

MARTIN COMMUNITY COLLEGE
COURSE SYLLABUS
Semester/Year: Spring 2011

COURSE NUMBER: AUT 141 (01)	INSTRUCTOR: Mr. Robert Swisher
COURSE TITLE: Suspension & Steering Systems	OFFICE NO: Building 3, Room 7
CREDIT HOURS: 3	OFFICE/VIRTUAL HOURS: NA
CONTACT HRS/WK: 5 (2 class, 3 lab)	PHONE NO: 252-789-0212
PREREQUISITES: None	FAX: 252-792-0826
COREQUISITES: None	E-MAIL: rswisher@mcc.martincc.edu

COURSE DESCRIPTION: This course covers principles of operation, types, and diagnosis/repair of suspension and steering systems to include steering geometry. Topics include manual and power steering systems and standard and electronically controlled suspension and steering systems. Upon completion, students should be able to service and repair steering and suspension components, check and adjust various alignment angles, repair tires and balance wheels.

PROGRAM LEARNING OUTCOMES:

1. Inspect, diagnose, disassemble, 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. Describe the principles of suspension and steering systems
2. Discuss standard and electronically controlled suspension and steering system operation
3. Diagnose and service steering/suspension components and adjust wheel alignment

NATEF OBJECTIVES:

A. General Suspension and Steering Systems Diagnosis

1. Identify and interpret suspension and steering concern; determine necessary action. P-1
2. Research applicable vehicle and service information, such as suspension and steering system 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, calibration decals). P-1

B. Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS). P-1
2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1
3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action. P-2

4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and fluid leakage concerns; determine necessary action. P-3
5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and fluid leakage concerns; determine necessary action. P-3
6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action. P-2
7. Adjust manual or power non-rack and pinion worm bearing preload and sector lash. P-3
8. Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets. P-1
9. Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots. P-1
10. Inspect power steering fluid levels and condition. P-1
11. Flush, fill, and bleed power steering system. P-2
12. Diagnose power steering fluid leakage; determine necessary action. P-2
13. Remove, inspect, replace, and adjust power steering pump belt. P-1
14. Remove and reinstall power steering pump. P-3
15. Remove and reinstall power steering pump pulley; check pulley and belt alignment. P-3
16. Inspect and replace power steering hoses and fittings. P-2
17. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. P-2
18. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps. P-1
19. Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action. P-3

IV. SUSPENSION AND STEERING

C. Suspension Systems Diagnosis and Repair

1. Front Suspension

1. Diagnose short and long arm suspension system noises, body sway, and uneven riding height concerns; determine necessary action. P-1
2. Diagnose strut suspension system noises, body sway, and uneven riding height concerns; determine necessary action. P-1
3. Remove, inspect, and install upper and lower control arms, bushings, shafts, and rebound bumpers. P-3
4. Remove, inspect and install strut rods (compression/tension) and bushings. P-2
5. Remove, inspect, and install upper and/or lower ball joints. P-2
6. Remove, inspect, and install steering knuckle assemblies. P-2
7. Remove, inspect, and install short and long arm suspension system coil springs and spring insulators. P-2
8. Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts. P-3
9. Remove, inspect, and install stabilizer bar bushings, brackets, and links. P-2
10. Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. P-1
11. Lubricate suspension and steering systems. P-2

2. Rear Suspension

1. Remove, inspect, and install coil springs and spring insulators. P-2
2. Remove, inspect, and install transverse links, control arms, bushings, and mounts. P-2
3. Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts. P-3
4. Remove, inspect, and install strut cartridge or assembly, strut coil spring, and insulators (silencers). P-2

3. Miscellaneous Service

1. Inspect, remove, and replace shock absorbers. P-1
2. Remove, inspect, and service or replace front and rear wheel bearings. P-1

3. Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action. P-3

IV. SUSPENSION AND STEERING

D. Wheel Alignment Diagnosis, Adjustment, and Repair

1. Differentiate between steering and suspension concerns using principles of steering geometry (caster, camber, toe, etc). P-1
2. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action. P-1
3. Perform prealignment inspection; perform necessary action. P-1
4. Measure vehicle riding height; determine necessary action. P-1
5. Check and adjust front and rear wheel camber; perform necessary action. P-1
6. Check and adjust caster; perform necessary action. P-1
7. Check and adjust front wheel toe; adjust as needed. P-1
8. Center steering wheel. P-1
9. Check toe-out-on-turns (turning radius); determine necessary action. P-2
10. Check SAI (steering axis inclination) and included angle; determine necessary action. P-2
11. Check and adjust rear wheel toe. P-2
12. Check rear wheel thrust angle; determine necessary action. P-2
13. Check for front wheel setback; determine necessary action. P-2
14. Check front cradle (subframe) alignment; determine necessary action. P-3

IV. SUSPENSION AND STEERING

E. Wheel and Tire Diagnosis and Repair

1. Diagnose tire wear patterns; determine necessary action. P-1
2. Inspect tires; check and adjust air pressure. P-1
3. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action. P-2
4. Rotate tires according to manufacturer's recommendations. P-1
5. Measure wheel, tire, axle, and hub runout; determine necessary action. P-2
6. Diagnose tire pull (lead) problem; determine necessary action. P-2
7. Balance wheel and tire assembly (static and dynamic). P-1
8. Dismount, inspect, repair, and remount tire on wheel. P-2
9. Reinstall wheel; torque lug nuts. P-1
10. Inspect and repair tire. P-2

REQUIRED TEXTBOOKS:

Text: Gilles. (2008) Automotive service: Inspection maintenance repair (3rd ed.); 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

Basic Tool Set (See Attached)

NOTE: SAFETY GLASSES ARE REQUIRED TO BE WORN AT ALL TIMES WHILE IN THE SHOP AREA AND IN THE OUTSIDE WORK AREA

Reference Materials: Information on Shop-Key discs; and videos from manufactures; on new up-date engines.

LEARNING/TEACHING METHODS: Lecture, VHS tapes, textbooks and various manufacturers' specifications and repair manuals, outside reading assignments, hands-on lab

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: Tire and Wheel Theory Chap 61
- Week 2: Tire and Wheel Theory Chap 61
- Week 3: Tire and Wheel Service Chap 62
- Week 4: Tire and Wheel Service Chap 62
- Week 5: Suspension Fundamentals Chap 63
- Week 6: Suspension Fundamentals Chap 63
- Week 7: Suspension System Service Chap 64
- Week 8: Suspension System Service Chap 64
- Week 9: Steering Fundamentals Chap 65
- Week 10: Steering Fundamentals Chap 65
- Week 11: Steering Service Chap 66
- Week 12: Steering Service Chap 66
- Week 13: Wheel Alignment Fundamentals Chap 67
- Week 14: Wheel Alignment Fundamentals Chap 67
- Week 15: Wheel Alignment Service Chap 68
- Week 16: Review and Lab Clean Up

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 for a course, which includes classes, labs, and shops. Some courses and programs have stricter attendance requirements of 85, 90, or 95 percent based upon the difficulty and complexity of the subject matter. General Education and Developmental courses require 85 percent attendance. The syllabus for each course will specify the attendance requirement.

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 by the instructor and given a grade of "WF." The "WF" will be equivalent to an "F" when

calculated into the student's GPA. The course syllabus will indicate what the instructor considers a justifiable absence and will define "verifiable contact." 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. The official withdrawal date for mini sessions, block courses, or other non-traditional schedules are available from the registrar and will be included on the course syllabus.

Make-up work may be allowed at the discretion of the instructor, and the instructor's policy on make-up work will be included in the course syllabus. Students in clinical and cooperative educational work experiences must complete 100 percent of the required hours to receive a passing grade. Clinical or cooperative work experience make-up hours require clinical or cooperative educational work site approval and approval of the instructor.

Habitual tardiness and/or early departure in a course may, at the discretion of the instructor, be considered in computing class attendance. The course syllabus will include the instructor's definition of tardiness and early departure.

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 through" 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.