Automotive Machinist Technology
Mississippi Curriculum Framework

Program CIP: 47.0615 – Engine Machinist

July 2015

Published by:
Mississippi Community College Board
Division of Workforce, Career, and Technical Education
3825 Ridgewood Road
Jackson, MS 39211
Phone: 601-432-6155
Email: curriculum@mccb.edu

Faculty Writing Team Members

Gilbert Loper, Mississippi Delta Community College, Moorhead, MS
Thomas McBrain, Hinds Community College, Raymond, MS

Administrator Writing Team Members

Dr. Chad Stocks, Associate Vice President of Work Force Training/ Associate Dean of Career & Technical Education, Hinds Community College, Raymond

Business and Industry Writing Team Members

Jamie Edwards, Owner, Capital Automotive, Jackson, MS

Office of Curriculum and Instruction Team Members

Angela Bryan, Director of Curriculum and Instruction, Mississippi Community College Board
Rachel De Vaughan, Curriculum Specialist, Office of Curriculum and Instruction, Mississippi Community College Board
Elmira Ratliff, Curriculum Specialist, Office of Curriculum and Instruction, Mississippi Community College Board

The Office of Curriculum and Instruction (OCI) was founded in 2013 under the Division of Workforce, Career, and Technical Education at the Mississippi Community College Board (MCCB). The office is funded through a partnership with The Mississippi Department of Education (MDE), who serves as Mississippi's fiscal agent for state and federal Career and Technical Education (CTE) Funds. The OCI is tasked with developing statewide CTE curriculum, programming, and professional development designed to meet the local and statewide economic demand.

For information, please contact curriculum@mccb.edu

Contents

RESEARCH ABSTRACT

In the spring of 2015, the Office of Curriculum and Instruction (OCI) met with different industry members who made up the advisory committees for the Automotive Machinist Technology program. An industry questionnaire was used to gather feedback concerning the trends and needs, both current and future, of their field. Program faculty, administrators, and industry members were consulted regarding industry workforce needs and trends.

Industry advisory team members from colleges involved with this program were asked to give input related to changes to be made to the curriculum framework. Specific comments related to soft skills needed in this program include having a positive attitude, being at work every day and on time, and having reading and writing skills to complete work orders and other forms. Occupation-specific skills stated include knowing the fundamentals of an engine, basic parts, operation, and troubleshooting. Safety practices emphasized include practicing all safety rules and wearing the proper safety equipment.

Instructors from colleges throughout the state were also asked to give input on changes to be made to the curriculum framework.

The following changes were made to the Automotive Machinist curriculum at this revision writing meeting: Adoption of national certification standards: The AERA Engine Builders Association

Revision History:

2004, Revised, Research and Curriculum Unit, Mississippi State University

2009, Revised, Research and Curriculum Unit, Mississippi State University

2015, Revised, Office of Curriculum and Instruction, Mississippi Community College Board

ADOPTION OF NATIONAL CERTIFICATION STANDARDS

The following national standards were adopted for the Automotive Machinist Technology curriculum: The Automotive Engine Rebuilders Association (AERA) Engine Builders Association.

Background

The AERA Engine Builders Association is the preeminent technical resource and industry voice for internal combustion engine builders, remanufacturers, machine shops, OEMs, suppliers and service providers worldwide. Established in 1922, AERA is the industry's oldest and most authoritative organization, serving an international membership made up of thousands of small and large businesses serving industries ranging from mining and manufacturing to Formula 1 racing.

As an industry representative, AERA acts as an influential voice, promoting the common interests of its members by educating and informing the public, and advocating sensible government policies that support an industry that is a critical component of local, nation and global economies.

As a technical organization, AERA provides engine specifications and technical assistance for internal combustion engines manufactured worldwide. Its world-class staff of experts and vast technical libraries provide AERA members with unparalleled access to information, expertise and assistance regarding engines and internal components of every conceivable size and use.

Development of Standards

The Association today has over 3,000 members worldwide, with members mainly in the United States and Canada, but also in Latin America, Europe and even Africa. Service to our members is our highest priority, whether it be through our publications, the web or in meetings and seminars.

Today, this association is a network of professional engine builders, rebuilders and installers with the expertise and connections to provide you with the right answers when you need them. AERA has established a "Standards of Service" document for both gasoline and diesel engines.

These documents define the standards for a rebuilt/remanufactured engine and have clearly differentiated a professionally rebuilt/remanufactured engine from a repaired, partially rebuilt or second hand exchange engine. In addition to active shop members, AERA welcomes suppliers/manufacturers, manufacturer reps and schools to our membership. For more information on the AERA Engine Builders Association, please contact:

AERA Engine Builders Association
500 Coventry Lane, Suite 180, Crystal Lake, IL 60014 USA
Phone: 888-326-2372 or 815-526-7600

INDUSTRY JOB PROJECTION DATA

Engine and other machine assemblers' occupations require an education level of short-term on-the-job training. There is expected to be a 0.99% decrease in occupational demand at the regional level and no growth or decline at the state level. Median annual income for automotive machinist technicians and mechanics is $27,996.80 at the state level. A summary of occupational data from the State Workforce Investment Board Data Center is displayed below:

Table 1: Education Level

Program Occupations	Education Level
Engine and other machine assemblers	Short-term on-the-job training

Table 2: Occupational Overview

	Region	State	United States
2010 Occupational Jobs	403	420	32930
2020 Occupational Jobs	399	420	29892
Total Change	-4	0	-3038
Total % Change	-0.99%	0.00%	-9.23%
2010 Median Hourly Earnings	$13.46	$13.46	$17.46
2010 Median Annual Earnings	$27,996.80	$27,996.80	$36,316.80
Annual Openings	0	0	-303

Table 3: Occupational Breakdown

Description	2010 Jobs	2020 Jobs	Annual Openings	2010 Hourly Earnings	2010 Annual Earnings 2,080 Work Hours
Engine and other machine assemblers	403	399	0	$13.46	$27,996.80
TOTAL	**403**	**399**	**0**	**$13.46**	**$27,996.80**

Table 4: Occupational Change

Description	Regional Change	Regional % Change	State % Change	National % Change
Engine and other machine assemblers	-4	-0.99%	0.00%	-9.23%

ARTICULATION

Articulation credit from Secondary Metal Trades to Postsecondary Automotive Machinist Technology will be awarded upon implementation of this curriculum by the college. The course to be articulated is Fundamentals for Automotive Machinists (AUT 1116), with the stipulation of passing the MS-CPAS2 assessment according to MCCB guidelines.

SEC Program	PS Program	PS Courses
S Metal Trades - Machine Shop Option (CIP: 48.0590)	PS Automotive Machinist Technology (CIP 47.0615)	AUT 1116 - Fundamentals for Automotive Machinists

TECHNICAL SKILLS ASSESSMENT

Students will be assessed using the *Mississippi Career Planning and Assessment Automotive Machinist Technology* test.

Make sure to check the MCCB site for the latest approved alternate assessments.

ONLINE AND BLENDED LEARNING OPPORTUNITIES

Course content includes lecture and laboratory semester credit hours. Faculty members are encouraged to present lecture related content to students in an online or blended learning environment. Training related to online and blended learning will be available to faculty members through the MS Community College Board.

INSTRUCTIONAL STRATEGIES

The AERA standards were adopted and provide instructional strategies to faculty members implementing the curriculum.

ASSESSMENT STRATEGIES

The AERA standards were adopted and provide assessment strategies to faculty member implementing the curriculum. Additionally, performance tasks were included in course content when appropriate.

PROGRAM DESCRIPTION

The Automotive Machinist Technology program provides instruction in the use of precision measuring instruments, hand tools, machines, and equipment. Topics covered are types and uses of hand, mechanical, power, and hydraulic tools, along with types of fluids, cutting oils, and coolants. Disassembly and inspection of automotive engines, resurfacing brake drums and rotors, basic engine balancing, and cylinder head rebuilding are included. Students receive instruction and practice in cylinder boring and submerged arc welding of crankshafts. The operations of the drill press and crankshaft grinder, along with a general knowledge of the milling machine, connecting rod rebuilding, and engine assembly are also covered.

1. In all areas, appropriate theory, safety, and support instruction is required for performing each task. It is assumed that this instruction has included identification and use of appropriate tools and testing and measuring equipment required to accomplish certain tasks. It is also assumed that the student has received necessary training to locate and use current reference and training materials from accepted industry publications (in most cases, published by the vehicle manufacturer) that present manufacturers' recommended or required specifications and procedures for performing various tasks.
2. All diagnostic and repair tasks described in this document are to be accomplished in accordance with manufacturers' recommended procedures and specifications.
3. The individual training program being evaluated for certification should have written and detailed performance standards for each task taught in the curriculum. Learning progress of students should be monitored and evaluated against these performance standards. A system should be in place to inform all students of their individual progress through all phases of the training program.
4. It is recognized that individual courses of study will differ across automobile technician training programs. The development of appropriate learning delivery systems and tests that monitor student progress will be the responsibility of the individual training program.

This curriculum offers an accelerated transition pathway at 15 hours and a career certificate at 30 hours in Automotive Machinist Technology. Students completing this program are prepared for entry-level positions at any processing facility. They will have acquired the basic technical skills in equipment and systems and have a broadened vocabulary to make the job-specific learning less difficult. They will also possess team-building skills, safety awareness, environmental awareness, communication skills, and computer skills that are critical in the workplace.

SUGGESTED COURSE SEQUENCE

Accelerated Integrated Career Pathway

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
AUT 1116	Fundamentals for Automotive Machinists	6	2	8	150	30	120	
AUT 1216	Cylinder Head Service	6	2	8	150	30	120	
	Electives	3						
	Total	**15**	**4**	**16**	**300**	**60**	**240**	

Career Certificate Required Courses

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
AUT 100(3-6)	Introduction to Automotive Machinist	3-6	3-6		45-90	45-90		
AUT 1116	Fundamentals for Automotive Machinists	6	2	8	150	30	120	
AUT 1216	Cylinder Head Service	6	2	8	150	30	120	
AUT 1316	Cylinder Block Service	6	2	8	150	30	120	
AUT 1416	Engine Assembly	6	2	8	150	30	120	
	Instructor approved technical electives							
	TOTAL	**27-30**	**11-14**	**32**	**645-690**	**165-210**	**480**	

Technical Certificate

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
AUT 1224	High Performance Heads	4	3	2	75	45	30	
AUT 1513	Parts and Labor	3	1	4	75	15	60	
AUT 1613	Crankshaft Balancing and Advanced Crankshaft Grinding	3	1	4	75	15	60	
AUT 1713	Brake Rotor and Drum Machining	3	1	4	75	15	60	
AUT 191(1-3)	Special Problem in Automotive Machinist	1-3		2-6	30-90		30-90	
	Instructor approved technical electives							
	TOTAL	**14-16**	**6**	**16-20**	**330-390**	**90**	**240-300**	

General Education Core Courses

To receive the Associate of Applied Science Degree, a student must complete all of the required coursework found in the Career Certificate option, Technical Certificate option and a minimum of 15 semester hours of General Education Core. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester or provided primarily within the last semester. Each community college will specify the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college. The Southern Association of Colleges and Schools (SACS) Commission on Colleges Standard 2.7.3 from the Principles of Accreditation: Foundations for Quality Enhancement[1] describes the general education core.

Section 2.7.3 In each undergraduate degree program, the institution requires the successful completion of a general education component at the collegiate level that (1) is substantial component of each undergraduate degree, (2) ensures breadth of knowledge, and (3) is based on a coherent rationale. For degree completion in associate programs, the component constitutes a minimum of 15 semester hours or the equivalent. These credit hours are to be drawn from and include at least one course from the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics. The courses do not narrowly focus on those skills, techniques, and procedures specific to a particular occupation or profession.

[1] Southern Association of Colleges and Schools Commission on Colleges. (2012). *The principles of accreditation: Foundations for quality enhancement*. Retrieved from http://www.sacscoc.org/pdf/2012PrinciplesOfAcreditation.pdf

General Education Courses

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
	Humanities/Fine Arts	3						
	Social/Behavioral Sciences	3						
MAT 1313	College Algebra	3						
	Academic electives	6						
	TOTAL	**15**						

Technical Electives

			SCH Breakdown				Contact Hour Breakdown		
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Externship	Total Contact Hours	Lecture	Lab	Externship
ATE 1113	Science and Technology	3	3			45	45		
AUT 1013	Introduction to Automotive Machinist Technology I	3	3			45	45		
AUT 1023	Introduction to Automotive Machinist Technology II	3	3			45	45		
AUT 1513	Parts and Labor	3	1	4		75	15	60	
AUT 1613	Crankshaft Balancing and Advanced Crankshaft Grinding	3	1	4		75	15	60	
AUT 1713	Brake Rotor and Drum Machining	3	1	4		75	15	60	
AUT 191(1-3)	Special Problem in Automotive Machinist	1-3		2-6		30-90		30-90	
AUT 192(1-3)	Supervised Work Experience	1-3			3-9	45-135			45-135
LLS 1151	College Life	1	1			15	15		
LLS 1413	Improvement of Study	3	3			45	45		
LLS 1723	Employment Readiness	3	3			45	45		
WBL 191(1-3) WBL 192(1-3) WBL 193(1-3) WBL 291(1-3) WBL 292(1-3) WBL 293(1-3)	Work-Based Learning	1-3			3-9	45-135			45-135
IMM 1935	Manufacturing Skills Basic	3	3			45	45		
	All other electives approved by instructor per local community college policy								

AUTOMOTIVE MACHINIST TECHNOLOGY COURSES

Course Number and Name: **AUT 100(3-6) Introduction to Automotive Machinist Technology**

Description: This course contains the baseline competencies and suggested objectives from the high school curriculum that directly relate to the community college program.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3		45
4	4		60
5	5		75
6	6		90

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Describe general safety rules for working in a shop/lab and industry.
    a. Describe how to avoid on-site accidents.
    b. Explain the relationship between housekeeping and safety.
    c. Explain the importance of following all safety rules and company safety policies.
    d. Explain the importance of reporting all on-the-job injuries and accidents.
    e. Explain the need for evacuation policies and the importance of following them.
    f. Explain the employer's substances abuse policy and how it relates to safety.
    g. Explain the safety procedures when working near pressurized or high temperature.

2. Identify and apply safety around automotive operations.
    a. Use proper safety practices when performing automotive operations.
    b. Recognize and explain personal protective equipment.
    c. Inspect and care for personal protective equipment.

3. Explain lifting.
    a. Identify and explain the procedures for lifting heavy objects.

4. Explain the material safety data sheet (MSDS).
    a. Explain the function of the MSDS.
    b. Interpret the requirements of the MSDS.

5. Explain fires.
    a. Explain the process by which fires start.
    b. Explain fire prevention of various flammable liquids.
    c. Explain the classes of fire and the types of extinguishers.

6. Explain safety in and around automotive and electrical situations.
    a. Explain injuries when electrical contact occurs.
    b. Explain safety around automotive and electrical hazards.
    c. Explain action to take when an electrical shock occurs.

7. Demonstrate safe and proper use and storage of tools and equipment in an automotive shop.
    a. Identify and demonstrate the safe and proper use of common hand tools including wrenches, sockets, pliers, screwdrivers, striking tools, and so forth.
    b. Identify and demonstrate the safe and proper use of lifting and hoisting equipment.
    c. Identify and demonstrate the safe and proper use of cleaning equipment.
    d. Identify and demonstrate the safe and proper use of power equipment including impact wrenches, drills, grinders, and presses.
    e. Organize and maintain a systematic storage system for hand and power tools.

8. Locate and apply service specifications and information.
    a. Locate service specifications and information, using both print and computerized service information references.
    b. Interpret and apply information to a specific job on a specific vehicle.
    c. Locate and interpret vehicle and major component identification numbers (VIN, certification, and calibration labels).

9. Demonstrate measurement practices used in the automotive service.
    a. Measure the length of an object using a rule to the nearest 1/16 in. and 1 mm.
    b. Measure the inside diameter, outside diameter, and/or depth to the nearest 0.001 in. and nearest 0.1 mm, using precision measuring instruments (micrometers, calipers, and dial indicators).

10. Identify common fasteners and describe their use.
    a. Identify the different types of bolts, nuts, and washers, and describe their appropriate uses.
    b. Identify bolts by grade, diameter, length, and thread pitch.
    c. Identify different glues and sealants used in automotive service, and describe their appropriate use.
    d. Restore internal and external threads.

11. Identify and describe the major systems and components of an automobile.
    a. Identify the major components and describe their purpose and/or function of the following major systems:
        (1) Power train
        (2) Chassis, steering, and suspension
        (3) Fuel
        (4) Electrical
        (5) Cooling
        (6) Exhaust
    b. Describe the operation of a four-stroke cycle engine.
    c. Describe the use of electronics and computer control in modern automobiles.

Course Number and Name: **AUT 1013 Introduction to Automotive Machinist Technology I**

Description: These courses contain the baseline competencies and suggested objectives from the high school curriculum that directly relate to the community college program. The courses are designed for students entering the community college who have had no previous training or documented experience in the field.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3		45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe general safety rules for working in a shop/lab and industry.
    a. Describe how to avoid on-site accidents.
    b. Explain the relationship between housekeeping and safety.
    c. Explain the importance of following all safety rules and company safety policies.
    d. Explain the importance of reporting all on-the-job injuries and accidents.
    e. Explain the need for evacuation policies and the importance of following them.
    f. Explain the employer's substances abuse policy and how it relates to safety.
    g. Explain the safety procedures when working near pressurized or high temperature.

2. Identify and apply safety around automotive operations.
    a. Use proper safety practices when performing automotive operations.
    b. Recognize and explain personal protective equipment.
    c. Inspect and care for personal protective equipment.

3. Explain lifting.
    a. Identify and explain the procedures for lifting heavy objects.

4. Explain the material safety data sheet (MSDS).
    a. Explain the function of the MSDS.
    b. Interpret the requirements of the MSDS.

5. Explain fires.
    a. Explain the process by which fires start.
    b. Explain fire prevention of various flammable liquids.
    c. Explain the classes of fire and the types of extinguishers.

6. Explain safety in and around automotive and electrical situations.
    a. Explain injuries when electrical contact occurs.
    b. Explain safety around automotive and electrical hazards.
    c. Explain action to take when an electrical shock occurs.

7. Demonstrate safe and proper use and storage of tools and equipment in an automotive shop.
    a. Identify and demonstrate the safe and proper use of common hand tools including wrenches, sockets, pliers, screwdrivers, striking tools, and so forth.
    b. Identify and demonstrate the safe and proper use of lifting and hoisting equipment.
    c. Identify and demonstrate the safe and proper use of cleaning equipment.
    d. Identify and demonstrate the safe and proper use of power equipment including impact wrenches, drills, grinders, and presses.

e. Organize and maintain a systematic storage system for hand and power tools.

8. Locate and apply service specifications and information.
    a. Locate service specifications and information, using both print and computerized service information references.
    b. Interpret and apply information to a specific job on a specific vehicle.
    c. Locate and interpret vehicle and major component identification numbers (VIN, certification, and calibration labels).

9. Demonstrate measurement practices used in the automotive service.
    a. Measure the length of an object using a rule to the nearest 1/16 in. and 1 mm.
    b. Measure the inside diameter, outside diameter, and/or depth to the nearest 0.001 in. and nearest 0.1 mm, using precision measuring instruments (micrometers, calipers, and dial indicators).

10. Identify common fasteners and describe their use.
    a. Identify the different types of bolts, nuts, and washers, and describe their appropriate uses.
    b. Identify bolts by grade, diameter, length, and thread pitch.
    c. Identify different glues and sealants used in automotive service, and describe their appropriate use.
    d. Restore internal and external threads.

11. Identify and describe the major systems and components of an automobile.
    a. Identify the major components and describe their purpose and/or function of the following major systems:
        (1) Power train
        (2) Chassis, steering, and suspension
        (3) Fuel
        (4) Electrical
        (5) Cooling
        (6) Exhaust
    b. Describe the operation of a four-stroke cycle engine.
    c. Describe the use of electronics and computer control in modern automobiles.

Course Number and Name: **AUT 1023 Introduction to Automotive Machinist Technology II**

Description: These courses contain the baseline competencies and suggested objectives from the high school curriculum that directly relate to the community college program. The courses are designed for students entering the community college who have had no previous training or documented experience in the field.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3		45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe general safety rules for working in a shop/lab and industry.
    a. Describe how to avoid on-site accidents.
    b. Explain the relationship between housekeeping and safety.
    c. Explain the importance of following all safety rules and company safety policies.
    d. Explain the importance of reporting all on-the-job injuries and accidents.
    e. Explain the need for evacuation policies and the importance of following them.
    f. Explain the employer's substances abuse policy and how it relates to safety.
    g. Explain the safety procedures when working near pressurized or high temperature.

2. Identify and apply safety around automotive operations.
    a. Use proper safety practices when performing automotive operations.
    b. Recognize and explain personal protective equipment.
    c. Inspect and care for personal protective equipment.

3. Explain lifting.
    a. Identify and explain the procedures for lifting heavy objects.

4. Explain the material safety data sheet (MSDS).
    a. Explain the function of the MSDS.
    b. Interpret the requirements of the MSDS.

5. Explain fires.
    a. Explain the process by which fires start.
    b. Explain fire prevention of various flammable liquids.
    c. Explain the classes of fire and the types of extinguishers.

6. Explain safety in and around automotive and electrical situations.
    a. Explain injuries when electrical contact occurs.
    b. Explain safety around automotive and electrical hazards.
    c. Explain action to take when an electrical shock occurs.

7. Demonstrate safe and proper use and storage of tools and equipment in an automotive shop.
    a. Identify and demonstrate the safe and proper use of common hand tools including wrenches, sockets, pliers, screwdrivers, striking tools, and so forth.
    b. Identify and demonstrate the safe and proper use of lifting and hoisting equipment.
    c. Identify and demonstrate the safe and proper use of cleaning equipment.
    d. Identify and demonstrate the safe and proper use of power equipment including impact wrenches, drills, grinders, and presses.

e. Organize and maintain a systematic storage system for hand and power tools.

8. Locate and apply service specifications and information.
    a. Locate service specifications and information, using both print and computerized service information references.
    b. Interpret and apply information to a specific job on a specific vehicle.
    c. Locate and interpret vehicle and major component identification numbers (VIN, certification, and calibration labels).

9. Demonstrate measurement practices used in the automotive service.
    a. Measure the length of an object using a rule to the nearest 1/16 in. and 1 mm.
    b. Measure the inside diameter, outside diameter, and/or depth to the nearest 0.001 in. and nearest 0.1 mm, using precision measuring instruments (micrometers, calipers, and dial indicators).

10. Identify common fasteners and describe their use.
    a. Identify the different types of bolts, nuts, and washers, and describe their appropriate uses.
    b. Identify bolts by grade, diameter, length, and thread pitch.
    c. Identify different glues and sealants used in automotive service, and describe their appropriate use.
    d. Restore internal and external threads.

11. Identify and describe the major systems and components of an automobile.
    a. Identify the major components and describe their purpose and/or function of the following major systems:
        (1) Power train
        (2) Chassis, steering, and suspension
        (3) Fuel
        (4) Electrical
        (5) Cooling
        (6) Exhaust
    b. Describe the operation of a four-stroke cycle engine.
    c. Describe the use of electronics and computer control in modern automobiles.

Course Number and Name: **AUT 1116 Fundamentals for Automotive Machinists**

Description: This course includes the study and practice of personal hand tools and shop safety; study and practice of measuring; types of calipers, micrometers, and gauges; types and uses of hand tools, mechanical tools, power tools, and coolants; and identification of materials and metals.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
6	2	8	150

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Explain safety procedures used in automotive machinist industry.
    a. Describe school policies and shop procedures.
    b. Explain and apply safety rules for personal safety.
    c. Explain and apply general shop safety.
    d. Explain and practice procedures for handling, storing, and disposing of hazardous materials.
    e. Describe the Right-To-Know Law.
    f. Describe data available in material safety data sheets.
    g. Demonstrate machine safety and operation.
    h. Demonstrate tool safety and operation.
    i. Explain rules and procedures associated with fire safety and emergencies according to local facility guidelines.

2. Demonstrate precision measurements using machinist rule, calipers, micrometers, and gauges.
    a. Identify selected precision measurement instruments.
    b. Measure the length of an object using a steel rule and a machinist rule to the nearest 1/64 in. and 1 mm.
    c. Measure the inside diameter, outside diameter, and/or depth to the nearest 0.0001 in. and nearest 0.1 mm, using precision measuring instruments including micrometers, calipers, and dial indicators.3.

3. Demonstrate safe and proper use and storage of tools and equipment in a machinist shop.
    a. Explain and demonstrate the safe and proper use of hand tools.
    b. Explain and demonstrate the safe and proper use of power tools such as air wrenches, engine hoists, presses, drills, and so forth.
    c. Explain and demonstrate the safe and proper use of cleaning equipment.
    d. Practice proper storage of all tools and equipment used in a machinist shop.

4. Apply methods of identification and cleaning of parts.
    a. Interpret and apply service specifications and information, using both printed material and Internet service information references.
    b. Interpret and apply information to a specific job.
    c. Compare the effectiveness of cleaning methods.

Course Number and Name: **AUT 1216 Cylinder Head Service**

Description: This course includes the rebuilding of cylinder heads. Included are valve, guide, and seat reconditioning as well as the resurfacing and assembly of heads. Crack detection and repair are also included in the course.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
6	2	8	150

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Disassemble, inspect cylinder head for cracks and imperfections, clean, and identify all parts.
2. Resurface cylinder head to manufacturer's specifications.
3. Inspect and recondition valve seats, valve guides, and valve surfaces to manufacturer's specifications.
4. Complete assembly of the cylinder head according to manufacturer's specifications.
    a. Locate manufacturer's specifications.
    b. Acquire tooling.
    c. Acquire proper sealers.
    d. Gather necessary assembly parts.
    e. Clean and assemble the cylinder head.

AERA Engine Builders Association Standards of Service
5.2 Rocker arm/shaft assembly
Rocker arm/shaft assemblies shall be completely dismantled, cleaned and inspected for wear and other defects. Components shall be machined or replaced as necessary.

5.3 Valve
The valve face shall be remachined and stems, keeper grooves, tips and valve margin inspected for wear and conformance with specifications and dimensions or the valve replaced. In all cases correct valve train geometry must be maintained.

5.4 Valve caps and valve spring retainers
All valve retaining components, i.e. collets, keepers, retainers, rotators, etc. shall be inspected for serviceability and replaced where necessary.

5.5 Valve spring
All valve springs shall be tested for squareness, free height and spring pressure at installed height and valve open height. The use of shims (spacers) and/or offset valve keepers are permitted in order to achieve installed height only.

7 – Assembly Procedures
7.2 Cylinder head assembly
During cylinder head assembly the following procedures shall be observed:

(a) All components shall be thoroughly cleaned.
(b) All applicable mating surfaces shall be lubricated with an appropriate lubricant and surfaces susceptible to storage corrosion shall be treated with a suitable rust inhibitor.
(c) All overhead camshaft and auxiliary shaft bearings/bushings shall be replaced as required to restore correct clearance.
(d) All seals and gaskets shall be replaced with new items.
(e) Valve spring pressures may not be adjusted using a spring shim or offset keeper.

10 – Quality Assurance

10.1 Technical prerequisites

The following equipment must be available for the proper execution of quality-assured engine repairs:

- Cleaning equipment capable of cleaning all areas of the engine parts.
- Cylinder sizing machinery for oversizing and honing of cylinders and the installation of cylinder sleeves.
- Crankshaft grinders and surface finishing equipment.
- Align boring or line honing equipment for the treatment of main and cam bearing bores.
- Connecting rod equipment for the treatment of the connecting rods, including equipment to accurately gage bore diameter, roundness and taper. (honing, boring, straightening, etc.)
- Surface grinder or milling machine.
- Crankshaft straightening press.
- Head straightening equipment.
- Hydraulic press.
- Valve seat & guide equipment.
- Valve seat finishing equipment to include accurate gaging, designed for this purpose, to determine valve seat concentricity. Vacuum testing may be used in conjunction with, but not exclusively to determine machining accuracy of the finished seat.
- Equipment for the treatment of engine valves.
- Thermal equipment for fitting of parts.
- Non-destructive test equipment, i.e. magnetic particle inspection, etc.
- Hardness tester.
- Spring pressure test equipment.
- Precision measuring instruments for inside and outside diameters and depths with a minimum accuracy of ± 0.0001” or .0025mm, i.e. micrometers, dial indicators, cylinder bore gauges.
- Radius gauges, straight edge, surface analyzer, torque wrenches.

Course Number and Name: **AUT 1224 High Performance Heads**

Description: This course covers more advanced techniques and practices of cylinder head porting. The goal of this course is to have the learners achieve a high level of understanding in air flow through the cylinder head.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
4	3	2	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Perform cylinder head modifications to enhance air flow.
2. Customize valve shape to promote air flow.
3. Understand the effects of different valve angles.
4. Construct a power point presentation to document findings.

Course Number and Name: **AUT 1316 Cylinder Block Service**

Description: This course includes the study of cylinder reconditioning, crankshaft renewal, and rod reconditioning.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
6	2	8	150

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Inspect engine cylinders.
    a. Bore and hone cylinders to manufacturer's specifications.
    b. Install cylinder sleeve and finish to manufacturer's specifications.

2. Refinish a crankshaft to manufacturer's specifications.
    a. Inspect a crankshaft for straightness and cracks.
    b. Measure a crankshaft for manufacturer's specifications.
    c. Prepare/perform buildup of journals if necessary, using proper submerged arc welding and/or gas tungsten arc welding processes.

3. Resize connecting rods to manufacturer's specifications.
    a. Inspect and recondition connecting rod bores (both ends) according to manufacturer's specifications.

AERA Engine Builders Association Standards

3.1 Short block assembly

A cylinder block and all those components contained within the limits of the block deck or decks, the pan rail, the block rear face and the timing cover, where fitted, including the crankshaft.

3.2 Cylinder head assembly

A rebuilt cylinder head fitted with valves, associated springs, retainers, and on overhead camshaft cylinder heads (OHC), camshaft, camshaft bearings, lash adjusters, tappets and rockers.

3.3 Long block assembly

A short block assembly together with a cylinder head assembly and all those components fitted within the rocker or cam cover, and timing cover. The whole presented as an assembly. A rebuilt or new oil pump, or kit, shall be supplied or fitted as appropriate.

Course Number and Name: **AUT 1416 Engine Assembly**

Description: This course includes preparation of the block and components for assembly. The individual installation of all internal components is included in the course.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
6	2	8	150

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Apply methods of identification and cleaning of engine parts.
    a. Interpret and apply service specifications and information, using both printed material and Internet service information references.
    b. Interpret and apply information to a specific job.
    c. Compare the effectiveness of cleaning methods.

2. Assemble all engine components to manufacturer's specifications.
    a. Install rod bearings, pistons, rings, cam bearings, camshaft, oil seals, main bearings, crankshaft, timing components, and cylinder heads according to manufacturer's specifications.

AERA Engine Builders Association Standards of Service
7 – ASSEMBLY PROCEDURES
7.1 Engine assembly
During short block assembly the following procedures shall be observed:

a. All components shall be thoroughly cleaned.
b. All expandable plugs shall be replaced. All non-expandable plugs may be refitted if inspected and in good condition.
c. All applicable mating surfaces shall be lubricated with an appropriate lubricant and surfaces susceptible to storage corrosion shall be treated with suitable rust inhibitor.
d. Cylinder block shall be reassembled using the following new or rebuilt parts as determined in Sections 3.5 and 3.6:
(1) Main, connecting rod and cam bearings and bushings.
(2) Pistons, pins and rings.
(3) Gaskets, expansion plugs and seals.
(4) Oil pump relief valve assemblies.

7.3 Long Block Assembly
A long block assembly is a combination of a short block as described in 3.1 and assembled as in 5.1 and a cylinder head as described in 3.2 and assembled as in 5.0.
NOTE:
a. All relevant bolts, nuts, screws, oil pump relief valve and springs, etc. shall be tightened to specifications as determined by the manufacturer.
b. All running clearances shall be checked and corrected during assembly.

Course Number and Name: **AUT 1513 Parts and Labor**

Description: This course includes training in the use of computerized parts pricing and inventory, labor price guides, and the purchasing and recovery of core materials.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	1	4	75

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Arrange and price parts for inventory and distribution.
    a. Utilize card or computer inventory systems to track parts sales.
    b. Combine similar items or parts for ease of distribution.
    c. Compute price discount and interest amounts.

2. Organize a core recovery system.
    a. Develop a system for tracking outstanding cores.
    b. Create a system for inventory and pricing of cores and finished products.

Course Number and Name: **AUT 1613 Crankshaft Balancing and Advanced Crankshaft Grinding**

Description: This course includes the balancing of bottom-end rotating and reciprocating parts. Crankshaft indexing, straightening, and stroking are also included.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	1	4	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Compute and assemble bob weights.

2. Measure and correct both dynamic and couple unbalance.
    a. Calculate the weight change required to correct unbalance.
    b. Determine the position to correct unbalance.

3. Measure stroke and index variation of all rod journals.
    a. Straighten crankshaft.
    b. Correct unequal strokes by grinding and/or welding if necessary.
    c. Correct index runout by grinding and/or welding.

AERA Engine Builders Association Standards of Service
4.2 Crankshaft
The crankshaft shall have all galley plugs removed and then be thoroughly cleaned and inspected for damage and specifications. On occasion, crankshafts may not need grinding in order to meet acceptable industry standards. In these instances journal roundness, surface finish, taper and diameter must be verified to be correct to the bearing manufacturer's specifications.

The crankshaft may be reclaimed by:

(a) journals that are not within specifications shall be ground to the same relative undersize and finish. If a crankshaft was originally heat treated and surface hardness is reduced below acceptable industry standards after grinding it shall be re-heat treated; and
(b) one or more crankshaft journals may be built up, reground and finished so as to maintain parity with the other journals. Thrust face condition shall be checked and built up and machined, or only machined, as required. Rear main sealing surfaces shall be checked and refinished as required. Crankshaft snouts to be inspected for wear and rectified as required.

Course Number and Name: **AUT 1713** **Brake Rotor and Drum Machining**

Description: This course includes machining of the brake drum and rotor.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	1	4	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe and discuss disc and drum brake components.

2. Set up brake drum and disc lathe machine.
    a. Select correct adapters, tool bits, and speed.
    b. Machine brake components to manufacturer's specifications.

Course Number and Name: **AUT 191(1-3) Special Problem in Automotive Machinist**

Description: This course is designed to provide students with an opportunity to utilize skills and knowledge gained in other courses. The instructor and student work closely together to select a topic and establish criteria for completion of the project.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
1		2	30
2		4	60
3		6	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Develop a written plan that details the activities and projects to be completed.
    a. Use a written plan that details the activities and projects to be completed.
    b. Perform written occupational objectives in the special problem.

2. Assess accomplishment of objectives.
    a. Prepare daily written assessment of accomplishment of objectives.
    b. Present weekly written reports of activities performed and objectives accomplished to the instructor.

3. Use and follow a set of written guidelines for the special problem.
    a. Develop and follow a set of written guidelines for the special problem.

Course Number and Name: **AUT 192(1-3) Supervised Work Experience in Automotive Machinist Technology**

Description: This course, which is a cooperative program between industry and education, is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of 1 semester hour per 45 industrial contact hours.

Hour Breakdown:

Semester Credit Hours	Lecture	Externship	Contact Hours
1		3	45
2		6	90
3		9	135

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Follow a set of instructor-written guidelines for the supervised work experience program.

2. Apply skills needed to be a viable member of the workforce.
    a. Prepare a description of skills to be developed in the supervised work experience program.
    b. Practice skills needed to be a viable member of the workforce.

3. Practice human relationship skills in the supervised work experience program.

4. Practice positive work habits, responsibilities, and ethics.

5. Develop written occupational objectives in the supervised work experience program.

6. Assess performance of occupational skills.
    a. Prepare daily written assessments of work performance as specified in the occupational objectives.
    b. Present weekly written reports to the instructor of activities performed and objectives accomplished.

RECOMMENDED TOOLS AND EQUIPMENT

CAPITALIZED ITEMS

1. Tool set, general mechanic, 150 pc. (1 per 4 students)
2. Storage cabinet, fireproof (1 per program)
3. Cylinder head and block surfacing machine, with complete tooling (1 per program)
4. Seat refacer, grinder, with complete tooling (1 per 3 students)
5. Seat refacer, cutter, with complete tooling (1 per program)
6. Valve refacer, with complete tooling (3 per program)
7. Guide knurler kit, metric and American (1 of each per program)
8. Bench grinder (2 per program)
9. Magnetic crack detection system (1 per program)
10. Gas tungsten arc welder (1 per program)
11. Valve guide and seat machine with tooling (1 per program)
12. Lathe, 12-in. geared head, with tooling (1 per program)
13. Mill, vertical with tooling (1 per program)
14. Boring machine with tooling (1 per program)
15. Pressure tester system with complete tooling (1 per program)
16. Crankshaft grinder with complete tooling (minimum 2 per program)
17. Crankshaft straightener with complete tooling (1 per program)
18. Honing machine, cylinder with complete tooling (1 per program)
19. Micrometers, metric, inside and outside, 0-in.–6-in. set (2 sets per program)
20. Micrometers, American, inside and outside, 0-in.–6-in. set (2 sets per program)
21. Dial bore gages (2 per program)
22. Cam bearing tools, set (4 per program)
23. Submerged arc welder with complete tooling (1 per program)
24. Rod and cap grinder (1 per program)
25. Rod alignment fixture (1 per program)
26. Rod resizing machine with complete tooling (2 per program)
27. Piston pin press with complete tooling (1 per program)
28. Run-in machine (1 per program)
29. Chain hoist, electric, 1/2 ton (4 per program)
30. Rod heater (1 per program)
31. Thermal cleaning system with complete tooling (1 per program)
32. Pressure washer (1 per program)
33. Parts washer, small, tumbler type (2 per program)
34. Glass bead machine (1 per program)
35. Drill press, 1/2-in. minimum with complete tooling (1 per program)
36. Work benches, 3 ft by 8 ft, heavy duty with vise (1 per student)
37. Computer (1 per 4 students)
38. Printer, laser (1 per 2 computers)
39. Brake lathe (1 per program)
40. Belt surfacer (1 per program)

NON-CAPITALIZED ITEMS

1. Drill, 1/2-in. (1 per 10 students)
2. Dial indicator and gauges (1 per student)
3. Tape rule, in 1/16-in. increments, 12 ft (5 per program)
4. Machinist ruler (1 per student)
5. Calipers (minimum 1 per student)

6. Waste container, fireproof (5 per program)
7. Spring tester (2 per program)
8. Head stands (1 pair per student)
9. Drill, 3/8-in. (2 per program)
10. Stud remover (1 per program)
11. Valve spring compressor (1 per 3 students)
12. Torque wrenches, inch and foot-pound, 3/8-in. drive (1 each per 5 students)
13. Torque wrenches, inch and foot-pound, 1/2-in. drive (1 each per 5 students)
14. Precision straight edge (2 per program)
15. Non-magnetic crack detection system (1 per program)
16. Valve stem height gage (1 per 4 students, or minimum 2 per program)
17. Oxy-fuel gas cutting and welding unit (1 per program)
18. Piston vise (1 per program)
19. Rod vise (2 per program)
20. Pneumatic die grinder (2 per program)
21. Carbide burrs, assorted kit (2 kits per program)
22. Telescoping gauges (1 per 4 students)
23. Gauge, small hole, set (1 set per 3 students)
24. Hammer, shop (5 per program)
25. Cylinder hone, manual, assorted sizes (4 to 5 per program)
26. Engine stand (1 per 2 students)
27. Ring compressors (1 per 3 students)
28. Oil seal installation tools (1 per program)
29. Core plug installation tools (1 per program)
30. Oil pressure tester (1 per program)
31. Compression tester (1 per program)
32. Valve adjusting tools, assorted (12 to 15 per program)
33. Chamfering cone (1 per program)
34. Cabinets, storage, lockable (4 minimum per program)
35. Drill bits, high-speed steel, assorted set (1 set per program)
36. Torque plates, assorted set (1 set per program)
37. Leak down tester kit (1 set per program)

Recommended Instructional Aids

It is recommended that instructors have access to the following items:

1. VCR/DVD player (1 per program)
2. TV, color monitor, 25-in. diameter (1 per program)
3. Screen, projection (1 per program)
4. Data projector (1 per program)

CURRICULUM DEFINITIONS AND TERMS

- Course Name – A common name that will be used by all community colleges in reporting students

- Course Abbreviation – A common abbreviation that will be used by all community and junior colleges in reporting students

- Classification – Courses may be classified as the following:
    - Career Certificate Required Course – A required course for all students completing a career certificate.
    - Technical Certificate Required Course – A required course for all students completing a technical certificate.
    - Technical Elective – Elective courses that are available for colleges to offer to students.

- Description – A short narrative that includes the major purpose(s) of the course

- Prerequisites – A listing of any courses that must be taken prior to or on enrollment in the course

- Corequisites – A listing of courses that may be taken while enrolled in the course

- Student Learning Outcomes – A listing of the student outcomes (major concepts and performances) that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:
    - Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district
    - Activities that develop a higher level of mastery on the existing competencies and suggested objectives
    - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised
    - Activities that include integration of academic and career–technical skills and course work, school-to-work transition activities, and articulation of secondary and postsecondary career–technical programs
    - Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas

- Sequencing of the course within a program is left to the discretion of the local college. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors. Programs that offer an Associate of Applied Science Degree must include all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college.

- In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

    - Adding new student learning outcomes to complement the existing competencies and suggested objectives in the program framework
    - Revising or extending the student learning outcomes
    - Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)