Coach or otherwise teach others to apply related concepts and theories to tasks
- 2.2.2 Convey job information to allow others to see its applicability and relevance to tasks
- 2.2.3 Identify training needs of others
- 2.2.4 Assess performance of others
- 2.2.3 Provide feedback on others' performance in a constructive manner
- 2.2.4 Provide solutions to observed problems

Competency 2.3 Serve clients/customers

Competency Builders:

- 2.3.1 Identify customers/clients expectations through surveys, questions, body language, or expressions
- 2.3.2 Communicate and work with clients/customers to satisfy their expectations
- 2.3.3 Listen actively to customers to avoid misunderstanding and to identify needs
- 2.3.4 Provide alternatives to clients/customers to satisfy their expectations
- 2.3.5 Provide services and goods in a timely, positive manner
- 2.3.6 Obtain additional resources to satisfy client needs efficiently

Competency 2.4 Exercise leadership

Competency Builders:

- 2.4.1 Communicate thoughts, feelings, and ideas to justify a position
- 2.4.2 Motivate and/or convince individuals or groups through encouragement or persuasion
- 2.4.3 Challenge existing procedures, policies or authorities responsibly
- 2.4.4 Use rules/values followed by others
- 2.4.5 Justify a position logically and appropriately
- 2.4.6 Consider minority viewpoints in making decisions or taking action

Competency 2.5 Negotiate to arrive at a decision

Competency Builders:

- 2.5.1 Achieve agreement through exchanging specific resources or resolving divergent interests
- 2.5.2 Research opposition and the history of the conflict
- 2.5.3 Set realistic, obtainable goals
- 2.5.4 Present facts and arguments
- 2.5.5 Listen to and reflect upon what has been said
- 2.5.6 Clarify problems and resolve conflicts
- 2.5.7 Propose and examine possible options
- 2.5.8 Make reasonable compromises

Competency 2.6 Work with cultural diversity

Competency Builders:

- 2.6.1 Work with men and women, and a variety of ethnic, social and educational backgrounds
- 2.6.2 Compare one's own culture and that of others
- 2.6.3 Respect the rights of others while helping them make cultural adjustments when necessary
- 2.6.4 Base impression upon individual performance, not stereotypes
- 2.6.5 Understand concerns of members of other ethnic and gender groups

Unit 3: Information

Competency 3.1 Acquire and evaluate information

Competency Builders:

- 3.1.1 Pose analytic questions to determine specific information needs
- 3.1.2 Select appropriate information sources
- 3.1.3 Determine when new information must be created and do so
- 3.1.4 Evaluate data for relevance and accuracy

Competency 3.2 Organize and maintain information

Competency Builders:

- 3.2.1 Organize a variety of information forms or sources in a systemic fashion
- 3.2.2 Maintain written or other forms of information to keep up-to-date information available in a systemic fashion
- 3.2.3 Organize information from computer, visual, oral and physical sources in readily accessible formats, such as computerized data bases, spreadsheets, microfiche, video disks, paper files, etc.
- 3.2.4 Transform data into different formats in order to organize them by the application of various methods such as sorting, classifying, or more formal methods

Competency 3.3 Interpret and communicate information

Competency Builders:

- 3.3.1 Select information to be communicated
- 3.3.2 Identify best methods to present information (e.g., overheads, handouts, etc.)
- 3.3.3 Communicate results to others in desired format
- 3.3.4 Convey information to others through a variety of means including oral, written, graphic, pictorial or multi-media methods

Competency 3.4 Process information using computer

Competency Builders:

- 3.4.1 Acquire information from the internet and other computer based resources
- 3.4.2 Organize information, using spreadsheets, word processor, and data bases effectively
- 3.4.3 Analyze information to identify trends, make projections, etc.
- 3.4.4 Enter, modify, retrieve, store and verify data and other information in a computer
- 3.4.5 Choose format for display (e.g., line graphs, bar graphs, tables, pie charts, narrative)
- 3.4.6 Convey information into the chosen format
- 3.4.7 Communicate information using e-mail, list serves, word processor, or other computer based communication functions

Unit 4: Systems

Competency 4.1 Apply appropriate techniques to function within social, organizational, and technological systems to attain goals effectively and ethically

Competency Builders:

- 4.1.1 Identify dynamics and components of social, organizational and technological systems
- 4.1.2 Recognize acceptable behavior and attitudes within social, organizational and technological systems
- 4.1.3 Communicate through acceptable methods to interact with social, organizational, and technological systems effectively, efficiently, and ethically
- 4.1.4 Recognize how a system's structures relate to goals
- 4.1.5 Recognize the right of people to ask for information and where to get resources

Competency 4.2 Monitor and correct performance of a system

Competency Builders:

- 4.2.1 Distinguish trends
- 4.2.2 Predict impact of actions on system operations
- 4.2.3 Diagnose deviations in the function of a system/organization
- 4.2.4 Correct performance through necessary action
- 4.2.5 Detect deviations from systems intended purpose
- 4.2.6 Troubleshoot the system
- 4.2.7 Make changes to the system to rectify system function and to ensure quality of product

Competency 4.3 Improve and design systems

Competency Builders:

- 4.3.1 Make suggestions to modify or improve existing products or services
- 4.3.2 Implement approved improvements in systems
- 4.3.3 Evaluate the benefits of the improvements
- 4.3.4 Develop/recommend new or alternative system designs based on relevant feedback
- 4.3.5 Communicate the results of the evaluations

Unit 5: Technology

Competency 5.1 Select appropriate technology

Competency Builders:

- 5.1.1 Determine the desired results or outcomes and applicable restraints
- 5.1.2 Visualize the necessary methods and applicable technology
- 5.1.3 Evaluate specifications
- 5.1.2 Judge which procedures, tools, machines or programs will produce the desired results

Competency 5.2 Apply technology to task

Competency Builders:

- 5.2.1 Set up tools such as machines, computers, and programming systems, using proper procedures, to get desired results
- 5.2.2 Analyze how different parts of machines interact and how machines interact with broader production systems
- 5.2.3 Install machines including computers
- 5.2.4 Interpret machine output accurately
- 5.2.5 Detect errors from program output

Competency 5.3 Maintain and troubleshoot technology

Competency Builders:

- 5.3.1 Prevent problems in machines, computers, and other technologies
- 5.3.2 Identify problems in machines, computers and other technologies
- 5.3.3 Perform routine maintenance and service of machines, computers, and other technologies
- 5.3.4 Detect more serious problems
- 5.3.5 Generate workable solutions to correct deviations
- 5.3.6 Recognize need for additional help

Unit 6: Basic Skills

Competency 6.1 Read written information in prose and documents, such as manuals, graphs, and schedules with understanding

Competency Builders:

- 6.1.1 Determine the main idea or essential message
- 6.1.2 Identify relevant details, facts, and specifications
- 6.1.3 Infer or locate the meaning of unknown or technical vocabulary
- 6.1.4 Judge the accuracy, appropriateness, style, and plausibility of reports, proposals, or theories of other writers

Competency 6.2 Communicate thoughts, ideas, information, and messages in writing

Competency Builders:

- 6.2.1 Record information completely and accurately
- 6.2.2 Compose and create documents such as letters, directions, manuals, reports, proposals, graphs, and flow charts
- 6.2.3 Use language, style, organization and format appropriate to the subject matter, purpose, and audience
- 6.2.3 Include supporting documentation where appropriate
- 6.2.4 Attend to level of detail
- 6.2.5 Check, edit, and revise for correct information, appropriate emphasis, form, grammar, spelling, and punctuation

Competency 6.3 Perform arithmetic computations and concepts with appropriate technology and/or paper and pencil to solve simple work problems

Competency Builders:

- 6.3.1 Perform basic computations
- 6.3.2 Use basic numerical concepts such as whole numbers and percentages in practical situations
- 6.3.3 Make reasonable estimates of arithmetic results without a calculator
- 6.3.4 Use tables, graphs, diagrams, and charts to obtain or convey quantitative information

Competency 6.4 Perform mathematics in a variety of techniques to approach practical problems appropriately

Competency Builders:

- 6.4.1 Choose appropriate technique to solve problem
- 6.4.2 Use quantitative data to construct logical explanations for real world situations

- 6.4.3 Express mathematical ideas and concepts orally and in writing
- 6.4.4 Predict an event considering the role of chance in the occurrence

Competency 6.5 Listen and react appropriately to verbal messages

Competency Builders:

- 6.5.1 Receive, attend to, interpret, and respond to verbal messages appropriately
- 6.5.2 Receive, attend to, interpret, and respond to other cues such as body language appropriately
- 6.5.3 Listen to comprehend, learn, critically evaluate, appreciate, or support the speaker

Competency 6.6 Deliver oral messages appropriately to listeners

Competency Builders:

- 6.6.1 Organize ideas and communicates orally as appropriate for the situation and listeners
- 6.6.2 Participate in conversation, discussion, and group presentations
- 6.6.3 Select an appropriate medium for conveying a message
- 6.6.4 Use verbal language and other cues, such as body language, in a way appropriate in style, tone, and level of complexity to the audience and the occasion
- 6.6.5 Speak clearly and communicate a message
- 6.6.6 Respond to listener feedback in a way that indicates understanding
- 6.6.7 Ask questions when needed

Unit 7: Thinking Skills

Competency 7.1 Generate new ideas using creative thinking

Competency Builders:

- 7.1.1 Change or reshapes goals using nonlinear or unusual connections
- 7.1.2 Imagine new ideas by combining ideas or information in new ways
- 7.1.3 Connects seemingly unrelated ideas
- 7.1.4 Reshape goals in ways that reveal new possibilities

Competency 7.2 Make decisions

Competency Builders:

- 7.2.1 Specify goals and constraints
- 7.2.2 Generate alternatives
- 7.2.3 Consider risks
- 7.2.4 Evaluate and choose best alternatives

- 7.2.5 Analyze how personal, family, and social factors influence decisions, behaviors, and lifestyles
- 7.2.6 Utilize a decision-making process to develop future career goals

Competency 7.3 Apply problem solving skills appropriate to situation

Competency Builders:

- 7.3.1 Recognize a problem exists (i.e., that there is a discrepancy between what is and what should be)
- 7.3.2 Identify possible reasons for the problem
- 7.3.3 Devise and implement a plan of action to resolve the problem
- 7.3.4 Evaluate and monitor progress
- 7.3.5 Revise the plan as indicated by the findings
- 7.3.6 Communicate in both oral and written language while working with others to identify/resolve problems
- 7.3.7 Reason inductively and deductively to solve problems
- 7.3.8 Select and apply problem-solving methods

Competency 7.4 See things in the mind's eye

Competency Builders:

- 7.4.1 Organize and process symbols, pictures, graphs, objects or other information to visualize actual representation (such as a building from blueprints)
- 7.4.2 Visualize possible options
- 7.4.3 Communicate visualized options verbally

Competency 7.5 Apply learning strategies to support life-long learning

Competency Builders:

- 7.5.1 Apply and adapt existing and new knowledge and skills, using learning techniques, in both familiar and changing situations
- 7.5.2 Evaluate learning style (visual, aural, etc.) to make proper selection of learning techniques
- 7.5.3 Identify various learning techniques including formal learning strategies (note taking or clustering items that share some characteristics) and informal learning strategies (awareness of unidentified false assumptions that may lead to faulty conclusions)
- 7.5.4 Make decisions/plans concerning school to work training and future educational needs using relevant resources

Competency 7.6 Apply reasoning to finding solutions or draw conclusions

Competency Builders:

- 7.6.1 Discover a rule or principle underlying the relationship between two or more objects
- 7.6.2 Extract rules or principles from a set of objects or a written text
- 7.6.3 Apply principles to solve problems

- 7.6.4 Draw conclusion from available information using logic
- 7.6.5 Apply rules and principles to a new situation
- 7.6.6 Determine which conclusion is correct when given a set of facts and conclusions
- 7.6.7 Evaluate alternatives and assess consequences to achieve personal and social goals

Unit 8: Personal Qualities

Competency 8.1 Act responsibly

Competency Builders:

- 8.1.1 Persevere toward goal attainment with a high level of effort
- 8.1.2 Set high standards in order to become excellent at doing tasks by setting high standards, paying attention to details, working well and displaying a high level of concentration even when assigned an unpleasant task
- 8.1.3 Display a high standard of attendance, punctuality, enthusiasm, vitality, and optimism in approaching and completing tasks

Competency 8.2 Exhibit effective self-esteem

Competency Builders:

- 8.2.1 Maintain a positive view of self and believes in own self-worth
- 8.2.2 Identify own skill and abilities possessed
- 8.2.3 Recognize own emotional capacity and needs
- 8.2.4 Identify/Apply effective ways to handle emotional capacity and needs
- 8.2.5 Recognize own impression on others

Competency 8.3 Employ appropriate social skills

Competency Builders:

- 8.3.1 Demonstrate understanding, friendliness, adaptability, empathy and politeness in new and on-going group settings
- 8.3.2 Assert self in familiar and unfamiliar social situations
- 8.3.3 Relate well to others
- 8.3.4 Respond appropriately as the situation requires
- 8.3.5 Take an interest in what others say and do

Competency 8.4 Manage self

Competency Builders:

- 8.4.1 Assess own knowledge, skills, and abilities accurately
- 8.4.2 Set well-defined and realistic personal goals
- 8.4.3 Monitor progress toward goal attainment
- 8.4.4 Motivate self through goal achievement
- 8.4.5 Exhibit self-control and respond to feedback unemotionally and nondefensively
- 8.4.6 Initiate action

Competency 8.5 Apply integrity and honesty to all matters

Competency Builders:

- 8.5.1 Recognize situations when faced with making a decision or exhibiting behavior that may break with commonly held personal or societal values
- 8.5.2 Understand the impact of violating these beliefs and codes on an organization, self, and others
- 8.5.3 Choose an ethical course of action

WorkKeys® Process Overview

Developed by American College Testing (ACT), the purpose of the Job Profiling process is to identify the level of applied academic skills that, according to business and industry, students must master to qualify for and be successful in their occupation of choice. The results of Job Profile “leveling” can help teachers to better target instruction toward their students’ needs.

The WorkKeys component, developed by ACT, measures students’ applied academic skills. These academic skills include Applied Mathematics, Locating Information, Reading for Information, Listening, Writing, Teamwork, Observation, and Applied Technology. It is determined during the profile which skills apply to the specific job or occupational area.

The ACAP (Austin Competency Analysis Profile) typically includes one or more of the skills described below. A fourth skill may be identified and included if the subject matter experts agree that it is necessary for entry into the position.

- *Applied Mathematics* measures students’ ability to analyze, set-up, and solve math problems typically found in the workplace.
- *Locating Information* measures students’ ability to use graphic documents to insert, extract, and apply information (includes charts, graphs, tables, forms, blueprints, maps, and instrument gauges).
- *Reading for Information* measures students’ ability to read and understand work-related reading materials (text only—does not include charts, graphs, tables, forms, blueprints, maps, or instrument gauges).

Each WorkKeys assessment is further broken down into four to five levels of achievement, with higher numbers indicating higher achievement in the assessed skill. For each academic skill, the Job Profiling process identifies the level required for successful entry into an occupational area as identified by subject matter experts.

A CT WorkKeys® Skill Levels

<u>Skill Area and Rank</u>	<u>Entry Level</u>	<u>Performance Level</u>
1) Locating Information	5-6	6
2) Applied Mathematics	5	6
3) Reading for Information	6	6-7

Entry Level

Refers to the requirements necessary for someone entering into the occupation (without previous on the job experience).

Performance Level

Refers to the level at which an employee would need to function effectively having gained on-the-job knowledge.

Skill Ranking

Refers to the criticality of the skill to the performance of the occupation with the most critical skill indicated with one (1) and higher numbers indicating lower criticality.

Levels of WorkKeys® Defined

The skills needed to achieve each level for WorkKeys academic skills identified in this profile are as follows:

Locating Information

Locating Information measures skill in using information taken from workplace graphics such as diagrams, blueprints, floor plans, tables, forms, graphs, charts, and instrument gauges. There are four levels of complexity, 3 through 6, with Level 3 being the least complex and Level 6 the most complex. The levels build on each other, each incorporating the skills at the preceding levels.

Level 3

- Find one or two pieces of information in elementary workplace graphics, such as simple order forms, bar graphs, tables, flowcharts, and floor plans.
- Fill in one or two pieces of information that are missing from elementary workplace graphics.

Level 4

- Find several pieces of information in these type of graphics.
- Summarize and/or compare information and trends in a single graphic.
- Summarize and/or compare information and trends among more than one workplace graphic, such as a bar chart and a table showing related information.

Level 5

- Summarize and/or compare information and trends in single graphic.
- Summarize and/or compare information and trends among more than one graphic, such as a bar chart and a table showing related information.

Level 6

- Make decisions, draw conclusions, and/or apply information to new situations using several related and complex workplace graphics that contain a great amount of information or have challenging presentations (e.g., very detailed graphs, charts, tables, forms, maps, blueprints, diagrams).

Applied Mathematics

Applied Mathematics measures skill in applying mathematical reasoning to work-related problems. There are five levels of complexity, 3 through 7, with Level 3 being the least complex and Level 7 the most complex. The levels build on each other, each incorporating the skills at the preceding levels.

Level 3

- Perform basic mathematical operations (addition, subtraction, multiplication, and division) and conversions from one form to another, using whole numbers, fractions, decimals, or percentages.
- Translate simple verbal problems into mathematical equations.
- Directly apply logical information provided to solve problems, including those with measurements and dollars and cents.

Level 4

- Perform one or two mathematical operations (such as addition, subtraction, or multiplication) on several positive or negative numbers. (Division of negative numbers is not covered until Level 5.)
- Add commonly known fractions, decimals, or percentages (e.g., $\frac{1}{2}$, .75, 25%) or add three fractions that share a common denominator.
- Calculate averages, simple ratios, proportions, and rates, using whole numbers and decimals.
- Reorder verbal information before performing calculations.
- Read simple charts or graphs to obtain information needed to solve a problem.

Level 5

- Look up and calculate single-step conversions within English or non-English measurement systems (e.g., converting ounces to pounds or centimeters to meters) or between measurement systems (e.g., converting centimeters to inches).
- Make calculations using mixed unit (e.g., hours and minutes).
- Determine what information, calculations, and unit conversions are needed to find a solution.

Level 6

- Set up problems and do several steps of calculations or conversions.
- Calculate using negative numbers, fractions, ratios, percentages, or mixed numbers (e.g., $12 \frac{1}{8}$).
- Transpose a formula before calculating (e.g., $8X = 20 \Rightarrow X = 20/8$).
- Look up and use two formulas to change from one unit to another unit within the same system of measurement (e.g., 1 cup = 8 fl oz, 1 quart = 4 cups).
- Find mistakes in calculations, such as those required in lower levels.
- Determine the best deal and perform a further calculation with the result.

Level 7

- Solve problems requiring multiple steps of logic and calculation.
- Solve problems involving more than one unknown, nonlinear functions (e.g., rate of change), and applications of basic statistical concepts (e.g., error of measurement).
- Locate errors in multiple-step calculations.
- Solve problems with unusual content or format, or with incomplete or implicit information.

Reading for Information

Reading for Information measures skill in reading and understanding work-related reading materials. There are five levels of complexity, 3 through 7, with Level 3 being the least complex and Level 7 the most complex. Although Level 3 is the least complex, it still represents a level of reading skill well above “no skill at all.” The levels build on each other, each incorporating the skills at the preceding levels.

Level 3

- Identify uncomplicated key concepts and simple details.
- Recognize the proper placement of a step in a sequence of events, or the proper time to perform a task.
- Identify the meaning of words that are defined within a passage.
- Identify the meaning of simple words that are not defined within a passage.
- Recognize the application of instructions, from a passage to situations that are described in the passage.

Level 4

- Identify details that are more subtle than those in Level 3.
- Recognize the application of more complex instructions, some of which involve several steps, to described situations.
- Recognize cause-effect relationships.

Level 5

- Understand the paraphrased definition of specialized words or phrases (jargon or technical terms) defined in these reading materials.
- Use jargon or technical terms appropriately in describing situations stated in these reading materials.
- Understand the meaning of acronyms defined in these reading materials (an acronym is a work or collection of letters which stands for a longer phrase, such as HMO to mean Health Maintenance Organization).
- Figure out which definition of a word with multiple meanings is appropriate in the context of these reading materials.
- Apply information given in these reading materials to situations that are not directly described, but similar.
- Apply instructions or procedures with a number of steps to described situations. These instructions may include conditional (if X happens, then you should do Y).

Level 6

- Recognize the application of jargon or technical terms to new situations.
- Recognize the application of complex instructions to new situations.
- Recognize the less-common meaning of a word with multiple meanings from context.
- Generalize from a passage to situations not described in the passage.
- Identify implied details.
- Explain the rationale behind a procedure, policy, or communication.
- Generalize from a passage to a somewhat similar situation.

Level 7

- Recognize the definitions of difficult, uncommon jargon or technical terms from context.
- Generalize from a passage to situations neither described in nor completely similar to those in a passage.

Glossary

ACAP–*Austin Competency Analysis Profile*–a well-established job analysis process unique to Austin Community College involving business, industry, labor, and community agency representatives from throughout the Austin area.

Advanced Competencies–the occupation and academic competencies needed to advance in a given occupation.

Competency–an observable and measurable behavior that has a definite beginning and end; can be performed within a limited amount of time; consists of two or more competency builders; and leads to a product, service, or decision.

Competency Builders–the skills, knowledge, and attitudes (written in measurable terms) needed to perform a given competency.

Core Competencies–the essential occupational and academic competencies needed to enter and remain in a given occupation.

Employability Competencies–underlying skills, abilities, and knowledge as they relate to work ethics, work habits, and personal growth and development.

Entry Level–refers to the requirements necessary for someone entering into the occupation (without previous on-the-job experience).

Performance Level–refers to the level at which an employee would need to function effectively having gained on-the-job knowledge.

Skill Ranking–refers to the criticality of the WorkKeys skill to the performance of the occupation with one (1) indicating the most critical skill.

SME–*Subject Matter Expert*–incumbent worker in a given occupation that is knowledgeable about the job.

Target Job Titles–titles that may be assigned to the types of jobs aligned with an ACAP. Possible titles of jobs for which students would qualify with certificates or degrees in the programs based on an ACAP.

WorkKeys Skills–Eight skills, defined by ACT, referring to underlying, academic skills as they relate to the workplace. The skills include *Applied Mathematics, Applied Technology, Locating Information, Reading for Information, Observation, Teamwork, Listening, and Writing*. Each skill has a very specific definition and levels of each skill can be aligned with specific abilities defined at each level. WorkKeys skills are the basis for an occupational analysis system developed by ACT. The WorkKeys analysis is the final part of the overall ACAP report. All ACAPs include *Reading for Information, Locating Information, and Applied Mathematics*. A fourth skill may be included in the profile if the subject matter experts identify a need for it.