



Ignite. Educate. Accelerate.

AMTEC Curriculum, Certification & Assessments



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AMTEC Vision and Mission

Vision

A recognized collaboration of colleges and companies working to strengthen the competency and global competitiveness of the automotive workforce.

Mission

Create and sustain an innovative, responsive, and standards-based workforce education development system that meets industry skill requirements.



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National Center Goals

Goal 1 - Create business/industry partnerships in delivering core technical education that meets the high priority needs of automotive manufacturers and suppliers.

Goal 2 - Increase secondary to postsecondary transition and from postsecondary to employment to meet industry needs.

Goal 3 - Implement a collaborative support system to sustain and replicate the AMTEC model.

Goal 4 - Create and sustain the support process for the automotive core integrated systems technology education through assessment and continuous improvement.

AMTEC Leadership

Principal Investigator & CEO



Annette Parker

AMTEC Strategy Board

Caren Caton

Toyota Motor Manufacturing
and Engineering Assoc.

Willy Kaulfersch

Ford Motor Co.

Steve Long

United Auto Workers

Joanne Pritchard

General Motors

AMTEC Staff

Scott Jedele

Project Director

Walt Barlow

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Alamo Community College

Pellissippi State Community College

Macomb Community College

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John Gajewski

Jeff Arnold

Mary Ann Hyland-Murr

Stan Chase/Bo Garcia

Mike Forrester

Bluegrass Community & Technical College

CARCAM

Cuyahoga Community College

Danville Community & Technical College

Jefferson Community & Technical College

Lansing Community College

Spartanburg Community College



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AMTEC Standards, Curriculum, & Assessments

AMTEC Skills
Standards

Module/Courses
Content

AMTEC
Assessments

Multi-Skilled Maintenance

Turbo - Develop A CUrriculUM (DACUM)

Administered by:

Dr. Katherine (Kitty) Manley

3 Round Electronic Delphi

Developed & Administered by:

Occupational Research & Assessment, Inc.

AMTEC Electronic Delphi Strategy

Research tool for

gathering data

facilitating
consensus

Used for groups
and individuals
who

Have special
knowledge to
share

Typically not
in contact with
each other

AMTEC Electronic Delphi—3 Rounds Required

Round One

Rate the 170
competencies

0 to 4 rating

Round Two

All compared
group mean from
first round to their
rating

May change their
first rating

Round Three

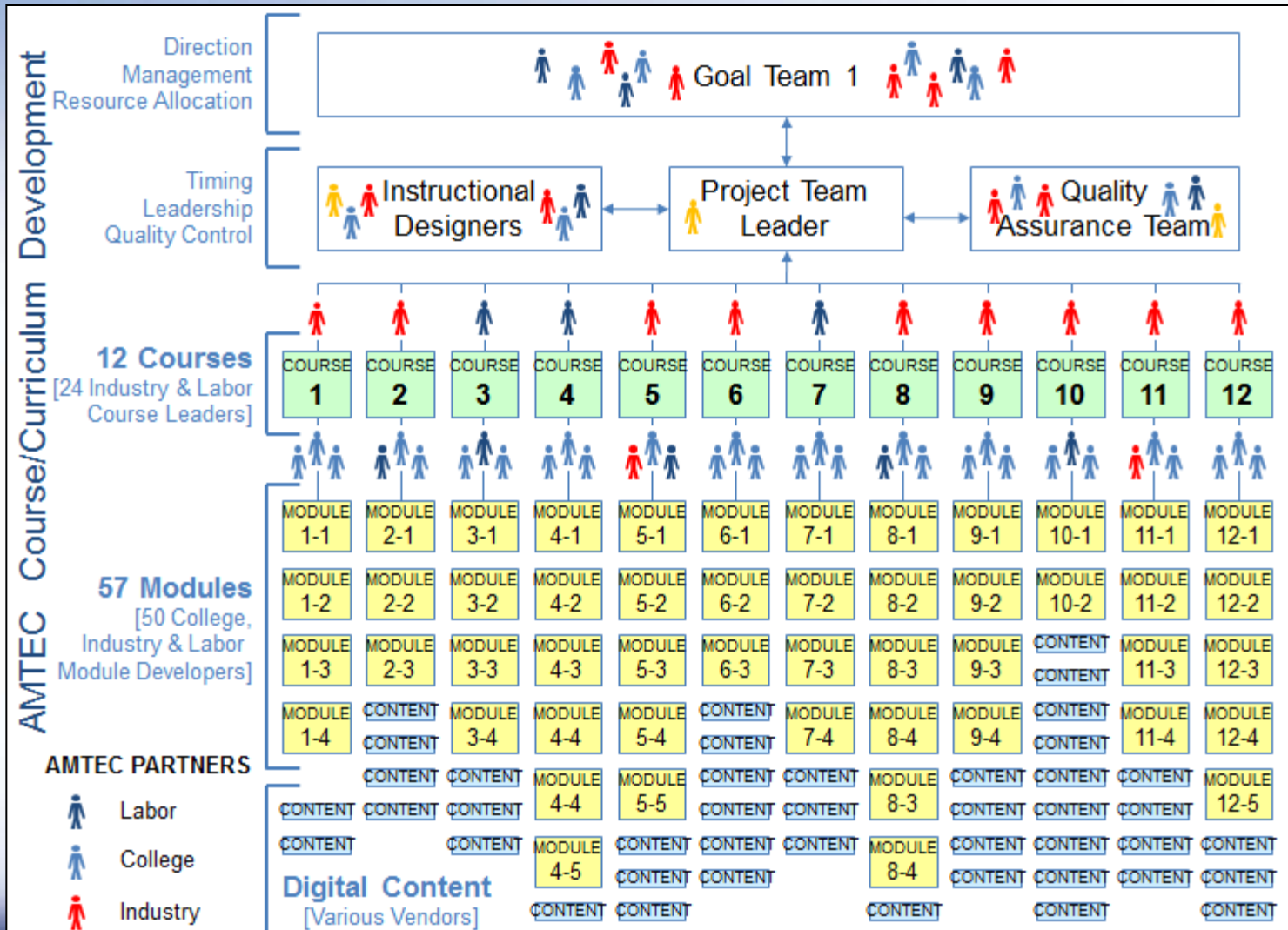
All compared
group mean from
second round to
their rating

May change their
second rating

“Making a Difference”

Consensus & Continuous Improvement





A Sector Based Common Modularized Curriculum

AMTEC Skills Standards

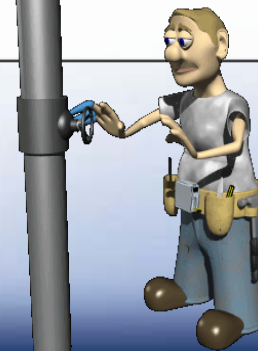
- H.60. Maintain/install fiber optics
- H.61. Troubleshoot/repair/replace vision systems

AMTEC Modules

- H.60 Maintain/install fiber optics
- H.61. Troubleshoot/repair/replace vision systems

- H.60. Maintain/install fiber optics
- H.61. Troubleshoot/repair/replace vision systems

AMTEC Assessments





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AMTEC Curriculum & Pathway Alignment

Literature Findings For Effective Career Pathway	Element Present - Example
1. Employer Involvement in all Phases of the program	<p>Governance Body - Boards/ Committee composed of majority Employers. Curriculum- Competencies, Standards, Labs Recruitment - Plant tours, High school fairs Retention - Mentoring, Internships Funding - Equipment, scholarships, donors Jobs – Internships and Pre or Apprenticeship Opportunities Employers of Employers – Requires Agreement between parties.</p>
2. Institutional and Instructional transformation links education and career competencies and training	<p>Connects high school to college career pathway Connects from workforce to college career pathway Allows for non-credit to credit conversion Values and aligns credits for industry certification.</p>
3.Wrap around support services.	<p>Provides career guidance, academic counseling, mentor financial assistance, and internships for student success.</p>
4. Partnerships	<p>Employers, Schools, Colleges, Universities, Government, and CBOs.</p>
5. Continuous Improvement	<p>Utilizes data to improve performance and student success.</p>
6. Sustainability	<p>Makes good use of data to drive planning and implementation that involves the blending and/or reallocating of funding sources.</p>



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**Increasing the Credibility and Quality
of Certifications and Certificates through
Accreditation**

Certification Accreditation Program

- Based on ANSI/ISO/IEC 17024: General Requirements for Bodies Operating Certification of Persons
 - International Standard
 - Nationally Adopted: American National Standard
- Requirements within the Standard
 - Organizational Structure
 - Requirements for the staff and contracted individuals such as examiners for performance examinations
 - Certification Process
 - Psychometrically sound examination
 - Recertification
 - Due process for taking certification away from individual



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The ANSI Certificate Accreditation Program ASTM E 2659 – Standard Practice for Certificate Programs

Why??

- To distinguish between a certificate and a certification program
 - Two different American National Standards
 - A distinct body of knowledge for each Standard
- Certification programs applying for accreditation were really “certificate” programs
- Frequency of use by the workforce is much higher
- OPM encouragement
- Private Sector Encouragement
 - Manufacturing
 - Construction
- Higher Education Accreditation says it is a “gap”

Certificate Accreditation Program

ASTM 2659

What's in the Standard?

- Requirements for Certificate Issuers
 - Organizational structure and Administration
- Requirements for the Certificate program
 - Program Plan
 - Analysis, Design, Development, Implementation and Evaluation
- Requirements for Certificate Issuance and Use
 - Use of designations
 - Certificate's term of validity

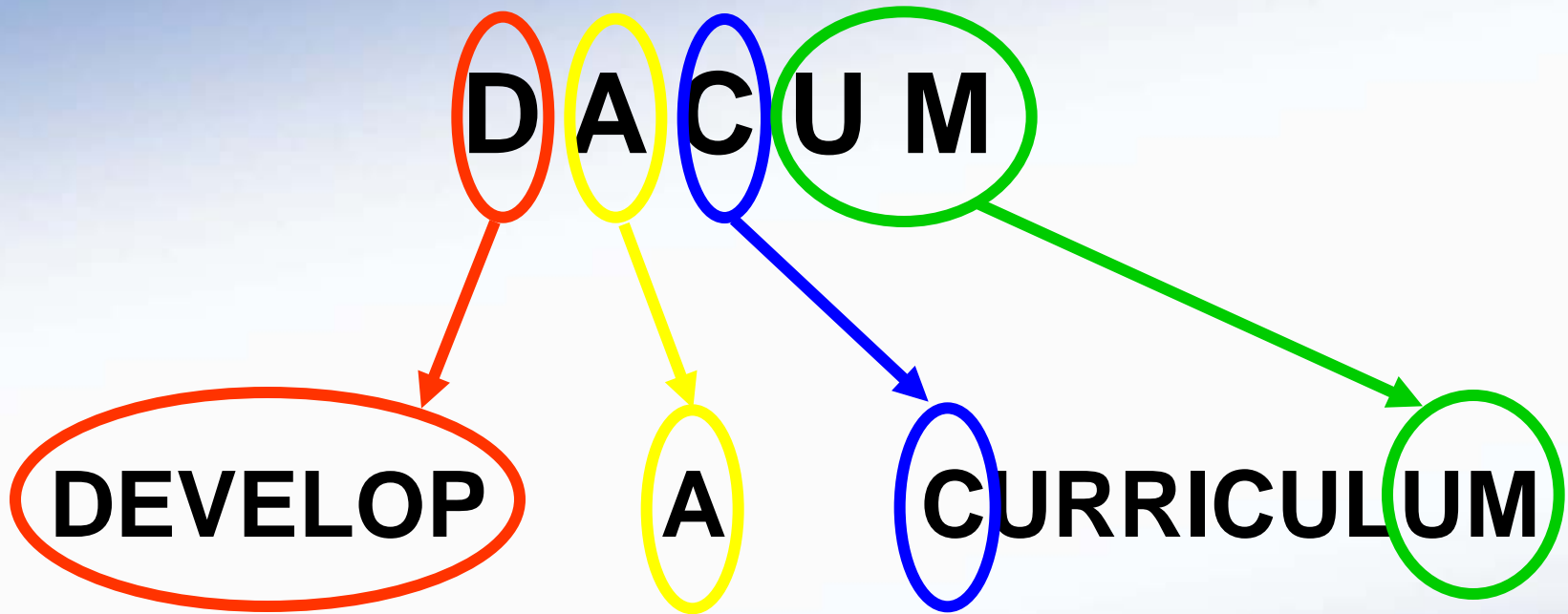


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Multi-Skilled Maintenance Occupational Standards

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Maintenance

Tool and Die

Two
Turbo-
DACUM's



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Multi-Skilled Maintenance Original DACUM

Toyota Motor Manufacturing Kentucky
September 25-26, 2007



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Maintenance Original DACUM

Toyota

September 25-26, 2007

TOYOTA



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Maintenance--26 Duties, 170 Tasks

A	MECHANICAL EQUIPMENT
B	PNEUMATIC/HYDRAULIC EQUIPMENT
C.	STEAM SYSTEM
D.	PREDICTIVE/CORRECTIVE MAINTENANCE
E	BLUEPRINT READING/SCHEMATICS
F	EQUIPMENT CONTROLS AND SENSORS
G	ELECTRICAL EQUIPMENT
H	ELECTRONIC EQUIPMENT
I	NETWORKING
J	PLC EQUIPMENT
K.	MAINTAIN NC/CNC EQUIPMENT
L.	ROBOTS
M	RESISTANCE WELDING
N	ROBOTIC GMAW WELDING
O	FABRICATE
P	COMPUTER LITERACY
Q	PREVENTATIVE MAINTENANCE
R	DUST AND MIST COLLECTORS
S	UTILITIES
T	POWER DISTRIBUTION
U	SPECIALIZED MACHINERY
V	METROLOGY
W	SAFETY AND DOCUMENTATION
X	LASER ETCHER
Y	AUTOMATIC WELDER
Z	SPECIALIZED EQUIPMENT

Duty A Tasks

A	MECHANICAL EQUIPMENT	
	1	Troubleshoot/repair/replace brakes & clutches (electromechanical and mechanical)
	2	Troubleshoot/repair/replace gears
	3	Troubleshoot/replace belts, sheaves/pulley
	4	Troubleshoot/maintain chains and sprockets
	5	Troubleshoot/repair/replace cams
	6	Troubleshoot/repair/replace seals and o-rings
	7	Troubleshoot/repair/replace bearings and bushings
	8	Troubleshoot/repair/replace shafts
	9	Perform alignment and balancing
	10	Troubleshoot/repair/replace motors (AC and DC)
	11	Maintain couplings
	12	Maintain fans
	13	Install/maintain valves (cut-off, pressure relief...)

Duty B Tasks

B		PNEUMATIC/HYDRAULIC EQUIPMENT
	14	Troubleshoot/repair/replace pneumatic/hydraulic valves
	15	Troubleshoot/repair/replace cylinders and intensifiers
	16	Troubleshoot/repair/replace hoses and tubing
	17	Adjust pressures and flows mechanically and electronically
	18	Maintain fluid levels for hydraulic systems
	19	Replace filters on hydraulic/pneumatic systems
	20	Troubleshoot/repair/replace gauges
	21	Troubleshoot/repair/replace pneumatic/hydraulic pumps
	22	Troubleshoot/replace accumulators
	23	Troubleshoot/repair/replace air motors
	24	Maintain vacuum system on pneumatic equipment
	25	Maintain filtration systems
	26	Adjust switches and controls on hydraulic/pneumatic system
	27	Install/design hydraulic/pneumatic components to upgrade/enhance systems

Task A1-Detail

A.		MECHANICAL EQUIPMENT	Tools and Equipment
	1	Troubleshoot/repair/replace brakes & clutches (electromechanical and mechanical)	
	a	Inspect brake for wear, leaks, damage, excessive wear on pads, etc.	Common hand tools
	b	Disassemble discs and pads	Vernier caliper
	c	Clean rotors	Micrometer
	d	Reassemble	Surface grinder
	e	Adjust or set air pressures or mechanical springs	Lathe
	f	Set gap on electrical brakes (air gap on electromechanical or gap on mechanical brake	Milling machine
	g	Troubleshoot/repair/replace electromagnet on electromechanical brake	Feeler gauge
	h	Set brake and clutch timing using transducers and monitors	Hydraulic press
			Instruction book



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Task A1—Details continued

Calculations	Communications	Technology	Safety
Measure in decimals (thousandths)	Interpret written work order	Principles of brakes	Common safety practices
Basic math	Verbal with co workers	Basic mechanical skills	PPE
Metric measurement; conversion	Verbal with operator	Electrical and mechanical brakes	Pinch points
	Read technical manual	Basic machine operation; sequence of operation	Turning hazard
	Interpret schematic		Stored energy
	Search database (computerized)		Lock out/tag out procedures
	Input data into a computer		Respiratory protection

For all 7 Divisions, Ratings

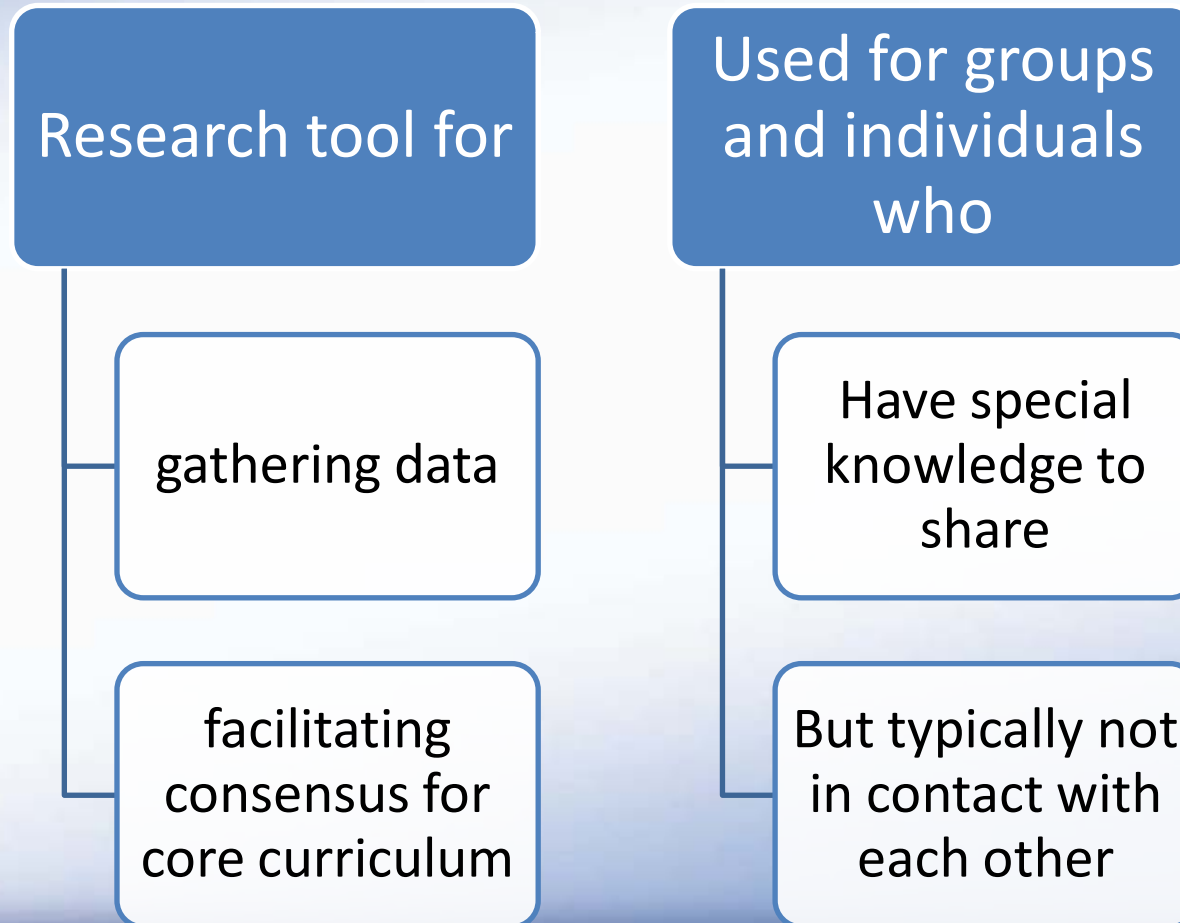
			Building Facilities		
			4=Essential	D=Daily	1=New
			3=Very Important	W=Weekly	2=After 5 yrs.
			2=Important	M=Monthly	3=Senior
			1=General Importance	Y=Yearly	
			0=Not Important	N=Never	
A		MECHANICAL EQUIPMENT	Importance	Frequency	Level
	1	Troubleshoot/repair/replace brakes & clutches (electromechanical and mechanical)	1	Y=Yearly	2
	2	Troubleshoot/repair/replace gears	3	M=Monthly	1
	3	Troubleshoot/replace belts, sheaves/pulley	3	W=Weekly	1
	4	Troubleshoot/maintain chains and sprockets	3	W=Weekly	1
	5	Troubleshoot/repair/replace cams	0	N=Never	
	6	Troubleshoot/repair/replace seals and o-rings	4	W=Weekly	1
	7	Troubleshoot/repair/replace bearings and bushings	4	W=Weekly	1
	8	Troubleshoot/repair/replace shafts	4	W=Weekly	1
	9	Perform alignment and balancing	4	D=Daily	2
	10	Troubleshoot/repair/replace motors (AC and DC)	4	D=Daily	1
	11	Maintain couplings	4	D=Daily	1
	12	Maintain fans	4	D=Daily	1
	13	Install/maintain valves (cut-off, pressure relief...)	4	D=Daily	1

Delphi—3 Rounds

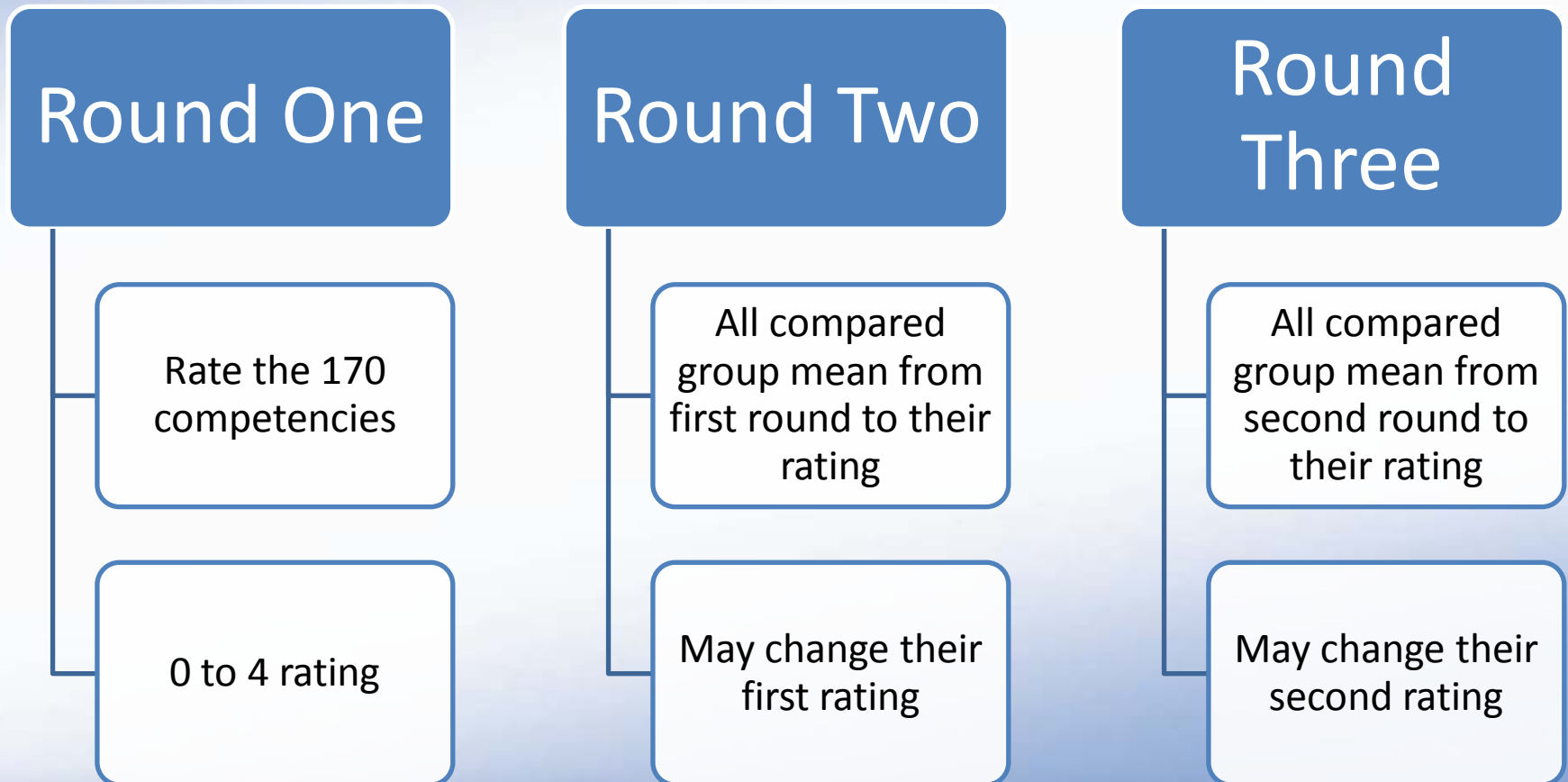
ORA, Inc.



Delphi



Delphi—3 rounds required



Importance Ratings

4	Essential	not having skill/knowledge in this area will keep you from gaining employment in this occupation
3	Very Important	skill/knowledge in this area WILL enhance employability in this area
2	Important	skill/knowledge in this area MAY enhance employability in this area
1	General Importance	skill/knowledge in this area will be learned on-the-job and would NOT effect employment in this occupation
0	Not Important	skill/knowledge in this area are NOT important for employment in this occupation at all



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Round One Survey - Format

1. INSTRUCTIONS: Rate the **IMPORTANCE** of "SAFETY, SCIENTIFIC INQUIRY, REFLECTION AND SOCIAL IMPLICATIONS" using the following scale and descriptions:

0 = Not Important (skill knowledge in this duty area are **NOT** important for employment in this occupation at all).

1 = General Importance (skill knowledge in this duty area will be learned on-the-job and would **NOT** affect employment in this occupation).

2 = Important (skill knowledge in this duty area **MAY** enhance employability in this occupation).

3 = Very Important (skill knowledge in this area **WILL** enhance employability in this occupation).

4 = Essential (not having skill knowledge in this area will keep you from gaining employment in this occupation).

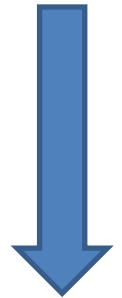
	0	1	2	3	4
A. Laboratory Safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B. Animal science safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C. Safety and sanitation methods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D. Care and maintenance of the common veterinary practice facility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E. Scientific Inquiry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
F. Scientific Reflection and Social Implications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

Round Two Survey--Sample

INSTRUCTIONS: Rate the **IMPORTANCE** of each area using the following scale and descriptions:

- 0= Not Important (skill knowledge in this duty area are NOT important for employment in this occupation at all).
- 1= General Importance (skill knowledge in this duty area will be learned on-the-job and would NOT affect employment in this occupation).
- 2= Important (skill knowledge in this duty area MAY enhance employability in this occupation).
- 3= Very Important (skill knowledge in this area WILL enhance employability in this occupation).
- 4= Essential (not having skill knowledge in this area will keep you from gaining employment in this occupation).



	0	1	2	3	4	Your rating	Changed Rating
A. INDUSTRY OVERVIEW	0.0%	15.0%	20.0%	40.0%	25.0%		
1. Describe the impact of the visual communication industry on the economy	5.0%	5.0%	20.0%	30.0%	40.0%	3	
2. Understand impact of emerging technologies in visual communications	5.0%	0.0%	20.0%	40.0%	35.0%	2	
3. Identify processes and equipment in visual communication	0.0%	10.0%	20.0%	45.0%	25.0%	4	
4. Examine and describe labor market trends and career options	10.0%	5.0%	35.0%	35.0%	15.0%	3	
5. Explain advantages of working for self/others	0.0%	15.0%	50.0%	25.0%	10.0%	1	



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Organization	Round 1	Round 2	Round 3
General Motors	24	17	11
Toyota	12	11	8
BMW	6	6	5
Ford	7	3	2
KCTCS	23	19	12
Alamo	2	1	1
ACCD--Palo Alto College		1	
Vincennes	2	1	1
Pellissippi State Technical CC	1	1	1
Other	16	6	5
Arkansas	2	2	1
Danville CC	1	1	
Eastern KY University	1	1	
Hopkinsville CC	1	1	
Ivy Tech	2		
Moorehead State	1		
NE Miss CC	1		
Woodbridge	1		
Totals	105	76	52

Delphi Data Analysis

Compared Individual Business Ratings

Compared Individual School Ratings

Compared Business Ratings to Educator
Ratings

R3-Compare Business Ratings



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			BUSINESS					
Delphi Results by Organization			Grand Total	Overall Business	BMW	Ford	GM	Toyota
Maintenance			Mean N=52	Mean N=34	Mean N=5	Mean N=2	Mean N=11	Mean N=8
A		MECHANICAL EQUIPMENT	3.34	3.44	3.33	3.50	3.38	3.50
	1	Troubleshoot/repair/replace brakes & clutches (electromechanical and mechanical)	2.98	2.97	3.20	3.50	2.82	3.00
	2	Troubleshoot/repair/replace gears	2.94	2.91	2.80	3.50	2.36	3.25
	3	Troubleshoot/replace belts, sheaves/pulley	3.08	2.91	3.00	3.50	2.36	3.00
	4	Troubleshoot/maintain chains and sprockets	2.88	2.65	2.80	3.50	2.18	3.25
	5	Troubleshoot/repair/replace cams	2.75	2.70	2.80	3.50	2.36	3.13
	6	Troubleshoot/repair/replace seals and o-rings	3.38	3.32	3.40	2.50	2.73	3.75
	7	Troubleshoot/repair/replace bearings and bushings	3.27	3.24	3.40	3.50	2.91	3.25
	8	Troubleshoot/repair/replace shafts	3.13	3.09	3.00	3.50	2.73	3.38
	9	Perform alignment and balancing	3.00	2.79	2.40	3.50	2.55	3.25
	10	Troubleshoot/repair/replace motors (AC and DC)	3.54	3.56	3.60	3.50	3.18	3.88
	11	Maintain couplings	3.06	2.97	3.20	3.50	2.45	3.38
	12	Maintain fans	3.00	2.91	2.60	3.50	2.73	3.25
	13	Install/maintain valves (cut-off, pressure relief...)	3.00	2.91	3.00	3.50	2.64	3.38



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R3-Compare Educator Ratings

			EDUCATORS								
			Grand Total	Overall Educators	KCTCS	Alamo	Palo Alto	Vincennes	Pellissippi	Arkansas	Other
		Maintenance	Mean N=52	Mean N=18	Mean N=12	Mean N=1	Mean N=1	Mean N=1	Mean N=1	Mean N=1	Mean N=8
A		MECHANICAL EQUIPMENT	3.34	3.15	3.13	3.00		3.00	4.00	3.00	3.50
	1	Troubleshoot/repair/replace brakes & clutches (electromechanical and mechanical)	2.98	3.00	3.08	3.00	2.00	2.00	4.00	3.00	2.88
	2	Troubleshoot/repair/replace gears	2.94	3.00	3.00	3.00	3.00	3.00	4.00	2.00	3.25
	3	Troubleshoot/replace belts, sheaves/pulley	3.08	3.39	3.58	3.00	2.00	4.00	4.00	2.00	3.38
	4	Troubleshoot/maintain chains and sprockets	2.88	3.33	3.50	3.00	1.00	4.00	4.00	3.00	2.38
	5	Troubleshoot/repair/replace cams	2.75	2.83	2.75	3.00	2.00	4.00	4.00	2.00	2.43
	6	Troubleshoot/repair/replace seals and o-rings	3.38	3.50	3.67	3.00	3.00	2.00	4.00	4.00	3.88
	7	Troubleshoot/repair/replace bearings and bushings	3.27	3.33	3.42	3.00	2.00	3.00	4.00	4.00	3.50
	8	Troubleshoot/repair/replace shafts	3.13	3.22	3.17	3.00	4.00	3.00	4.00	3.00	3.25
	9	Perform alignment and balancing	3.00	3.39	3.33	3.00	4.00	3.00	4.00	4.00	2.75
	10	Troubleshoot/repair/replace motors (AC and DC)	3.54	3.50	3.42	3.00	4.00	4.00	4.00	4.00	3.75
	11	Maintain couplings	3.06	3.22	3.33	3.00	2.00	3.00	4.00	3.00	3.00
	12	Maintain fans	3.00	3.17	3.08	3.00	4.00	3.00	4.00	3.00	2.88
	13	Install/maintain valves (cut-off, pressure relief...)	3.00	3.17	3.25	3.00	2.00	3.00	4.00	3.00	2.63

R3 - Compare Business to Educator Ratings

			Round 3 Business/Industry			Round 3 Educator			Business Vs Educators		
Maintenance			Mean	N	Std. Deviation	Mean	N	Std. Deviation	Difference Round 3		
Delphi Results for Business and Industry vs. Educators											
M			RESISTANCE WELDING	1.50	28	1.453	2.29	17	0.772	-0.79	***
	85	*	Perform visual inspection of resistance welding equipment operation	1.82	34	1.527	2.33	18	0.767	-0.51	
	86	*	Align components in resistance welding equipment	1.71	34	1.528	2.33	18	0.767	-0.63	**
	87	*	Repair/replace failed components in resistance welding equipment	1.71	34	1.567	2.33	18	0.767	-0.63	**
	88	*	Maintain and troubleshoot gun servos	1.62	34	1.518	2.33	18	0.767	-0.72	**
	89	*	Perform parameter adjustments (weld conditions) on resistance and stud welding	1.71	34	1.567	2.28	18	0.826	-0.57	
	90	*	Troubleshoot/repair/replace location pins and datum surfaces	1.76	34	1.539	2.28	18	0.826	-0.51	
	91	*	Maintain cooling system in resistance welding equipment	1.59	34	1.480	2.33	18	0.767	-0.75	***
	92	*	Perform resistance checks (resistance of cable and condition of insulators)	1.71	34	1.567	2.33	18	0.767	-0.63	**
N			ROBOTIC GMAW WELDING	1.25	28	1.404	2.12	17	0.600	-0.87	***
	93		Perform visual inspection of Robotic-GMAW welding equipment operation	1.41	34	1.540	2.17	18	0.618	-0.75	***
	94		Replace weld controller in Auto-mig welding equipment	1.50	34	1.562	2.22	18	0.647	-0.72	**
	95		Maintain torch/brazing equipment	1.50	34	1.562	2.11	18	0.676	-0.61	**
	96		Maintain welding gas regulating systems	1.44	34	1.418	2.11	18	0.676	-0.67	**



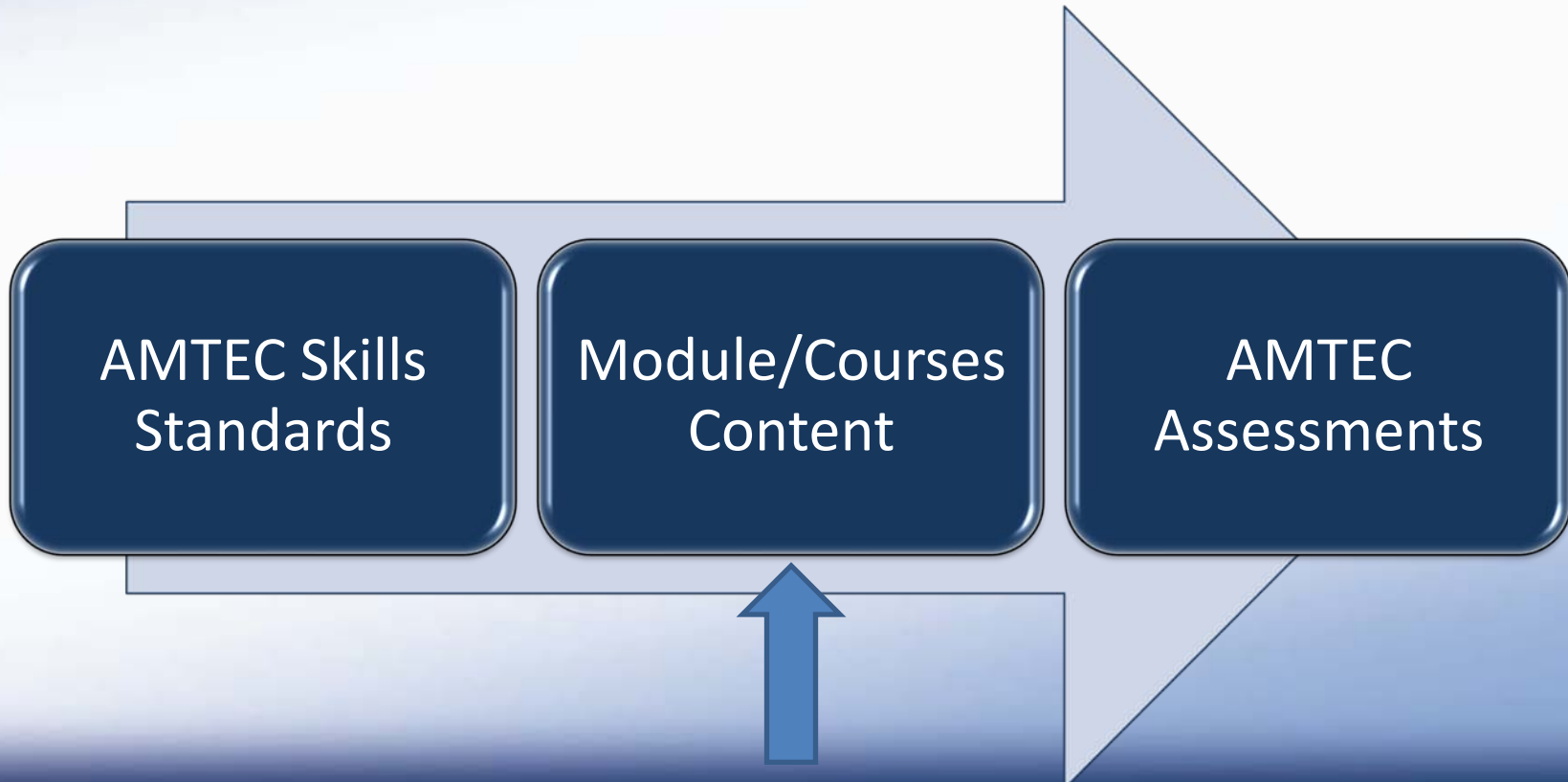
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AMTEC Standards, Curriculum, & Assessments



Core Curriculum—

Result--20 Duties, 110 Tasks

August, 2008

Meeting with
all partners

- Business
- Educators

Used

- DACUM
- Delphi Data



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Identified Core Curriculum

H		ELECTRONIC EQUIPMENT	Fundamental	Advanced	Certificate	Shop Specific
	60	Maintain/install fiber optics	Introduction	x		
	61	Troubleshoot/repair/replace vision systems	Introduction	x		
	62	Install/maintain/troubleshoot bar code readers	Introduction	x		
	63	Troubleshoot/maintain (single rail transport) SRT monorail				x
	64	Maintain and calibrate quality touch center system (MARPOS)				x
I		NETWORKING	Fundamental	Advanced	Certificate	Shop Specific
	65	Use DeviceNet protocol	Introduction	x		
	66	Use Data Highway protocol	Introduction	x		
	67	Use TCP/IP protocol	Introduction	x		
	68	Use ControlNet protocol (Allen Bradley)				x
	69	Use FL net protocol				x



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Assign Core Competencies to Courses

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			Fluid Power and Electrohydraulics	General PM and Predictive Maintenance	PLC	Blueprint Reading/Schematics	Robotics	Controls and Instrumentation	Basic Electricity and Electronics	Mechanical Systems/Mechanical Drives/Power Transmissions	Safety	Computer Literacy	Welding and Fabrication	Machine Tool
A		MECHANICAL EQUIPMENT												
	1	Troubleshoot/repair/replace brakes & clutches (electromechanical and mechanical)								x				
	2	Troubleshoot/repair/replace gears								x				
	3	Troubleshoot/replace belts, sheaves/pulley								x				
	4	Troubleshoot/maintain chains and sprockets								x				
	5	Troubleshoot/repair/replace cams								x				
	6	Troubleshoot/repair/replace seals and o-rings								x				
	7	Troubleshoot/repair/replace bearings and bushings								x				
	8	Troubleshoot/repair/replace shafts								x				
	9	Perform alignment and balancing								x				
	10	Troubleshoot/repair/replace motors (AC and DC)						x						
	10	Troubleshoot/repair/replace motors (AC and DC)								x				
	11	Maintain couplings								x				
	12	Maintain fans								x				
	13	Install/maintain valves (cut-off, pressure relief...)	x											
	13	Install/maintain valves (cut-off, pressure relief...)						x						
B		PNEUMATIC/HYDRAULIC EQUIPMENT	Power and Electrohydraulics	General PM and Predictive Maintenance	PLC	Blueprint Reading/Schematics	Robotics	Controls and Instrumentation	Basic Electricity and Electronics	Mechanical Systems/Mechanical Drives/Power Transmissions	Safety	Computer Literacy	Welding and Fabrication	Machine Tool
	14	Troubleshoot/repair/replace pneumatic/hydraulic valves	x											
	15	Troubleshoot/repair/replace cylinders and intensifiers	x											
	16	Troubleshoot/repair/replace hoses and tubing	x											
	17	Adjust pressures and flows mechanically and electronically	x											
	18	Maintain fluid levels for hydraulic systems	x											



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Allocated Courses into Modules

			Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7
A		MECHANICAL EQUIPMENT	Fundamentals	Flow, Directional, Pressure Control Valves	Actuators	Pumps and reservoirs	Fluids and Filters	Hose, pipes and Tubing fabrication	Electrohydraulic and pneumatics
	13	Install/maintain valves (cut-off, pressure relief...)		x					
B		PNEUMATIC/HYDRAULIC EQUIPMENT							
	14	Troubleshoot/repair/replace pneumatic/hydraulic valves		x					
	15	Troubleshoot/repair/replace cylinders and intensifiers			x				
	16	Troubleshoot/repair/replace hoses and tubing						x	
	17	Adjust pressures and flows mechanically and electronically		x					x
	18	Maintain fluid levels for hydraulic systems					x		
	19	Replace filters on hydraulic/pneumatic systems					x		
	20	Troubleshoot/repair/replace gauges	x						
	21	Troubleshoot/repair/replace pneumatic/hydraulic pumps				x			
	22	Troubleshoot/replace accumulators				x			
	23	Troubleshoot/repair/replace air motors			x				
	24	Maintain vacuum system on pneumatic equipment						x	
	25	Maintain filtration systems					x		
	26	Adjust switches and controls on hydraulic/pneumatic system							x
	27	Install/design hydraulic/pneumatic components to upgrade/enhance systems							x
E		BLUEPRINT READING/SCHEMATICS							
	42	Interpret pneumatic and hydraulic drawings	x						
G		ELECTRICAL EQUIPMENT							
	55	Install/maintain solenoid valve		x					

12 Courses by Clock Time

	Courses	Clock Time	Lecture	Lab	%
1	Fluid Power and Electrohydraulics/pneumatics	120	60	60	13%
2	General PM and Predictive Maintenance	30	20	10	3%
3	PLC	100	40	60	10%
4	Blueprint Reading/Schematics	30	20	10	3%
5	Robotics	80	40	40	8%
6	Controls and Instrumentation	100	40	60	10%
7	Basic Electricity and Electronics	100	40	60	10%
8	Mechanical Systems/Mechanical Drives/Power Transmissions	100	40	60	10%
9	Safety	40	30	10	4%
10	Computer Literacy	40	10	30	4%
11	Welding and Fabrication	120	24	96	13%
12	Machine Tool	100	20	80	10%
	Total Clock Hours	960	384	576	100%
	Credit (Lecture at 15:1 and Lab at 30:1)		26	19	
				45	

Each Course into 57 Modules— Keeping Link to Standards

Mod.	Fluid Power and Electrohydraulics/pneumatics	Lecture	Lab	Standard Link
1	Fundamentals	16		20, 42
2	Flow, Directional, Pressure Control Valves	10	18	13, 14, 17
3	Actuators	6	8	15, 23
4	Pumps and reservoirs	8	8	21,22
5	Fluids and Filters	5	3	18, 19, 25
6	Hose, pipes and tubing fabrication	3	9	16, 24
7	Electrohydraulics/pneumatics	12	14	17,26,27
		60	60	



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5 Regional Gap Analysis Workshops

Birmingham, AL—
November 14, 2008

- Host: CARCAM

Knoxville, TN—
January 7, 2009

- Host: Pellissippi State Technical College

San Antonio, TX—
January 9, 2009

- Host: Alamo Community College District

Dearborn, MI—
January 12, 2009

- Host: Henry Ford Community College

Danville, VA—
January 16, 2009

- Host: Danville Community College

Identified

**Does the college
provide this training?**

**AC=for academic
credit;**

NC=non-credit;

NT=not taught

**Does industry in your
area have to teach this?**

How?

Example of Gap Analysis

A		MECHANICAL EQUIPMENT	AMTEC Core	Pellissippi State	PBR/ Industry	Danville CC	KCTCS	Spartanburg CC	Danville Industry
	1	Troubleshoot/repair/replace brakes & clutches (electromechanical and mechanical)	*	NC	Hands on training	AC	AC&NC	AC&NC	Equipment Spec
	2	Troubleshoot/repair/replace gears	*	AC	Hands on training	AC	AC&NC	AC&NC	Equipment Spec
	3	Troubleshoot/replace belts, sheaves/pulley	*	AC	Hands on training	AC	AC&NC	AC&NC	Equipment Spec
	4	Troubleshoot/maintain chains and sprockets	*	AC	Hands on training	AC	AC&NC	AC&NC	Equipment Spec
	5	Troubleshoot/repair/replace cams	*	NC	Hands on training	AC	AC&NC	AC&NC	Equipment Spec
	6	Troubleshoot/repair/replace seals and o-rings	*	NC	Hands on training	AC	AC&NC	AC&NC	Equipment Spec
	7	Troubleshoot/repair/replace bearings and bushings	*	AC	Hands on training	AC	AC&NC	AC&NC	Equipment Spec

AC=Academic Credit; NC=Non-Credit; and NT=Not Taught

Gap's in Core-- Automatic Welding

Y		AUTOMATIC WELDER	AMTEC Core	Pellissippi State	KCTCS	Spartanburg CC	Henry Ford CC	Cuyahoga CC	Alamo CC District	Itawamba CC
	152	Maintain/troubleshoot power supply	*	Gap			Gap	Gap	Gap	Gap
	153	Perform PM's	*	Gap			Gap	Gap	Gap	Gap
	154	Set power supply parameters	*	Gap			Gap	Gap	Gap	Gap
	155	Adjust frequency and other parameters	*	Gap			Gap	Gap	Gap	Gap
	156	Troubleshoot electrodes and torch body problems	*	Gap			Gap	Gap	Gap	Gap
	157	Maintain robotic/cam rotation parameters	*	Gap	Gap	Gap	Gap	Gap	Gap	Gap
	158	Maintain cooling and quenching systems	*	Gap			Gap	Gap	Gap	Gap

Gaps in Core Predictive/Corrective Maintenance

D.	PREDICTIVE/CORRECTIVE MAINTENANCE	AMTEC Core	KCTCS	Cuyahoga CC	Alamo CC District
32	Perform route-based vibration analysis	*	Gap		
33	Collect oil samples for analysis	*	Gap	Gap	
34	Interpret and take action on oil analysis	*	Gap	Gap	
35	Perform alignment (laser system)	*	Gap	Gap	Gap
36	Perform balancing	*	Gap		Gap
37	Perform online motor current analysis	*	Gap		Gap
38	Perform off-line motor current analysis	*	Gap		Gap
39	Perform infrared thermography	*	Gap		Gap
40	Perform ultrasonic maintenance	*	Gap	Gap	



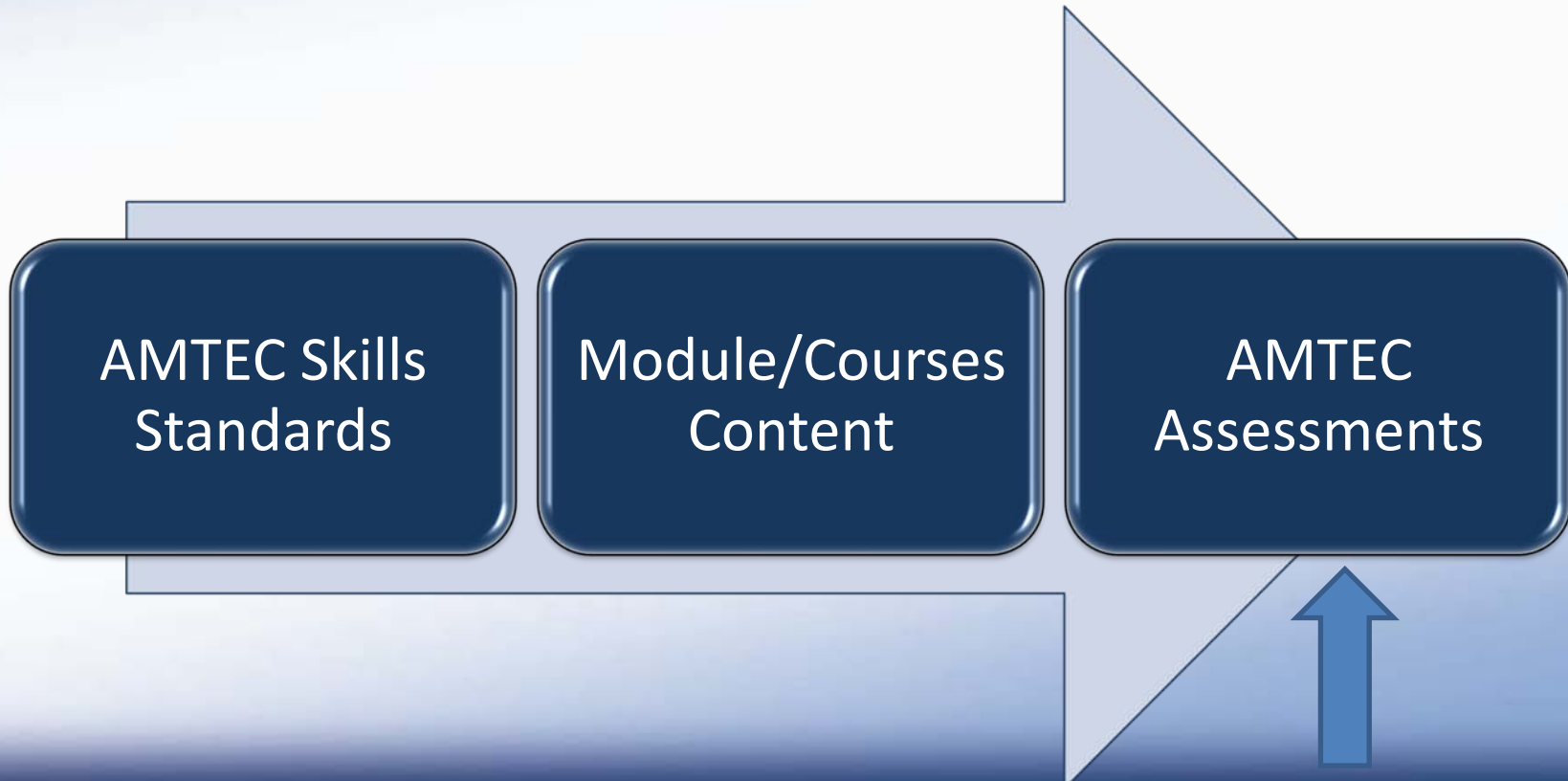
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AMTEC Standards, Curriculum, & Assessments



Assessments

At least two
equal
versions of
Core
Curriculum

57
standardized
end-of-
module
assessments



		Fundamental	Percent	200 Items	Grand Mean N=52
A	MECHANICAL EQUIPMENT	x	6%	11	3.08
B	PNEUMATIC/HYDRAULIC EQUIPMENT	x	5%	11	3.04
D.	PREDICTIVE/CORRECTIVE MAINTENANCE	Knowledge	5%	10	2.77
E	BLUEPRINT READING/SCHEMATICS	x	6%	12	3.28
F	EQUIPMENT CONTROLS AND SENSORS	x	6%	12	3.38
G	ELECTRICAL EQUIPMENT	x	6%	13	3.57
H	ELECTRONIC EQUIPMENT	Intro	4%	8	2.35
I	NETWORKING	Intro	4%	8	2.34
J	PLC EQUIPMENT	x	6%	13	3.56
L.	ROBOTS	x	5%	11	3.03
M	RESISTANCE WELDING	x	3%	7	1.92
O	FABRICATE	x	4%	9	2.47
P	COMPUTER LITERACY	x	6%	12	3.43
Q	PREVENTATIVE MAINTENANCE	x	6%	12	3.40
U	SPECIALIZED MACHINERY	x	5%	10	2.82
V	METROLOGY	x	5%	9	2.56
W	SAFETY AND DOCUMENTATION	x	7%	13	3.67
X	LASER ETCHER	Intro	3%	5	1.43
Y	AUTOMATIC WELDER	x	3%	7	1.84
Z	SPECIALIZED EQUIPMENT	x	3%	5	1.44
			100%	200	

Test Specification by Task

			Fundamental	Items Needed	Items Have	Grand Mean N=52
E		BLUEPRINT READING/SCHEMATICS				
	41	Interpret mechanical drawings	x	3	0	3.60
	42	Interpret pneumatic and hydraulic drawings	x	3	32	3.48
	43	Interpret electrical schematics	x	3	49	3.73
	44	Interpret piping and instrumentation diagram (P&ID)	x	2	0	2.96
	45	Operate basic drafting software (AutoCAD or Visio)	Introduction	2	0	2.62

Continuous Improvement

Data is analyzed to determine mastery

	Item	Q001	Q002	Q003	Q004	Q005	Q006	Q007	Q008	Q009	Q010	Q011
	Task Link	A1	A1	A1	A1	A1	A1	A1	A2	A2	A2	A2
	Key	4	4	1	2	3	3	1	1	1	3	1
Adam	87.2%			2								
Randy	77.4%			2				3	4			
David	76.6%			2					2	2		
George	74.0%			2						2		4
Joe	69.4%	3		2	1					2		
Chris	68.5%			2						3		
Mary	68.1%			2	3							
Laura	66.4%			2					4			4
Ali	64.7%	1	2	2	4	2				3		
Tom	63.4%			4					2			
Jack	62.1%			3	1				2	2		
Sid	61.3%	3		2	1					2		
James	58.3%	3	3	3	1	2		4		3		
Steve	57.9%	3		2	1				4	2		
Mike	26.8%	2		2	4	2	1	4	2	4	1	2



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Prepare Feedback

	H	I	J	K	L	M	N	O	P
1			Total Score N=35	Duty A: Hydraulic N=15	Duty B: Pneumatic N=15	Duty C: Tools N=5			
2		Cut Score from Cut Score Sheet	25	11	10	4		Pass	
3		Student A	Pass	Pass	Pass	Pass		Needs Improvement	
4		Student B	Pass	Pass	Pass	Pass			
5		Student C	Pass	Pass	Pass	Pass			
6		Student D	Pass	Pass	Pass	Pass			
7		Student E	Pass	Pass	Pass	Pass			
8		Student F	Pass	Pass	Pass	Pass			
9		Student G	Pass	Pass	Pass	Pass			
10		Student H	Pass	Pass	Pass	Pass			
11		Student I	Pass	Pass	Pass	Pass			
12		Student J	Pass	Needs Improvement	Pass	Pass			
13		Student K	Pass	Pass	Pass	Pass			
14		Student L	Pass	Pass	Pass	Pass			
15		Student M	Pass	Pass	Pass	Pass			
16		Student N	Pass	Pass	Pass	Pass			
17		Student O	Pass	Pass	Needs Improvement	Pass			
18		Student P	Pass	Pass	Pass	Pass			
19		Student Q	Pass	Needs Improvement	Pass	Pass			
20		Student R	Pass	Pass	Pass	Pass		Needs Improvement	
21		Student S	Pass	Pass	Pass	Pass		Needs Improvement	
22		Student T	Pass	Pass	Pass	Pass			

=IF(B3>=J\$2,O\$2,O\$3)

Name:

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The following table contains your scores from the pilot test you participated in this summer. While the test contained 264 test items, after an analysis, the final test contained 240 items. The following scores represent your score on the final version of the test. The last column indicates if improvement is recommended in the specific test category.

	Test Category	Number of Items	Your Percent Correct	Recommended Improvement by Category
A	BASIC ELECTRICITY	34	94.1%	No
B	PRIME MOVERS	29	100. %	No
C	GENERATORS/ALTERNATORS	28	100. %	No
D	ENGINE GENERATOR INSTRUMENTATION AND CONTROLS	19	89.5%	No
E	GOVERNORS	27	100. %	No
F	AUTOMATIC TRANSFER SWITCHES	22	100. %	No
G	VOLTAGE REGULATORS	8	100. %	No
H	MULTIPLE GENERATOR SWITCHGEAR & CONTROLS	11	100. %	No
I	AUXILIARY SUPPORT SYSTEMS	26	88.5%	No
J	TROUBLESHOOT SYSTEMS PROBLEMS	25	96. %	No
K	START UP COMMISSIONING	11	100. %	No
	Overall Percent Correct	240	96.7%	

Your certification status is based on your overall percent correct and is designated below:

Certification Status: **Pass**

Sample Score Report



Name:

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The following table contains your scores from the pilot test you participated in this summer. While the test contained 264 test items, after an analysis, the final test contained 240 items. The following scores represent your score on the final version of the test. The last column indicates if improvement is recommended in the specific test category.

	Test Category	Number of Items	Your Percent Correct	Recommended Improvement by Category
A	BASIC ELECTRICITY	34	94.1%	No
B	PRIMEMOVERS	29	69. %	Yes
C	GENERATORS/ALTERNATORS	28	60.7%	Yes
D	ENGINE GENERATOR INSTRUMENTATION AND CONTROLS	19	78.9%	No
E	GOVERNORS	27	92.6%	No
F	AUTOMATIC TRANSFER SWITCHES	22	77.3%	Yes
G	VOLTAGE REGULATORS	8	87.5%	No
H	MULTIPLE GENERATOR SWITCHGEAR & CONTROLS	11	72.7%	No
I	AUXILIARY SUPPORT SYSTEMS	26	61.5%	Yes
J	TROUBLESHOOT SYSTEMS PROBLEMS	25	68. %	No
K	STARTUP COMMISSIONING	11	63.6%	Yes
	Overall Percent Correct	240	75.4%	

Your certification status is based on your overall percent correct and is designated below:

Certification Status: **Not Pass**