CENTRAL PIEDMONT COMMUNITY COLLEGE

Course Syllabus
AUT 116A-35
Engine Repair Lab
General Curriculum (N. Meck)

Syllabus Contents:

Time Requirements:
- **12 Week Session (9/8/2017 thru 12/15/2017)**
- **3 Lab Hours/Week**
- **1 Semester Hours Credit**

Instructor: **James Viehmann**

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Office: **TS 138**

Phone: **704-330-4159**

Office hours: **By appointment**

AUT 116A-35
General Curriculum (N. Meck)
ENGINE REPAIR LAB

Prerequisites: None
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/repair of automotive engines using appropriate tools, equipment, procedures, and service information.

Core Competency Category:
Critical Thinking

Key Indicator: (*Please choose one of more key indicators that will focus your efforts on the core competency initiative).*

Applies Knowledge In Practical Ways

Briefly describe the instructional methodology or activity designed to teach or incorporate the Core Competency:

Students are required to Disassemble, Inspect, Measure, and Reassemble an engine in our engine lab using the most up to date service information. These tasks help the student understand" How an engine operates" thereby enhancing their critical thinking skills when diagnosing and repairing engine related concerns.

Briefly describe the primary methods of assessment and how they specifically measure and give feedback regarding students' attainment of the core competency. Attach any rubrics, tests, evaluation instruments, questions, etc.

Students must complete a worksheet detailing the condition and measured tolerances of key engine components. Students will reassemble the engine using the correct procedures and manufacturers torque specs.
*****Upon completion the engine MUST start and run with acceptable oil pressure and no abnormal engine noises.*****

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ENGINE REPAIR LAB
COURSE OBJECTIVES

I. ENGINE REPAIR

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

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Identify and interpret engine concern; determine necessary action. P-1
3. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins. P-1
4. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). P-1
5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1
6. Diagnose engine noises and vibrations; determine necessary action. P-2
7. Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound; determine necessary action. P-2
8. Perform engine vacuum tests; determine necessary action. P-1
9. Perform cylinder power balance tests; determine necessary action. P-1
10. Perform cylinder cranking compression tests; determine necessary action.P-1
11. Perform cylinder leakage tests; determine necessary action. P-1
12. Remove and reinstall engine in a front-wheel or rear wheel drive vehicle (OBDII or newer); reconnect all attaching components and restore the vehicle to running condition. P-2
13. Install engine covers using gaskets, seals and sealers as required. P-1

B. Cylinder Head and Valve Train Diagnosis and Repair

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

Remove and reinstall 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-3
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 cam drive 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

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. Perform common fastener and thread repair to include, remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-2
4. Inspect and measure cylinder walls/sleeves 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 main and connecting rod bearings for damage and wear; determine necessary action. P-2
9. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine necessary action. 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-2
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 engine block assembly. P-1

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 pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; 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 gasket. P-1
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-1
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-1

WEEKLY OUTLINE
AUT 116A-35
ENGINE REPAIR LAB
General Curriculum (N. Meck)

Text: ***Automotive Engines:***
By: James D. Halderman / Prentice Hall 9th Ed., Copy 2017
Lab Sheets for Projects (Web/Instructor)

WEEK 1-12

Shop Activities:

Mechanical Testing Procedures:

1. Compression
2. Leak Down
3. Oil Pressure
4. Lubrication Noise Diagnosis
5. Oil Leaks
6. Lubrication System Repair
7. Cooling System Pressure Testing
8. Cooling System Leak Diagnosis
9. Cooling system Noise Diagnosis
10. Cooling System Repair
11. Timing Belt/ Component Diagnosis
12. Timing Component Repair

Performance Diagnosis Electrical:

1. Engine Electrical Troubleshooting
2. Misfire Data Acquisition
3. Misfire Diagnosis
4. Related Component Diagnosis and Repair

Performance Diagnosis Fuel:

1. Pressure Testing
2. Injector Testing
3. Vacuum Testing
4. Misfire Data
5. Related Component Diagnosis and Repair

CENTRAL PIEDMONT COMMUNITY COLLEGE

STUDENT GRADE POINT AVERAGE

Students will be graded according to the following grade point system.

Grade	Point Value	Description
A	4	Excellent
B	3	Very Good
C	2	Satisfactory
D	1	Poor
F	0	Failing

The following grades will not be used in computing the grade point average.

I = Incomplete		W = Withdrawal
S = Satisfactory		U = Unsatisfactory
AUD = Audit		N = Never Attended
X = Credit by Examination		

- **Since this course is preparatory to entering the automotive service industry, job attitude, neatness, promptness and care of equipment will be considered part of the final grade. The final grade on these items will be determined by the instructor and based upon accepted industry standards.**

GRADING

1. FOR A GRADE OF "A":

a. Complete all written tests with an average of 93% to 100%.

b. Attend 90% of all scheduled class/lab hours.

c. Complete all lab/shop work in a manner as would be determined EXCELLENT in an actual shop.

2. FOR A GRADE OF "B":

a. Complete all written test with an average of 85% to 92%.

b. Attend 85% of all scheduled class/lab hours.

c. Complete all lab/shop work in a manner as would be determined VERY GOOD in an actual shop.

3. FOR A GRADE OF "C":

a. Complete all written tests with an average of 77% to 84%.

b. Attend 80% of scheduled class/lab hours.

c. Complete all lab/shop work in a manner as would be determined SATISFACTORY in an actual repair shop.

4. FOR A GRADE OF "D":

a. Complete all written tests with an average of 70% to 76%.

b. Attend 80% of all scheduled class/lab hours.

c. Complete all lab/shop work in a manner as would be determined POOR in an actual repair shop.

CENTRAL PIEDMONT COMMUNITY COLLEGE

Transport Systems Technology - Rules and Regulations

Year- Semester: 2017 Fall

Class Name: Engine Repair

Class Number- Section: AUT-116A-35 (N. Meck)

Instructor: James Viehmann

As a participant in the Transport Systems Technology division of CPCC, my classes include participation in hands-on activities in a lab setting. These labs can be in a large shop or small lab facility. In order to protect myself and others from harm, I agree to participate in those labs in a safe and professional manner.

Dress/Appearance/Hygiene

1. ***Safety Glasses:*** I agree to wear approved, non-tinted Safety Glasses at all times while in the lab.

   "At all times" means from the moment I enter the lab until I leave. This includes any time working, not working, referencing a computer, washing hands, etc. If I am found to not be wearing my safety glasses appropriately (covering my eyes), I agree to the following consequences:

   a. First offense – Verbal warning from the instructor
   b. Second offense – I will be excluded from that lab for the remainder of the lab
   c. Third offense – I will be excluded from that lab for the remainder of the lab and my grade will be reduced
   d. Any offenses while underneath a vehicle – skip automatically to the next highest penalty. There are no verbal warnings; exclusion for the day is automatic and a second occurrence will affect my grade

I understand that there are no exceptions from the above penalties. *In addition, warnings and exclusions can and will be made by any member of the CPCC faculty, staff, lab facilitators, Division Director, etc., and carry the same weight.*

2. ***Dress:*** All students are required to wear their dealer sponsored uniform to school each day. All shirts must be clean and tucked in. Dark colored work-style pants are recommended or proper fitting jeans that meet the following requirements (length above the shoes, jeans above the hip with belt). No oversized jeans will be permitted. Shorts are not allowed. No keys, chains or wallets hanging out of pockets. Rips and tears must be mended in a timely manner. All belts must be of the type that does not have an exposed buckle, or buckle turned to side of body.
3. ***Shoes****:* Students must wear leather work boots/shoes. We highly recommend steel toes and oil resistant soles. No sneakers, tennis shoes, open toed shoes, or dress shoes are permitted.
4. ***Jewelry:*** Facial jewelry of any type is NOT permitted. This includes ear, nose, lip, eyebrow, cheek rings, studs, etc. Also prohibited are necklaces, rings (only one wedding ring permitted), or bracelets of any kind as these items may pose a safety hazard. It is strongly recommended that you not wear a wristwatch.
5. ***Hats:*** Hats are permitted in the shop area only! If a hat has a bill, it must be worn with it facing forward. (skullies or beanies are not permitted)
6. ***Hair:*** Hair that is below the collar must be pulled back appropriately. Facial hair must be well groomed and not constitute a safety hazard.
7. ***Hygiene:*** Good personal hygiene must be maintained at all times.

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

Attendance

8. ***Attendance:*** All Students are required to be on time. Students are expected to discuss tardiness with the instructor after class. *Students that do not attend 80% of the classes will automatically receive a failing grade.*

9. ***Illness-Emergency Reporting Procedures:*** All students must notify the Instructor whenever he/she will be absent and state the reason for the absence. If the Instructor cannot be reached, leave a voice mail or e-mail. If no message is received from the student, this will constitute an absence. *A MESSAGE MUST BE RECEIVED.*

10. ***Tardiness:*** Tardiness in any manner will not be tolerated. Students are expected to be in class on time both in the morning and after lunch. Class begins at exactly the scheduled time. *Three unexcused tardies will result in lowering of one grade level.*

Six or more excused tardies will result in lowering by one grade level and /or penalty to be determined by the instructor.

Participation/Behavior

11. ***Participation:*** Students are to participate in all areas of instruction to the fullest extent of their ability.

12. ***Disrespectful Behavior:*** Talking, whispering, sleeping, laying your head on the desk, passing notes, etc. while the instructor is teaching is disrespectful behavior and will not be tolerated. *One warning will be given; a second violation will result in immediate dismissal from the class; third violation will result in dismissal from the program.*

13. ***Instructors/Staff/Guests:*** All persons must be treated with full courtesy and respect. Students, during any association with the instructional staff and/or guests, shall refer to them as "Sir" or "Ma'am" as the case may be. Students are expected to sit straight in their seats and give instructors their undivided attention while in class.

14. ***Language:*** Profanity of any kind will not be tolerated.

15. ***Cheating:*** Cheating in any manner WILL NOT be tolerated. Any student caught cheating or allowing or assisting in cheating, will be immediately dismissed from the program by the Instructor.

16. ***Cell Phones:*** Pagers, cell phones, or other electronic devices are not to be used in class. NO EXCEPTIONS!!

17. ***Food/Tobacco/Alcohol/Drugs/Medications:***

- Smoking or use of *any tobacco* products are not permitted on campus.

- The unlawful manufacture, distribution, dispensation, possession, or use of illegal drugs presents a hazard to students, employees, and property and is not permitted at any property in use by the College or while participating in a co-op. Any student who violates this policy is subject to disciplinary action. Refer to CPCC's Policy and Procedures No.7.01 at http://www.cpcc.edu/administration/policies-and-procedures/7-01-drug-free-college for complete details.

- NO FOOD OR DRINK (EXCEPT BOTTELD WATER) IS ALLOWED IN THE LAB AT ANY TIME. You may eat and drink only in the break areas or outside. Food and drink in the classroom is at the instructor's discretion.

- No alcohol is permitted on campus. If this occurs it will result in immediate dismissal from the program.

- No student is to be on campus under the influence of alcohol or with the odor of alcohol on or about them.

18. ***Breaks****:* Students are not permitted to gather in the hallways or other areas of the building. During breaks students are allowed in the break areas, restrooms, or outside. Students are not to block walkways or doorways.
19. ***Vehicles:*** All vehicles brought into the main lab will have a CPCC work order filled out and visible on windshield.

Refer to **"CPCC Student Code of Conduct and Disciplinary Procedures"** and/or **CPCC's Policies and Procedures at** http://www.cpcc.edu/administration/policies-and-procedures/7-students for the College's expectations of its students.

Any student not following these guidelines will be dismissed from class and attendance credit for that day will not be given. After a student has been warned or dismissed from class three times he or she will be dropped from the program.

No excuses will be considered.

By signing this form I am attesting to the fact that I have read or had read to me and I understand all of the Rules and Regulations of Central Piedmont Community College's Transport Systems Technology program. By affixing my signature to this form I am also agreeing to abide by each and every rule. I understand that any and all violations of these rules will be made part of my record and that any violation could result in termination from this program.

Student Name (Print) _____

Date_____

Student ID#_____

Student Signature_____

CENTRAL PIEDMONT COMMUNITY COLLEGE

Automotive Technology, Tool List

Safety Glasses or Goggles Mandatory in Labs

- Toolbox
- Common slotted screwdrivers, 4"x3/16, 6"x1/4, 8"x1/4
- Phillips screwdrivers number 1 and number 2
- Torx bit set T10 to T60
- Standard combination wrench set 5/16 to 1 1/4"
- Metric combination wrench set 6mm to 22mm
- 16 oz ball peen hammer
- 6" needle nose pliers
- Regular slip joint pliers
- 10 or 12" Channel Lock pliers
- 6 or 7" side cutting pliers
- Set of punches and chisels
- Feeler gauge set
- 3/8 "drive socket set, including ratchet, extensions, standard and metric sockets,
  - 3/8 to 7/8 and 8mm to 17mm
- 3/8" to 1/2" socket adapter, 1/2" to.3/8" socket adapter
- 1/2" drive socket set with extensions and ratchet,
- 1/2"' drive flex handle at least 18" long (breaker bar)
- 1/2" drive sockets, 7/16 to 1 1/14 and 10mm to 22mm
- 1/2" inch drive torque wrench
- Spark plug sockets 5/8" and 13/16" 3/8" drive
- Gasket scraper
- Set of Allen wrenches
- 12-volt test light
- 1/4" drive socket set, standard and metric sockets, including ratchet
- Non-sparking drift punch, brass or aluminum
- Digital Volt, Ohm and Ammeter DVOM, with Leads Example Fluke model 83

You may wish to purchase additional tools for the specific program you are enrolled in such as ASEP, BMW, T-TEN, CAP. Check with your instructor for a list.

CENTRAL PIEDMONT COMMUNITY COLLEGE

Automotive Technology Safety Regulations

- An Instructor must be present any time a class or session is working in the lab

Use of safety glasses is required/mandatory in lab areas.

- Any safety hazard will be reported to the instructor immediately. Floor will be kept clear of all liquids and tripping hazards.

- No equipment will be operated by students until they have received instruction on proper and safe operation of same equipment.

- Vehicle lifts must be secured with mechanical locks prior to working under vehicle

- Jack stands will be used when jacking up a vehicle for service.

- Brake asbestos "dust" will be controlled any time work is done which could lead to asbestos exposure.

- Floor exhaust system will be used anytime an engine is running in the lab.

- Use of tobacco is not permitted in any lab or classroom.

- Use of audio equipment is not permitted during class/lab hours.

- Students and faculty must follow OSHA rules concerning exposure to blood borne diseases.

- Proper disposal of automotive waste products, including hazardous wastes, is required.