MARTIN COMMUNITY COLLEGE
COURSE SYLLABUS
Semester/Year: Spring 2011

COURSE NUMBER: AUT 116 (01)

COURSE TITLE: Engine Repair

CREDIT HOURS: 3

CONTACT HRS/WK: 5 (2 Class, 3 Lab)

PREREQUISITES: None

COREQUISITES: None

INSTRUCTOR: Steven Denis

OFFICE NO: Building 3, Room 7

OFFICE/VIRTUAL HOURS: MF 3:00-3:50, TTH 2:00-2:50, F 11:00-2:50

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COURSE DESCRIPTION: This course covers the theory, construction, inspection, diagnosis, and repair of internal combustion engines and related systems. Topics include fundamental operating principles of engines and diagnosis, inspection, adjustment, and repair of automotive engines using appropriate service information. Upon completion, students should be able to perform basic diagnosis, measurement and repair of automotive engines using appropriate tools, equipment, procedures, and service information.

PROGRAM LEARNING OUTCOMES:

Upon successful program completion, the student shall be able to:

1. Inspect, diagnose, dissemble, repair, replace and service each of the major systems in various types of vehicles to a NATEF standard.
2. Perform with accuracy, dependability, proficiency, and in a timely manner when servicing automotive systems
3. Discuss industry standards and employer/customer expectations for employees in the automotive industry workplace

COURSE LEARNING OUTCOMES:

1. Explain the theory, construction, and inspection of internal combustion engines and related systems.
2. Discuss the fundamental operating principles of engine diagnosis.
3. Perform basic diagnosis, measurement and repair of automotive engines using appropriate tools and equipments.

NATEF Objectives:

A. General Engine Diagnosis; Removal and Reinstallation (R & R)

1. Identify and interpret engine concern; determine necessary action. P-1

2. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins. P-1

3. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels,

and calibration decals). P-1

4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1

5. Diagnose engine noises and vibrations; determine necessary action. P-2

6. Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound; determine necessary action. P-2

7. Perform engine vacuum tests; determine necessary action. P-1

8. Perform cylinder power balance tests; determine necessary action. P-1

9. Perform cylinder compression tests; determine necessary action. P-1

10. Perform cylinder leakage tests; determine necessary action. P-1

11. Remove and reinstall engine in a late model front-wheel drive vehicle (**OBDI** or newer); reconnect all attaching components and restore the vehicle to running condition. P-1
12. Remove and reinstall engine in a late model rear-wheel drive vehicle (**OBDI** or newer); reconnect all attaching components and restore the vehicle to running condition. P-3

I. ENGINE REPAIR

B. Cylinder Head and Valve Train Diagnosis and Repair

1. Remove cylinder head(s); visually inspect cylinder head(s) for cracks; check gasket surface areas for warpage and leakage; check passage condition. P-2

2. Install cylinder heads and gaskets; tighten according to manufacturer's specifications and procedures. P-1

3. Inspect valve springs for squareness and free height comparison; determine necessary action. P-2

4. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks, and valve grooves; determine necessary action. P-2

5. Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action. P-3

6. Inspect valves and valve seats; determine necessary action. P-3

7. Check valve face-to-seat contact and valve seat concentricity (runout); determine necessary action. P-3

8. Check valve spring assembled height and valve stem height; determine necessary action. P-3

9. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action. P-2

10. Inspect hydraulic or mechanical lifters; determine necessary action. P-2

11. Adjust valves (mechanical or hydraulic lifters). P-1

12. Inspect camshaft drives (including gear wear and backlash, sprocket and chain wear); determine necessary action. P-2

13. Inspect and replace timing belts (chains), overhead camdrive sprockets, and tensioners; check belt/chain tension; adjust as necessary. P-1

14. Inspect camshaft for runout, journal wear and lobe wear. P-2

15. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action. P-3

16. Establish camshaft(s) timing and cam sensor indexing according to manufacturer's specifications and procedures. P-1

I. ENGINE REPAIR

C. Engine Block Assembly Diagnosis and Repair

1. Disassemble engine block; clean and prepare components for inspection and reassembly. P-2

2. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action. P-2

3. Inspect internal and external threads; restore as needed (includes installing thread inserts). P-2

4. Inspect and measure cylinder walls for damage, wear, and ridges; determine necessary action. P-2

5. Deglaze and clean cylinder walls. P-2

6. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action. P-3

7. Inspect crankshaft for end play, straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure journal wear; check crankshaft sensor reluctor ring (where applicable); determine necessary action. P-2

8. Inspect and measure main and connecting rod bearings for damage, clearance, and end play; determine necessary action (includes the proper selection of bearings). P-2

9. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore condition. P-3
10. Inspect and measure pistons; determine necessary action. P-2

11. Remove and replace piston pin. P-3

12. Inspect, measure, and install piston rings. P-1

13. Inspect auxiliary (balance, intermediate, idler, counterbalance or silencer) shaft(s); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time. P-2

14. Inspect or replace crankshaft vibration damper (harmonic balancer). P-3

15. Assemble the engine using gaskets, seals, and formed-in-place (tube-applied) sealants, thread sealers, etc. according to manufacturer's specifications. P-2

I. ENGINE REPAIR

D. Lubrication and Cooling Systems Diagnosis and Repair

1. Perform oil pressure tests; determine necessary action. P-1

2. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action. P-2

3. Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action. P-1

4. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

5. Inspect and replace engine cooling and heater system hoses. P-1

6. Inspect, test, and replace thermostat and housing. P-2

7. Test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. P-1

8. Inspect, test, remove, and replace water pump. P-1

9. Remove and replace radiator. P-2

10. Inspect, and test fans(s) (electrical or mechanical), fan clutch, fan shroud, and air dams. P-2
11. Inspect auxiliary oil coolers; determine necessary action. P-3

12. Inspect, test, and replace oil temperature and pressure switches and sensors. P-2

13. Perform oil and filter change. P-2

REQUIRED TEXTBOOKS
Text: Gilles. (2008) Automotive service : Inspection maintenance repair. (3rd ed.) Clifton Park: Thompson Delmar. ISBN: 1-4180-3758-3.
Worktext: Hadfield. (2008) Automotive job sheets for NATEF task mastery. (1st ed.) Clifton Park: Thompson Delmar. ISBN: 1-4180-7302-1

SUPPLEMENTAL RESOURCES:
Required Supplies: Approved Safety Glasses
NOTE: SAFETY GLASSES ARE REQUIRED TO BE WORN AT ALL TIMES WHILE IN THE SHOP AREA AND IN THE OUTSIDE WORK AREA
Basic Tool Set (See Attached)
Reference Materials: Information on Shop-Key, Internet, video/DVD information from manufactures
Revised: January 9, 2010

LEARNING/TEACHING METHODS
Lecture, video tapes/DVD's, textbooks and various manufacturers' specifications and repair manuals, **outside reading assignments,** hands-on lab

ASSESMENTS/METHODS OF EVALUATION:
Grading will be based on a minimum of four (4) tests, a final exam and lab work and outside reading assignment.

Classroom	**20%**
Shop	**20%**
Tests	**20%**
Outside Reading Assignments	**15%**
Final Exam	**25%**

(Determined by quality of work done, quantity of work and dependability in completing job tasks.)

A=90-100 B=80-89 C=70-79 D=60-69 F=59 and below

COURSE OUTLINE:

Week 1. Engine Principles and Fundamentals Chap 49
Week 2. Basic Engine Operation Chap 49
Week 3. Engine Fundamentals Chap 49
Week 4. Engine removal/Disassembly Chap50
Week 5. Component Inspection Chap 53
Week 6. Cylinder Block Servicing and repair Chap 54
Week 7. Cylinder Head Servicing and repair Chap 54
Week 8. Seal, Gaskets, Fasteners Chap 54
Week 9. Engine Assembly Chap 55
Week 10. Engine Installation Chap 55
Week 11. Engine In-chassis Servicing Chap 52
Week 12. Cooling System Chap 55
Week 13. Accessories and Drives Chap 55
Week 14-15. Diagnosing Engine Problems Chap 55
Week 16. Lab Clean up and Review

STUDENT ATTENDANCE POLICY:

Martin Community College recognizes that academic success is tied to regular attendance and completion of assigned work and tasks in a timely manner. Students are expected to attend a minimum of 80 percent of the total hours in this course, which includes classes, labs. Students must be present in at least one class during the first ten percent (10%) of a course in order to be considered enrolled in the class. If a student has not attended at least one class by the ten percent census date, the instructor will administratively withdraw the student.

Students who miss more than six contiguous contact hours or fail to attend the required percentage of total hours without a justifiable absence and verifiable contact with the instructor may be administratively withdrawn from the class and given a grade of "WF." The "WF" will be equivalent to an "F" when calculated into the student's GPA. An absence MAY, the instructor's sole discretion, be considered justifiable if proper, verifiable documentation of medical emergency is supplied. Verifiable contact will consist exclusively of an email to the instructor with an instructor reply and/or a registered/return-receipt letter to the instructor. Students may remove a "WF" by submitting appropriate paperwork for an official withdrawal by the last day to officially withdraw without receiving an "F." The last day to officially withdraw without receiving an "F" is published in the academic calendar for each academic year.

Make-up work will be allowed only with written prior approval of the instructor.

Habitual tardiness and/or early departure in a course will be considered in computing class attendance. A student will be considered tardy if they are not in their seat and prepared for work at the published class starting time. Students will be considered absent if not present when the roll is taken. Students may enter the classroom after the after the published class starting time if they can do so without disruption. It is the student's responsibility at the end of class or first break to make the instructor aware of their presence and arrival time. Students failing to do this will be considered absent for the entire class period. Early departure will be considered any time the student is absent from class for more than 5 minutes per class hour without direct instructor permission. Students departing more than 5 minutes before the published class ending time without prior instructor approval will be considered absent for the entire class period.

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Students will be counted absent from the date they register for each course.

Note: Under DVA regulations, the enrollment of veterans or dependents will be terminated or adjusted if they are administratively withdrawn or if they officially withdraw.

If an instructor fails to report for a class within 15 minutes of the scheduled beginning time and has not left instructions, those students present should sign a sheet before leaving and designate a student to submit it to the Dean of Academic Affairs and Student Services

REQUEST FOR EXCUSED ABSENCES FOR RELIGIOUS OBSERVANCES*

***In compliance with G.S. 115D-5, MCC policy permits a student to be excused, with the opportunity to make-up any test or other missed work, a minimum of two excused absences per academic year for religious observances required by the student's faith. The policy limits the excused absences to a maximum of two days per academic year.**

Students who wish to be excused for a Religious Observance required by their faith must complete and submit a request form to the instructor(s) prior to the census date of each class. The ***Request for Excused Absences for Religious Observances*** form can be picked up from Student Services. This does not supersede the college-wide attendance policy as outlined in the college catalog or syllabus, with the exception of a reasonable accommodation for the make-up of missed course work.

COURSE POLICIES:

All persons will have and wear safety glasses at all times in shop or lab areas. Failure to adhere to safety glasses rules will result in removal from the lab area and may result in disciplinary action.

The shop area is defined as Rm 10A, 10B, 10C and the area the area enclosed by the chain link fence outside the lab bay doors of building 3

Students are permitted, when entering the lab, to do so, at their own risk, without glasses if they are going directly to their tool box/work station to retrieve their glasses. "Passing though" to classrooms or hallways by employing the lab area while not wearing safety glasses is not allowed. This includes entry to the lab/class area from the parking area via the fence gate.

1. Eating /Drinking not allowed in classroom or Laboratory.
2. Work-style pants are recommended or proper fitting jeans that meet the following requirements (length above the shoes, jeans above the hip with belt/suspenders). No oversized pants/jeans will be permitted. **Shorts are not allowed**. Labcoats/Aprons are highly recommended to prevent damage to regular clothing.
3. We suggest that you refrain from wearing necklaces, rings, or bracelets of any kind as these items may pose a safety hazard. Likewise, facial jewelry can compound injury and wearing of same is discouraged in the lab
4. All belts will be of the type that does not have an exposed buckle. No keys, chains or wallets hanging out of pockets.
5. Hats are permitted in the shop area only! If a hat has a brim, it must be worn with it facing forward.

6. Students must wear leather or composite work boots or shoes. We highly recommend those with steel toes, oil resistant soles. No open toed shoes are permitted.

7. Other appearance issues not directly covered by these rules will be considered on a case-by-case basis. MCC staff will decide what is safe and professional in appearance and what is not.

Any Student Not Following These Guidelines Will Be Dismissed From Class and Attendance Credit for That Day Will Not Be Given. No Excuses Will Be Considered.

Students must have their tools required for class available to them at class time.

No Tools, No Lab Credit.

If you cannot reach your instructor, you may contact Dr. Phyllis Broughton, Dean of Academic Affairs and Student Services at (252)789-0246 or (252)789-0247 by phone, pbroughton@martincc.edu by e-mail, or in person at her office in Building 2, Room 33.

To access the Martin Community College Career Catalog for policies and curriculum requirements, please go online to www.martincc.edu.

If you have a need for a disability-related accommodation, please notify the Student Services counselor at (252) 789-0293.

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Recommended Minimum Tool List
MARTIN COMMUNITY COLLEGE
AUTOMOTIVE SYSTEMS TECHNOLOGY

DISCRIPTION	"SUCH AS"
Tool Chest, 8 Drawer	Sears 9-65248
½" Drive Torque Wrench 20-150 lb/ft	Sears 9-44595
Telescoping Inspection Mirror	Sears 9-40931
Brake Retainer Spring tool	Sears 9-47761
Magnetic Pick-up tool	Sears 9-0413
12 volt test light	KD Tools #126
Flashlight, 2 AA, Focusable beam	Mag Instruments "Mini-mag"
10" Mill Bastard file	Sears 9-31257
File handle	
16 oz Ball Peen hammer	Sears 9-38465
16 oz Rubber Mallet	Sears 9-45787
Scratch Awl	Sears 941028
1 inch Gasket Scraper	Sears 9-43292
12 in. square frame hacksaw	Klein 701-S
2, 12 in 24TPI hacksaw blades	Sears 9-36046
2, 12 in 32 TPI hacksaw blades	Sears 9-36049
25 in Pry Bar	Sears 9-43277
TORX™ Screwdrivers T10,T15,T20,T27,T30	Sears 9-4140
Screwdriver, Slotted 1/8 x 4	Sears 9-41589
Screwdriver, Slotted 3/16/ x 4	Sears 9-41581
Screwdriver, Slotted ¼ x 4	Sears 9-41583
Screwdriver, Slotted ¼ x 6	Sears 9-41584
Screwdriver, Slotted 3/16 x 8	Sears 9-41248
Screwdriver, Slotted 3/8 x 8	Sears 9- 41852
Screwdriver, Phillips #1 x3	Sears 9-41294
Screwdriver, Phillips #2 x 4	Sears 9-41295
Screwdriver, Phillips #1 x 1 1/2	Sears 9-418.55
Screwdriver, Phillips #2 x 1.5	Sears 9-04118
Screwdriver, Phillips #2 x 8	Sears 9-41296
Screwdriver, Phillips # 3 x 6	Sears 9-41297
Wrench set, Combination, SAE 1/4 in. to 15/16 in	Sears 9- 46893
Wrench set, Combination, METRIC 7mm to 17mm	Sears 9- 46894
Socket set, 3/8 Drive 6 pt. SAE 5/16-11/16	Sears 9-34437
Socket set, 3/8 Drive 6 pt. Metric 8-17 mm	Sears 9-34441
Socket set, 3/8 Drive 6 pt. SAE deep 5/16-11/16	Sears 9-34439
Socket set, 3/8 Drive 6 pt. Metric deep 8-17 mm	Sears 9-34443
Ratchet, 3/8 Drive	Sears 9-44808
Ratchet, 1/2 Drive	Sears 9-44809
Extension, 3/8 Drive 3"	Sears 9-44264

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Extension, 3/8 Drive 6”	Sears 9-44261
Extension, 3/8 Drive 10”	Sears 9-44262
Extension, 1/2 Drive 3”	Sears 9-44133
Extension, 1/2 Drive 6”	Sears 9-44131
Extension, 1/2 Drive 10”	Sears 9-44132
Flex Handle, 10 inch 3/8 Drive	Sears 9-44363
Flex Handle,18 inch, ½ Drive	Sears 9-44202
Spark Plug Socket 5/8	Sears 9-43324
Spark Plug Socket 13/16	Sears 9-43325
Universal Joint, 3/8 drive	Sears 9-4435
Universal Joint, ½ drive	Sears 9-4425
Pliers, Diagonal Side cutting	Sears 9-45075
Pliers, Long nose	Sears 9-45102
Pliers, Tongue and groove	Sears 9-45381
Pliers, Slip Joint	Sears 9-45378
Feeler Gauge set	Sears 9-40811
Steel Rule, 6 inch 1/64 graduation	
Brass Drift, 7 inch	
Center punch	Sears 9-42862
Flare Nut Wrench set SAE	Sears 9-44565
Flare Nut Wrench set Metric	Sears 9-44566
Adjustable wrench, 10in.	Sears 9-44604
Digital Volt-Ohm Meter (Fluke 88 preferred)	Sears 34-82139