Odessa College
Technical Studies Division
Automotive Technology

Course Syllabus

COURSE NUMBER: **AUMT 1416**

COURSE TITLE: **Automotive Steering and Suspension Systems**

CREDIT HOURS: **4** **LECTURE HOURS:** **2** **LAB HOURS:** **6**

PREREQUISITE: **Consent of department chair or instructor.**

CATALOG DESCRIPTION:

A study of automotive suspension and steering systems including tire and wheel problem diagnosis, component repair, and alignment procedures. May be taught manufacturer specific. The students working as a team, yet displaying individual responsibility, will learn repair procedures related to brakes, front-end alignment and suspension systems. Students will use brake lathes, computer aligning equipment, as well as non-computer alignments. Students will calculate alignment measures in degrees, fractions, and metrics. Lab exercises are designed to develop reasoning, decision-making ability and improving self-esteem regarding alignment problems. Reading of technical materials is required. Lab fee required. (SCANS 1, 2, 3, 5, 6, 7, 9, 10, 11) Prerequisite: Consent of department chair or instructor.

COURSE LEARNING OUTCOMES:

Utilize appropriate safety procedures; identify system components; diagnose and repair system components; perform wheel alignment procedures; and perform tire service and repair.

COMPETENCIES:

After completing this course, the student should be able to demonstrate automotive competency in:

IV. SUSPENSION AND STEERING

TEXTBOOK

Classroom Manual: Automotive Suspension & Steering Systems, Don Knowles, 4th Edition, Thomson Delmar Learning, 2007

SUPPLIES:

Students will need course textbook, job sheets, paper, notebook, pen and pencils.

COURSE GRADE EVAULATION:

25% Professionalism (*A grade will be assessed using the following guide lines.)*
- Punctuality
- Desire to learn
- Appropriate appearance
- Quality workmanship
- Ability to work with others
- Safe working habits (*Students will be graded in all areas of shop safety.)*
- Positive attitude
- Work ethics
- Integrity
- Attendance

25% Research Paper and/or Final Exam
25% Lab Participation
25% Quizzes and/or Daily

Also see instructor information sheet:

ATTENDANCE POLICY:

YOUR attendance is the greatest predictor of your success. **Student attendance at EVERY class is expected.** You should expect that each absence will adversely affect your course grade. Please see the instructor regarding anticipated absences or conflicts due to college sponsored activities.

ACADEMIC ETHICS:

You are expected to participate and contribute as a group in the labs and classroom; test will be taken without notes or other outside-assistance. If unethical behavior is detected, all parties involved will be denied credit for that project or exam. The questioned material and report of the ethics violation will be submitted to the department chair for further action if deemed necessary.

STUDENT ASSISTANCE:

- Admissions: 432-335-6443
- Book Store: 432-335-6654
- Cafeteria: 432-335-6435
- Career Services: 432-335-6835
- Cashier's: 432-335-6600
- Counseling: (Help center) 432-335-6346
- Auto/Diesel Department Chair: 432-335-6633
- .edu: (Student Service Center) 432-335-6833
- Financial Services: 432-335-6429
- Housing/Judicial Affairs: 432-335-6300
- Learning Resources Center: 432-335-6641
- Registrar: 432-335-6443
- Student Learning Center:
  Peer tutoring available
  PLATO: Computer tutoring available
  (LRC 300) 432-335-6878
- Student Support Services: 432-335-6868
- Technical Studies Dean: 432-335-6686
- Testing Center: 432-335-6834
- Vice President Instruction: 432-335-6413
- Vice President for Student Services: 432-335-6683
- Wi-Fi Java, Cyber Café: 432-335-6509

FACULTY:

James McCutcheon, chair;	Office Dm102	432-335-6633	jmccutcheon@odessa.edu
Jerry Griffith	Office Dm101	432-335-6632	jgriffith@odessa.edu
Perry Griffith	Office Dm105A	432-335-6603	pgriffith@odessa.edu

LAB REQUIREMENTS:

General Shop Practices and Procedures

- **Safety requirements will be strictly enforced: comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, proper ventilation, and the handling, storage, and disposal of chemicals in accordance with local, state, and federal environmental regulations.**
- Proper **Personal Protection Equipment** (PPE) will be used in all required areas.
- **Safety Glasses** must be worn **at all times** in the **lab/shop area**. No exceptions!
- **Adhere to all Safety signs** posted on equipment, fire extinguishers, tool groups, vehicle lifts, support stands, grinders, drill presses, or any other equipment or areas marked with Safety signage.
- Do not restrict the passage of any marked walkway.
- **Safety is paramount** and you are responsible for your work area and your safe work habits! **Therefore, do not leave fluid spills on floor and keep your area free of clutter!**
- Equipment use is limited to those knowledgeable enough to operate the equipment safely; otherwise the equipment is **OFF LIMITS! (Consult your instructor).**
- Tools and equipment **will not be loaned** or taken from the Odessa College premises.
- Students **MUST** sign out for any specialty tool needed and will only be issued by an instructor or designated person. The student will be **responsible for safety and care of those tools, when finished or at the end of each lab period,** return all tools to the checkout person so they can sign the tool back in.
- NATEF job sheets will be filled out for each lab assignment. When finished, give completed job sheets to the instructor and those will be recorded on your progress report.
- All vehicles are to be treated as customer vehicles. As a student **YOU ARE TO RESPECT THIS,** do not sit in, lean on, or handle any vehicle that has not been specifically assigned to you by your instructor.
- Any time a vehicle hood is open, fender covers must be in place on the fenders at all times.
- Students must get approval from the instructor **before** bringing vehicles in the shop. **Only certain vehicles qualify for NATEF required tasks.**
- **V**isitors are not allowed in the lab/shop area, however they may be escorted through the lab/shop area by approved personal.

COURSE COMPETENCIES:

NATEF RECOMMENDED TASKS FOR AUTOMOTIVE TECHNOLOGY

SUSPENSION AND STEERING

For every tasks in* Suspension and Steering Systems, *the following safety requirement must be strictly enforced as a number 1 priority: Comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and handling, storage and disposal of chemicals in

accordance with local, state, and federal safety and environmental regulations, listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

IV. SUSPENSION AND STEERING

IV.A General Suspension and Steering Systems Diagnosis

Task	Job Sheet	Priority	
A.1	1	P1	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
A.2	2	P1	Identify and interpret suspension and steering concern; determine necessary action.
A.3	3	P1	Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins
A.4	3	P1	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels calibration decals).

IV.B Steering Systems Diagnosis and Repair

B.1	4	P1	Disable and enable supplemental restraint system (SRS).
B.2	4	P1	Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
B.3	5	P2	Diagnose steering column noises, looseness, & binding concerns (including tilt mechanisms); determine necessary action.
B.4	6	P3	Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, noise, and fluid leakage concerns; determine necessary action.
B.5	7	P3	Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, noise, and fluid leakage concerns; determine necessary action.
B.6	8	P2	Inspect steering shaft universal-joints(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.
B.7	9	P3	Adjust manual or power non-rack and pinion worm bearing preload and sector lash.
B.8	10	P1	Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets.
B.9	11,12	P1	Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
B.10	13	P1	Determine proper power steering fluid types; inspect fluid levels and condition.
B.11	14	P2	Flush, fill, and bleed power steering system.
B.12	15	P2	Diagnose power steering fluid leakage; determine necessary action.
B.13	16	P1	Remove, inspect, replace, and adjust power steering pump belt.
B.14	17	P3	Remove and reinstall power steering pump.
B.15	16	P3	Remove and reinstall power steering pump pulley; check pulley and belt alignment.
B.16	17	P2	Inspect and replace power steering hoses and fittings.
B.17	18	P1	Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, steering linkage damper
B.18	19	P1	Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
B.19	20	P3	Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action.
B.20	21	P3	Inspect and test non-hydraulic electric-power assist steering.
B.21	22	P3	Identify hybrid vehicle power steering system electrical circuits, service and safety precautions.

IV.C Suspension Systems Diagnosis and Repair

IV.C.1 Front Suspension

C.1.1	23	P1	Diagnose short and long arm-type suspension system noises, body sway, and uneven riding height concerns; determine necessary action.
C.1.2	24	P1	Diagnose strut suspension system noises, body sway, and uneven riding height concerns; determine necessary action.
C.1.3	25	P3	Remove, inspect, and install upper and lower control arms, bushings, shafts and rebound bumpers.
C.1.4	26	P2	Remove, inspect, and install strut (compression/tension) rods and bushings.
C.1.5	27	P1	Remove, inspect and install upper and lower ball joints.
C.1.6	28	P2	Remove, inspect and install steering knuckle assemblies.
C.1.7	29	P3	Remove, inspect and install short and long arm suspension system coil springs and spring insulators.
C.1.8	30	P2	Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts.
C.1.9	31	P2	Remove, inspect and install stabilizer bar bushings, brackets, and links.
C.1.10	32	P1	Remove, inspect and install strut cartridge or assembly, strut coil spring, insulators, (silencers)/upper strut bearing mount.
C.1.11	33	P2	Lubricate suspension/steering systems.

IV.C.2 Rear Suspension

C.2.1	34	P2	Remove, inspect and install coil springs and spring insulators.
C.2.2	35	P2	Remove, inspect and replace transverse links, control arms, bushings, and mounts.
C.2.3	36	P3	Remove, inspect and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts
C.2.4	34	P2	Remove, inspect and install strut cartridge or assembly, strut coil spring, and insulators (silencers).

IV.C.3 Miscellaneous Service

C.3.1	35	P1	Inspect, remove and replace shock absorbers.
C.3.2	38	P1	Remove, inspect, and service or replace front and rear wheel bearings.
C.3.3	37	P3	Test /diagnose components of electronically- controlled suspension systems using a scan tool; determine necessary action.

IV.D Wheel Alignment Diagnosis, Adjustment, and Repair

Task	Job Sheet	Priority		
D.1	**39,40**	**P1**	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque concerns; determine necessary action.	steer, and steering return
D.2	**41**	**P1**	Perform prealignment inspection; perform necessary action.	
D.3	**42**	**P1**	Measure vehicle riding height; determine necessary action.	
D.4	**43**	**P1**	Check and adjust front and rear wheel camber; perform necessary action.	
D.5	**43**	**P1**	Check and adjust caster; perform necessary action.	
D.6	**43**	**P1**	Check and adjust front wheel toe and center steering wheel.	
D.7	**43**	**P2**	Check toe-out-on-turns (turning radius); determine necessary action.	
D.8	**43**	**P2**	Check SAI (steering axis inclination) and included angle; determine necessary action.	
D.9	**43**	**P1**	Check and adjust rear wheel toe.	
D.10	**43**	**P1**	Check rear wheel thrust angle; determine necessary action.	
D.11	**43**	**P2**	Check for front wheel setback; determine necessary action.	
D.12	**44**	**P3**	Check front cradle (sub frame) alignment; determine necessary action.	

IV.E Wheel and Tire Diagnosis and Repair

E.1	**45**	**P1**	Diagnose tire wear patterns; determine necessary action.
E.2	**45**	**P1**	Inspect tires check, and adjust air pressure.
E.3	**46**	**P2**	Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.
E.4	**47**	**P1**	Rotate tires according to manufacturer's recommendations.
E.5	**48**	**P2**	Measure wheel, tire, axle, and hub run out; determine necessary action.
E.6	**23**	**P2**	Diagnose tire pull (lead) problem; determine corrective actions.
E.7	**49**	**P1**	Balance wheel and tire assembly (static and dynamic).
E.8	**50**	**P2**	Dismount, inspect, and remount tire on wheel.
E.9	**51**	**P3**	Dismount, inspect, and remount tire on wheel equipped with tire pressure sensor.
E.10	**50**	**P1**	Reinstall wheel; torque lug nuts.
E.11	**52**	**P1**	Inspect tire and wheel assembly for air loss; perform necessary action.
E.12	**52**	**P1**	Repair tire using internal patch.
E.13	**51**	**P3**	Inspect, diagnose, and calibrate tire pressure monitoring system.