

Automotive and Diesel Technology

The following matrix indicates those courses deemed transferable among institutions listed across the top of the matrix. The numbers on the matrix represent the number of semester hours associated with the course at each institution and which institutions have agreed to transfer the commonly numbered course in each row.

A list of the academic discipline liaisons contacts for each institution are listed at the bottom of this document.

Auto Body Repair

Prefix	Number	Course Title	BSC	NDSCS
ABOD	100	Introduction to Automotive Collision Technology	2	
ABOD	101	Basic Auto Body Repair Techniques Lab		4
ABOD	102	Basic Auto Body Production Lab		3
ABOD	103	Refinishing and Plastic Repair		4
ABOD	104	Refinishing Systems		4
ABOD	105	Introduction to Metal Finishing	5	
ABOD	106	Refinishing Lab		4
ABOD	107	Introduction to Sanding, Priming and Painting	5	
ABOD	108	Intermediate Metal Finishing	4	
ABOD	109	Plastics & Adhesives	4	
ABOD	110	Auto Collision Plastics and Adhesives	4	
ABOD	112	Introduction to Painting	4	
ABOD	113	Basic Auto Body Repair Techniques I		2
ABOD	114	Component Parts - Replacement & Adjustment	5	
ABOD	115	Basic Auto Body Repair Techniques II		2
ABOD	120	Applied Welding		1
ABOD	200	Mechanical/Electrical Components	5	5

Prefix	Number	Course Title	BSC	NDSCS
ABOD	201	Wheel Alignment & Measuring Systems		4
ABOD	202	Frame/Body & Structural Repairs		4
ABOD	203	Advanced Damage Analysis Lab I		4
ABOD	204	Estimating & Job Costing		4
ABOD	205	OEM, Trim, Shop Planning		3
ABOD	206	Advanced Damage Analysis Lab II		4
ABOD	210	Advanced Painting	1	
ABOD	216	Frame Straightening & Wheel Alignment	3	
ABOD	220	Estimating & Industrial Management	1	
ABOD	251	Advanced Refinishing		9
ABOD	252	Advanced Unibody Repair/Measurement		9
ABOD	253	Automotive Trim & Upholstery		9
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ABOD 100 Introduction to Automotive Collision Technology

This is a laboratory course covering the basic fundamentals of auto body repair. Emphasis is placed on learning the basic repair methods, stressing the quality of the repair. Lab tasks are performed on donated salvage vehicle. Tasks are assigned according to the NATEF task list.

ABOD 101 Basic Auto Body Repair Techniques Lab

A lecture, demonstration, and laboratory course covering the basic fundamentals of auto body repair. Emphasis is placed on learning the basic repair methods stressing quality of repair. Laboratory tasks are performed on donated salvage vehicles. Tasks are assigned according to the NATEF task list.

Upon completion of this course, the student will be able to:

1. Follow all safety procedures while performing all tasks
2. Demonstrate proper vehicle surface cleaning
3. Demonstrate safe removal and handling of fuel tanks and other hazardous items
4. Demonstrate proper glass replacement
5. Remove and replace automotive fasteners properly
6. Demonstrate proper removal of various automotive parts

7. Demonstrate proper hand tool usage
8. Perform various dent repairs
9. Demonstrate proper metal working techniques
10. Use different types of body fillers in their proper applications.
11. Use different types of sandpapers and grits in their proper applications.
12. Demonstrate the use of various air tools
13. Perform the various welding procedures
14. Perform weld-on panel replacement procedures
15. Perform glue- on panel replacement procedures
16. Demonstrate the use of specialized auto body tools
17. Perform proper body measurement and alignment
18. Adjust fastened panels for proper alignment

ABOD 102 Basic Auto Body Production Lab

Applied basic procedures learned in ABOD 101 to production type vehicles. Using NATEF task lists, the student will take vehicle from damaged state through the initial priming stage. Prerequisite: ABOD 101.

ABOD 103 Refinishing and Plastic Repair

This lab/theory combination course is a continuation of ABOD 102. Major emphasis is the utilization of lecture, discussion, and demonstrations with practical application in the production lab on customer repair projects. There is continued development of basic skills and introduction to paint spray systems and related refinish equipment. Addresses plastic welding and plastic adhesive repair. Covers the ASE-NATEF task list for plastic repairs. Prerequisites: ABOD 101 and ABOD 102.

ABOD 104 Refinishing Systems

This lab/theory combination course is a continuation of ABOD 103. Major emphasis is the utilization of lecture, discussion, and demonstrations with practical application by the student in the production lab on customer production projects. There is continuing development of basic skills and introduction to the preparation and application of current paint refinishing systems and the use of other specialized paint products related to automotive repair and refinishing. Prerequisites: ABOD 101, ABOD 102, ABOD 103.

ABOD 105 Introduction to Metal Finishing

Covers the proper methods of filing, metal picking, and use of power grinders to properly finish metal surfaces, as well as the theory of expansion and contraction to metals during welding. Students are introduced to when and how to use plastic fillers. Shop safety is stressed.

ABOD 106 Refinishing Lab

Covers the ASE-NATEF task list for the auto body technician training program. Major emphasis is the utilization of lecture, discussion, and demonstrations with practical application in the refinish lab on customer repair projects. There is continued development of basic skills and the monitoring of student progress with the use of task progress charts. Tasks listed in this course are tracked on ASE-NATEF progress chart 70-1000c and the NATEF task list. Prerequisites: ABOD 101,

ABOD 102, ABOD 103, ABOD 104.

ABOD 107 Introduction to Sanding, Priming and Painting

Introduction to thinning and the proper use of primer. The proper use of sandpaper and the art of sanding are initiated and practiced at this time.

ABOD 108 Intermediate Metal Finishing

A lab course in which students are introduced to roughing out and aligning damaged areas of a vehicle. Students upgrade their manipulative skills. Prerequisite: ABOD 105.

ABOD 109 Plastics & Adhesives

Different types of plastic material are introduced. Students are in lab practicing the use of adhesives on plastic repairs.

ABOD 110 Auto Collision Plastics and Adhesives

Basic training in the use of oxyacetylene torch and wire feed welders. Equipment, safety, and common weld joints are covered using both welding processes. Lecture and shop instruction apply welding techniques and process used in industry. Welding fuels, gases, electric current, electrodes and their applications are introduced.

ABOD 112 Introduction to Painting

The proper use, maintenance and adjustment of paint equipment is demonstrated. Students are introduced to thinners, reducers and additives in paint, and to painting damaged vehicles. Prerequisite: ABOD 105 and 107.

ABOD 113 Basic Auto Body Repair Techniques I

This is a lecture and demonstration course covering the basic fundamentals of auto body repair. Emphasis is placed on learning the basic repair methods, stressing the quality of the repair.

Upon completion of this course, the student will be able to:

1. Identify all safety procedures for performing auto body tasks
2. Identify types of fires and fire fighting techniques
3. Identify the inner workings of a typical collision shop
4. Explain the major work areas of a typical collision repair facility
5. Identify vehicle classifications
6. Compare and contrast modern body over frame to unibody designs
7. Locate and utilize charts and graphs for collision repair
8. Identify and use basic measuring tools common to auto body repair
9. Identify common body shop hand tool.
10. Explain the importance of have a wide range of hand tools
11. Identify and explain the operation of electric and air tools
12. Describe the hydraulic equipment used in auto body repair

ABOD 114 Component Parts - Replacement & Adjustment

Students are introduced to the techniques of installing and properly adjusting doors, hoods, and trunk lids, and replacing and aligning new body panels. This course also covers the proper techniques of installing windshields, window regulators and glass channels.

ABOD 115 Basic Auto Body Repair Techniques

This is a lecture and demonstration course covering the basic fundamentals of auto body repair. Emphasis is placed on learning the basic repair methods, stressing the quality of the repair.

Upon completion of this course, the student will be able to:

1. Describe the different types of metals used in vehicle construction.
2. Summarize the deformation effects of impacts on steel.
3. Explain how to use a hammer and dolly to straighten metal.
4. List the different types of body fillers and their uses.
5. Identify the correct ratio and mixing procedures.
6. List common mistakes and misuses of fillers and spot putties.
7. Explain common repairs using various body fillers.
8. Identify the parts and panel considered structural on a vehicle.
9. List the steps necessary for replacing a panel at the factory seams.
10. Section rails, rockers, pillars, floor pans, and trunk floors.
11. List the various methods for adjusting mechanically fastened panels.
12. Describe the types of glass used today and methods of removal and replacement.

ABOD 120 Applied Welding

Covers basic welding instruction for students enrolled in the Auto Body curriculum. Major emphasis is placed on Gas Metal Arc Welding (GMAW), using wire MIG (Metal Inert Gas) welders on sheet metal gauges used on modern unibody automobiles. Introduction to Oxy-Acetylene welding and cutting procedures is also covered.

ABOD 200 Mechanical/Electrical Components

A practical introduction to electrical and electronic systems, brake systems, air conditioning systems, cooling systems, drive train, fuel, intake and exhaust systems, and restraint systems. Major emphasis is the utilization of lecture, discussion, and demonstrations to the production lab on customer production projects. HP-1 items are traced on progress charts and the ASE-NATEF task list.

ABOD 201 Wheel Alignment & Measuring Systems

This theory/lab course covers tasks necessary to diagnose, repair and replace suspension and frame parts on today's high tech vehicles. The use of various measuring systems will be used in this course to perform proper repairs. Prerequisite: ABOD 200.

ABOD 202 Frame/Body & Structural Repairs

This theory/lab course covers tasks necessary to repair and replace frame, unibody, and structural parts on today's vehicles. Chainless anchoring, magna racks,

and floor pulling equipment will be used in this course. This course is co-scheduled with ABO

ABOD 203 Advanced Damage Analysis Lab I

This lab course will provide the student practical application in advanced repair methods. This will include frame, body, suspension, glass, refinishing, and related procedures. Tasks listed in this course are tracked on ASE-NATEF progress chart 70-1000c and NATEF task list (1993). Prerequisites: ABOD 100 level courses.

ABOD 204 Estimating & Job Costing

This theory/lab course covers school and shop safety rules, shop equipment, work habits and proper ethics, estimating vehicles involved in a collision to get an accurate repair cost and job costing each vehicle to show a profit or loss. Prerequisites: All ABOD 100 level courses.

ABOD 205 OEM, Trim, Shop Planning

This theory/lab course will cover how to use OEM (Original Equipment Manufacture) manuals to repair today's high tech vehicles. Auto trim and detailing explains how to add or remove vehicle accessories. A fieldwork project is assigned as an opportunity for students to observe and participate in daily body shop tasks. The course also includes designing a working shop plan that the student would like to own or work in. Prerequisites: All ABOD 100-level courses.

ABOD 206 Advanced Damage Analysis Lab II

This lab course will continue to provide the student practical application in advanced repair methods. This will include frame, body, suspension, glass, refinishing, and related procedures. Tasks listed in this course are tracked on ASE/NATEF progress chart 70-1000c and NATEF task list (1993). Prerequisites: ABOD 201, ABOD 202, ABOD 203.

ABOD 210 Advanced Painting

A lecture demonstration and application course in learning color control to apply and blend with existing color in spot painting. Factory representatives will also demonstrate the latest paints and painting techniques.

ABOD 216 Frame Straightening & Wheel Alignment

A lab course in which students are introduced to frame straightening equipment used to align damaged channel frames, installation of bumpers on vehicle, and setting caster, camber, and toe-in of modern car.

ABOD 220 Estimating & Industrial Management

Students are introduced to estimating, bidding, and using crash manuals by appraising jobs. Students also get practical experience in management by operating the storeroom and stock control room. Personal and public relations are also covered.

ABOD 251 Advanced Refinishing

A lecture, discussion, demonstration, and practical applications course that utilizes the paint products of two major paint manufacturers and the various systems used in the refinishing process. Complete refinishing, panel and partial refinishing, spot repair, blending and tinting are covered in depth, with practical applications on actual production projects. (Su or by arrangement)

ABOD 252 Advanced Unibody Repair/Measurement

A lecture, discussion, demonstration, and practical applications course designed to place major emphasis on the use of advanced measuring systems and measuring system techniques. This course involves the actual repair and restoration of damaged unibody vehicles to factory specifications. Wheel alignment is included as a part of the total vehicle alignment system. (Su or by arrangement)

ABOD 253 Automotive Trim & Upholstery

A lecture, discussion, demonstration and practical applications course in automotive and related trim and upholstery techniques. Students receive training in basic upholstering processes including sewing machine operation, maintenance, and repair; measuring, marking, and cutting covering materials; seat re-upholstering; trim panel repair; headliner recovering; carpet installation; vinyl top installation; convertible top replacement; window tinting and various other auto trim procedures. Procedures occur on actual production projects. (Su or by arrangement)

ABOD 254 Classic Restoration

A lecture, discussion, demonstration, and practical applications course involving the actual repair and restoration of classic, vintage, and special interest projects. The student is expected to make arrangements to provide a project for this course. Emphasis is on top quality repairs and refinishing to provide a showroom finished vehicle. (Su or by arrangement)

Automotive Technology

Prefix	Number	Course Title	BSC	LRSC	NDSCS	WSC
AUTO	103	Power Trains/Brakes			3	
AUTO	108	Mechanical & Shop Orientation	1			1
AUTO	111	Engine Fundamentals		6		
AUTO	112	Engine Overhaul		6		
AUTO	128	Automatic Transmissions & Transaxles	5			
AUTO	131	Clutches, Drivetrains & Axles	3			
AUTO	132	Manual Transmissions & Transaxles	3			
AUTO	133	Power Trains I			1	
AUTO	134	Power Trains II			1	
AUTO	143	Steering Suspension and Wheel Alignment			3	
AUTO	146	Suspension & Steering Theory				1
AUTO	147	Suspension & Steering Lab				4

Prefix	Number	Course Title	BSC	LRSC	NDSCS	WSC
AUTO	148	Suspension & Steering	4	4		
AUTO	151	Brake Fundamentals	2			
AUTO	152	Brake Repair	3			
AUTO	155	Brakes I			1	
AUTO	156	Brakes Theory				2
AUTO	157	Brakes Lab				6
AUTO	158	Brakes		4		
AUTO	161	Electronics	2	3	2	
AUTO	162	Electrical Systems		6		
AUTO	163	Starting & Charging Systems	3		3	
AUTO	164	Instruments & Accessory Systems	4			
AUTO	165	Automotive Electrical and Electronics			5	
AUTO	166	Electrical Theory				1
AUTO	167	Electrical Lab				2
AUTO	176	Heating & Air Conditioning Theory				1
AUTO	177	Heating & Air Conditioning Lab				3
AUTO	181	Fuel Systems		3		
AUTO	182	Computer Controls		3		
AUTO	186	Engine Performance I Theory				3
AUTO	187	Engine Performance I Lab				6
AUTO	188	Driveability Procedures I			5	
AUTO	206	Chassis Repair/Body Electrical Theory			3	
AUTO	208	Hybrid and Light Duty Diesel Systems		7		

Prefix	Number	Course Title	BSC	LRSC	NDSCS	WSC
AUTO	207	Chassis Repair/Body Electrical Lab			4	
AUTO	209	Advanced Chassis Repair/Body Electrical			4-8	
AUTO	211	Engine Fundamentals	4			
AUTO	212	Engine Repair	5			
AUTO	216	Engine Repair Theory			3	2.5
AUTO	217	AC-Heating Theory & Operations			4	6.5
AUTO	219	Advanced Engine Rebuilding			4-8	
AUTO	221	Automatic Transmission Fundamentals		4		
AUTO	222	Automatic Transmission Hydraulics Principles		4		
AUTO	226	Automatic Transmission/Transaxle Theory			3	2
AUTO	227	Automatic Transmission/Transaxle Lab			4	5
AUTO	229	Advanced Automotive Transmissions/Transaxles			4-8	
AUTO	231	Standard Transmission Theory				1
AUTO	232	Standard Transmission Lab				3
AUTO	234	Differential & Driveline Theory				1
AUTO	235	Differential & Driveline Lab				2
AUTO	238	Manual Drivelines		6		
AUTO	265	Advanced Automotive Electronics			2	
AUTO	271	Air Conditioning-Heating Theory & Operation	3			
AUTO	272	AC-Heating Diagnosis & Service	3			
AUTO	278	Heating & Air Conditioning		3		
AUTO	282	Ignition Systems	5			
AUTO	283	Fuel Delivery Systems	6			

Prefix	Number	Course Title	BSC	LRSC	NDSCS	WSC
AUTO	284	Emission Control Systems	4			
AUTO	285	Light Duty Trucks			2	
AUTO	286	Driveability Procedures Theory			3	
AUTO	287	Driveability Procedures Lab			4	
AUTO	288	Engine Performance II		6		5
AUTO	289	Electronic & Computer Systems			4-8	

AUTO 103 Power Trains/Brakes

Lecture, demonstration, and performance type course that covers the theory of operation, diagnosing procedures and service procedures of the chassis mechanical systems. The student will disassemble, inspect, reassemble, and adjust the following units according to the manufacturer's specification: drum and disc brakes, universal joints, differentials, clutches, standard transmissions, and standard transaxles. Emphasis is placed on proper test procedures and the use of specialty tools.

AUTO 108 Mechanical & Shop Orientation

A course in safety and shop procedures applied specifically to the automotive field. Students will become familiar with safety equipment, hoists, and shop operating procedures. Included are hazardous waste handling, disposal, and use of material safety data sheets.

AUTO 111 Engine Fundamentals

Introduction to fundamentals of automotive engines, engine principles, engine measurements, types of engine design, basic engine construction, cylinder heads and valves, lubrication systems, and engine cooling systems.

AUTO 112 Engine Overhaul

Diagnosis, removal from chassis, disassembly, cleaning, and inspecting components for possible future failure; cleanliness and attention to detail highly emphasized; all aspects of major overhaul demonstrated, including reconditioning and proper reassembly according to manufacturers' specifications; practice, including cylinder head service, piston ring and cylinder preparation, camshaft installation, connecting rod and main bearing installation, methods for checking clearances, and proper torquing of bolts.

AUTO 128 Automatic Transmissions & Transaxles

Concentrates on study of basic principles of operation in automatic transmission hydraulic control systems, planetary gear systems, and torque converters through classroom lecture and demonstration. The diagnosis of problems and methods of repair are actual hands-on projects in the shop on live vehicles and trainers.

AUTO 131 Clutches, Drivetrains & Axles

Concentrates on a study of the mechanical transmission of torque through clutches, gear boxes, drive lines and front driving axles.

AUTO 132 Manual Transmissions & Transaxles

Concentrates on the transmission of torque through manual transmissions and transaxles. Course content includes a study of bearing and gear types.

AUTO 133 Power Trains I

An applied automotive course intended for the student who are interested in pursuing a career in automotive technology or related fields. This course is a lecture, demonstration and performance course that covers the basic mechanical principles and fundamentals of operation, disassembly, and adjustment procedures of the following components: Manual Transmissions, Transaxles, and clutches.

AUTO 134 Power Trains II

An applied automotive course intended for the student who are interested in pursuing a career in automotive technology or related fields. This course is a lecture, demonstration and performance course that covers the basic mechanical principles and fundamentals of operation, disassembly, and adjustment procedures of the following components: differentials, drive shafts, CV shafts, and transfer cases. This course is offered as a dual credit option for high school students that have completed an equivalent Final Drives & Transfer Cases Course in a certified program.

AUTO 143 Steering Suspension and Wheel Alignment

Lecture, demonstration, and performance type course covering steering gears, power steering pumps, steering linkage, suspension systems, two- and four-wheel alignment, and wheel balancing. Included in the course is the study of the operation, construction difference, diagnosing, and repair procedures of the steering, suspension, and wheel alignment systems.

AUTO 146 Suspension & Steering Theory

Introduction to the theory of steering geometry, front and rear suspension systems, two and four wheel procedures, manual and power steering gears, power steering pumps, rack and pinion units; factory specifications and procedures stressed.

AUTO 147 Suspension & Steering Lab

All types of steering units disassembled, inspected, reassembled, and adjusted according to manufacturer's specifications; alignment and wheel balance operations performed and practiced.

AUTO 148 Suspension & Steering

Demonstration and performance type course covering steering gears, power steering pumps, steering, linkage, suspension systems, two- and four-wheel alignment, and wheel balancing. Included in the course is the study of the operation, construction differences, diagnosing, and repair procedures of the steering, suspension, and wheel alignment systems.

AUTO 151 Brake Fundamentals

The study of automotive braking system and theory and operation. Included are hydraulic fundamentals, brake system construction, and anti-lock brake system fundamentals. The course consists of classroom theory, demonstration, and lab application.

AUTO 152 Brake Repair

A study of brake components, application, testing and repair.

AUTO 155 Brakes I

An applied automotive course intended for the student who are interested in pursuing a career in automotive technology or related fields. This course is a lecture, demonstration and performance course that covers the principles of operation, disassembly, and adjustment procedures of the following components: brake system hydraulics, boost systems, drum, and disc brake systems. This course is offered as a dual credit option for high school students that have completed an equivalent brakes course in a certified program.

AUTO 156 Brakes Theory

Introduction to brake hydraulics, operation of brake systems (drum and disc), power assist units, anti-skid and anti-lock systems, related electrical and wiring circuits; factory specifications and procedures stressed.

AUTO 157 Brakes Lab

Practical application of the theory of brake systems (hydraulic, mechanical, and electrical-ABS); diagnosis and repair in accordance with established rules and safety standards.

AUTO 158 Brakes

Introduction to brake hydraulics, operation of brake systems (drum and disc, power assist units, anti-skid and anti-lock systems, related electrical and wiring circuits) factory specifications and procedures stressed. Practical application of the theory of brake systems (hydraulic, mechanical and electrical-ABS) diagnosis and repair in accordance with established rules and safety standards.

AUTO 161 Electronics

A course in basic electronics designed to prepare the student for advanced training in diagnosis and repair of current automobile electronic and microprocessor-controlled vehicle electrical systems and future multiple-microprocessor-controlled vehicle systems.

AUTO 162 Electrical Systems

A course in electrical systems designed to teach theory and fundamentals of electricity and electronics as it applies to the modern automobile. Includes cleaning, servicing, and testing batteries. Testing, diagnose, repair, starting, charging, and ignition systems.

AUTO 163 Starting & Charging Systems

The theory of operation for batteries, starting motor system, and charging systems are covered. An in-depth review of types of components, their construction and how they are tested is done using bench units and live cars. Extensive use of manuals, test equipment and proper tools are stressed for doing proper service, repair, and replacement of system components.

AUTO 164 Instruments & Accessory Systems

This course will familiarize the student with the lighting systems used on today's automobiles. It will introduce the major manufacturers use of different types of instrumentation systems and their operation. The use of power accessory systems and component interrelationship, testing procedures and service procedures

to maintain operation to specification are dealt with. Extensive use of manuals and test equipment are needed.

AUTO 165 Automotive Electrical and Electronics

This is a lecture, demonstration, and performance type course covering the basic fundamentals of electricity and electronics. Included in this course is the study of Ohm's law, series and parallel circuits, test instruments, and various semiconductors. Also included is the study of electrical symbols and wiring diagrams of accessory circuits as found in manufactures service manuals. Also included is the study of design and operation of charging and cranking systems. Included in the course is the study of the operation, control, diagnosing, and repairing of these systems. Emphasis is placed on the proper use of test instruments and special tools used to test and service the system involved.

AUTO 166 Electrical Theory

Introduction to theory of electricity and its uses; operation of the charging, starting, ignition, lighting, and wiring systems.

AUTO 167 Electrical Lab

Starters, alternators and distributors diagnosed, disassembled, inspected, repaired, properly reassembled, and tested; practical wiring performed on mock and live units; engine tune-up; use of engine analyzers in diagnosing engine performance.

AUTO 176 Heating & Air Conditioning Theory

Introduction to theory of air conditioning and heating systems, controls; safety in recovering, recycling, and handling of refrigerants stressed; special emphasis on governmental regulations as to handling materials.

AUTO 177 Heating & Air Conditioning Lab

Practical application of theories and practices in testing and repairing vehicle heating and air conditioning systems; special attention given to governmental regulations as the handling materials.

AUTO 181 Fuel Systems

Theory, construction, principles of operation, new developments, and reconditioning of carburetors, manifold controls, PVC systems, supercharger, and governors. Computer controlled fuel injection, air injection, exhaust gas circulation, 3-way catalytic converter, and exhaust system.

AUTO 182 Computer Controls

To provide the student with a general description of the computer system and its features. Identify fuel delivery systems and their operations, learn the inputs and outputs of the system, learn how the sensors and electronic signals are sent to the control module to control fuel timing and emissions, learn to diagnose these systems using built-in self-tests, special tools, and service codes and code charts.

AUTO 186 Engine Performance I Theory

Introduction to fundamentals of fuel supply systems, carburetion, electronically controlled carburetors, fuel injection (gas & diesel), emission control systems, air supply, exhaust systems, and engine tune-up. Introduction to computerized engine controls as applied in the modern automobile. Factory and governmental regulations explained and strictly adhered to.

AUTO 187 Engine Performance I Lab

Diagnosis and repair of carbureted systems, gas and diesel fuel injection systems; engine tune-up; diagnosis and repair of computerized engine control systems with the use of diagnostic scan tools, oscilloscopes, and gas analyzers; factory specifications and procedures demonstrated and strictly adhered to.

AUTO 188 Driveability Procedures I

A lecture, demonstration and performance type course covering fuel systems from fuel tank to the delivery system of the engine. Also covered is the operation of the ignition systems, emission control systems and scan tool basics. Emphasis is placed on proper usage of tools and procedures in diagnosing the systems.

AUTO 206 Chassis Repair/Body Electrical Theory

A lecture and discussion class covering the operation, diagnosing, and servicing of the chassis mechanical and electrical systems. The systems covered are antilock braking, four-wheel alignment, air suspension systems, variable rate power steering systems, supplemental restraint systems, anti-theft systems, electronic instrumentation, and other chassis related systems. The course will begin with a review of the fundamentals of these systems and lead to how the systems operate on the vehicle.

AUTO 208 Hybrid and Light Duty Diesel Systems

Theory, construction, principles of operation, diagnosis, and repair of hybrid and light duty diesel vehicles. Strong emphasis on safety measures and diagnosis of computer-controlled fuel and emission systems.

AUTO 207 Chassis Repair/Body Electrical Lab

A production lab class where the student works on customer-owned vehicles. The students are in charge of writing repair orders, diagnosing customer problems, repair of the vehicle, and figuring time of the individual labor charges for the services they performed. Lab work will be performed on the following units: brake, alignment, suspension components, electrical accessories, instrumentation, air conditioning, standard transmission, clutch, differential, and many other areas which pertain to the chassis. This is a 1/2 semester course offered both fall and spring semesters.

AUTO 209 Advanced Chassis Repair/Body Electrical

An advanced course in diagnosing, testing, and repairing the following: Differentials, clutches, standard transmissions, drive-shafts, brakes, front end service, wheel alignment and body electrical components.

AUTO 211 Engine Fundamentals

A course in gasoline engine theory and basic diagnosis. Common mechanical engine problems and diagnostic techniques are covered in the classroom and lab. Students will learn the proper use of measuring tools and fastener methods so critical to engine repair work as well as all automotive work.

AUTO 212 Engine Repair

Class and laboratory practice devoted to disassembly and assembly of automotive engines. This will include measuring and fitting components such as bearings, pistons, and rings. Cylinder head reconditioning work will include guide repair, valve, and seat machining operations.

AUTO 216 Engine Repair Theory

The advanced theory of complete engine rebuilding. Topics covered are proper removal, installation, cleaning, valve grinding, cylinder head servicing, pin fitting,

cylinder boring, sleeve installation, engine bearings, hydraulic lifters, camshaft servicing, cooling, oiling systems, and engine noises.

AUTO 217 AC-Heating Theory & Operations

Involves production work on automobiles which are brought into the shop for engine work. Students perform all types of engine work using the latest rebuilding equipment.

AUTO 219 Advanced Engine Rebuilding

An advanced course in engine rebuilding including cylinder boring, complete cylinder head service, camshaft degreasing, and other related areas.

AUTO 221 Automatic Transmission Fundamentals

Introduction to automatic transmissions and transaxles. Includes basic principles of torque converter construction and operation, planetary gearset construction and power flow.

AUTO 222 Automatic Transmission Hydraulics Principles

Course in hydraulic fundamentals, pump construction and operation, control valve body construction and operation, and automatic transmission fluid service principles.

AUTO 226 Automatic Transmission/Transaxle Theory

Introduction to operation of automatic transmissions and transaxles. Studied are fluid couplings, torque converters, planetary gear systems, hydraulic and electrical controls, oil circuits, valve body assemblies, linkage and band adjustments, pressure checks, diagnosis, and transmission problems.

AUTO 227 Automatic Transmission/Transaxle Lab

Course where units are inspected, assembled, and adjusted according to manufacturer's procedures and specifications, then checked on an automatic transmission tester. These principles of operation are applied by servicing customer-owned vehicles.

AUTO 229 Advanced Automotive Transmissions/Transaxles

An advanced course in automatic transmission/transaxles service, including overhaul procedures, and hydraulic and electrical diagnosis procedures. Computer operated lockup clutches will be diagnosed using volt/ohmmeters, L.E.D. test lights and scan tools. Diagnosis and repair will be performed on current model vehicles with transmission/transaxles being tested on a trans-tester.

AUTO 231 Standard Transmission Theory

Introduction to operation of clutches, standard transmissions, transaxles, and transfer cases.

AUTO 232 Standard Transmission Lab

Maintenance, disassembly, inspection, reassembly, and adjustment according to manufacturers' specifications of different types of standard transmissions, transfer cases, and transaxles.

AUTO 234 Differential & Driveline Theory

Introduction to operation of differentials, final drives, constant velocity joints, standard universal joints, 4-wheel drive lockout front axles.

AUTO 235 Differential & Driveline Lab

Practical application in maintenance, diagnosis, disassembly, inspection, reassembly, and adjustment according to manufacturers' specifications of the different types of differentials, final drives, constant velocity joints, 4-wheel drive lockout front axles.

AUTO 238 Manual Drivelines

Theory, construction principles of operation, overhaul of clutches, standard transmissions, differentials, axles, overdrives, transaxles, and transfer cases.

AUTO 265 Advanced Automotive Electronics

An applied automotive electronics course intended for the student who is pursuing a career in automotive technology. Areas of study include the operation and testing of engine control and body computers, input sensors, output actuators, plus the associated diagnostic procedures and test instruments used to troubleshoot the various electronic systems.

AUTO 271 Air Conditioning-Heating Theory & Operation

Course will familiarize the student with terms, how heat is transferred, pressure-temperature relationships, system components, and how they operate to provide heat or cooling. Extensive use of manuals is needed to understand the varied methods used by the industry in today's automobiles.

AUTO 272 AC-Heating Diagnosis & Service

Course will familiarize the student with the safe handling of coolants and refrigerants. An in-depth use of special tools and testing equipment is used in the servicing of both the systems and the components.

AUTO 278 Heating & Air Conditioning

A course on air conditioning designed to enable the student to understand the theory of heat transfer, systems operation in controls, servicing systems, diagnosis of automotive and farm equipment, and automatic temperature control systems.

AUTO 282 Ignition Systems

Course is the study of the types of ignition systems in use by major automotive manufacturers. Theory and lab classes will cover operation and service procedures, including the use of basic and specialized test equipment.

AUTO 283 Fuel Delivery Systems

Course consisting of theory, diagnosis, and repair of basic fuel delivery systems. These systems will include various types of gasoline fuel injection and carburation.

AUTO 284 Emission Control Systems

Course consisting of theory, diagnosis and repair of emission control systems used on automotive gasoline engines. Systems covered will include evaporative, crankcase, and exhaust emission controls.

AUTO 285 Light Duty Trucks

A lecture, discussion class covering the operational principals of the light duty diesel vehicles used in the passenger vehicle market. A study of diesel fuels, fuel delivery systems, diesel fuel injectors, exhaust emissions systems, air delivery, and diagnostic checks, using scan tools and fuel pressure test equipment to diagnose system failures.

AUTO 286 Driveability Procedures Theory

Covers the operation and testing of the following: emission controls, ignition systems, feedback carburetion, throttle body injection, and port fuel injection on domestic and foreign passenger vehicles. The student will be instructed in using diagnostic equipment used in testing the various vehicles.

AUTO 287 Driveability Procedures Lab

Work is similar to that of a production shop. Minor and major tune-ups, electrical systems and troubleshooting. Use of oscilloscopes, voltmeters, distributor testers, battery testers, portable tune-up equipment and diagnosing computer problems.

AUTO 288 Engine Performance II

Theory, construction, operation and new development in the tune-up electronics and emission control areas, including the use of the most modern special tools and test equipment available.

AUTO 289 Electronic & Computer Systems

An advanced automotive electronics course emphasizing the diagnosis and repair of the computerized systems currently found in the automotive industry. The course offers extensive training in the various electronic ignition, fuel injection, emission, electronic instrumentation, and other electronic control devices now being used by most automobile manufacturers.

Caterpillar Technology

Prefix	Number	Course Title	NDSCS
DCAT	110	Caterpillar Engine Fundamentals	4
DCAT	111	Introduction to Caterpillar Service	2
DCAT	112	Fundamentals of Hydraulics	3
DCAT	113	Caterpillar Fuel Systems	3
DCAT	114	Fundamentals of Electricity	3
DCAT	115	Air Conditioning	2
DCAT	116	Fundamentals of Transmission and Torque Converters	3
DCAT	117	Machine Hydraulic Systems	3

Prefix	Number	Course Title	NDSCS
DCAT	150	Internship I	4
DCAT	151	Internship II	4
DCAT	200	Undercarriage/Final Drives	3
DCAT	201	Machine Electronic Systems	3
DCAT	202	Engine Performance	2
DCAT	203	Diagnostic Testing	2
DCAT	204	Machine Specific Systems	3
DCAT	250	Internship III	4
DCAT	251	Internship IV	4

DCAT 110 Caterpillar Engine Fundamentals

A theory and lab course covering engine operating principles, cylinder and piston service, valve service, crankshaft and bearing service, lubrication systems, rebuilding procedures and measurement fundamentals on Caterpillar Engines. Caterpillar engines are used for lab disassembly and assembly.

DCAT 111 Introduction to Caterpillar Service

This course introduces the student to the Caterpillar organization history and the different parts of the company. Instruction and lab experiences in the shop include safety, shop operation and a major emphasis on how to obtain information using CAT Specific Software Systems.

DCAT 112 Fundamentals of Hydraulics

A theory and lab course designed to teach the basic hydraulic fundamentals. Identification and function of the various components used in Caterpillar Hydraulic Systems, will include vane pumps, gear pumps and piston pumps. ISO hydraulic symbol identification and tracing oil flows used in Caterpillar Hydraulic Systems. Lab exercises include disassembly and assembly of Caterpillar Hydraulic Components.

DCAT 113 Caterpillar Fuel Systems

A lab lecture course introducing the student to fuel systems used on Caterpillar Engines. Combustion chamber design, injectors and injection pumps are covered in this class. Also covered are diagnosing faults in fuel injection and combustion systems. Lab exercises include disassembly and assembly of fuel components used in Caterpillar Fuel Systems.

DCAT 114 Fundamentals of Electricity

A lecture/lab course that introduces the student to basic electrical and electronic fundamentals needed by a technician to properly diagnose and repair the complex electrical systems installed on Caterpillar Machines.

Included is the study of Ohm's law.

DCAT 115 Air Conditioning

A lecture, discussion and lab-type course covering the basic theory and operating principles of air-conditioning systems as they relate to Caterpillar equipment. Lab exercises consist of leak detecting, evacuation, reclaiming, charging, component repair and use of test equipment to diagnose and repair malfunctions.

DCAT 116 Fundamentals of Transmission and Torque Converters

A lecture/lab course that covers the various transmissions, torque converters and differentials used in Caterpillar Equipment. This course also covers constant mesh, sliding gear, hydrostatic synchromesh, and power shift transmissions involving planetaries. At the completion of this course, the student will have working knowledge of basic power train theory.

DCAT 117 Machine Hydraulic Systems

A lecture/lab course designed for inspecting, testing, servicing, and diagnosing Caterpillar Hydraulic Systems and components. Students will conduct testing and adjusting procedures on Caterpillar Equipment, utilizing Caterpillar Service Procedures and Test Equipment.

DCAT 150 Internship I

This supervised experience is required of students enrolled in the Caterpillar Dealer Service Technology curriculum. Placement experience is obtained through the cooperation of a CAT Dealer. Students needs and objectives determine major emphasis.

DCAT 151 Internship II

This supervised experience is required of students enrolled in the Caterpillar Dealer Service Technology curriculum. Placement experience is obtained through the cooperation of a CAT Dealer. Students needs and objectives determine major emphasis.

DCAT 200 Undercarriage/Final Drives

A lecture/lab course that introduces the student to undercarriage and drive systems used on the many different types of Caterpillar track machines. Also covered are final drives and braking systems used in Caterpillar Track and Wheel Equipment. This course is a continuation of DCAT 116 Fundamentals of transmissions and torque converters.

DCAT 201 Machine Electronic Systems

A lecture/lab course that covers the electronic systems used on Caterpillar Equipment. This course provides the background needed to diagnose and repair the electronics and computerized circuits found on Caterpillar Equipment and Engines. Basic electronic concepts, component function and system operation are covered. Caterpillar's procedures are taught to identify malfunctions and to test the system properly.

DCAT 202 Engine Performance

A lecture/lab course that teaches the skills necessary to make CAT Engines run at peak performance. The student will be provided with a thorough understanding of the necessary diagnostic skills required for trouble shooting Caterpillar Engines and Fuel Systems. Emphasis will be placed upon knowledge and skills necessary to assure product reliability and performance.

DCAT 203 Diagnostic Testing

A lecture/lab course that studies the practical use of diagnosing Caterpillar Products using the proper test equipment. System testing on the various Caterpillar Equipment will cover such areas as Engines, Hydraulics, Transmissions, Electro-Hydraulics and Implement System Control. The student will utilize ET and Data View systems for diagnostic testing.

DCAT 204 Machine Specific Systems

This course is designed to expose the student to different types of specialty equipment used for various operations, utilizing CAT equipment. Testing and adjustment of this equipment will also be covered as per Caterpillar Service procedures.

DCAT 250 Internship III

This supervised experience is required of students enrolled in the Caterpillar Dealer Service Technology curriculum. Placement experience is obtained through the cooperation of a CAT Dealer. Students needs and objectives determine major emphasis.

DCAT 251 Internship IV

This supervised experience is required of students enrolled in the Caterpillar Dealer Service Technology curriculum. Placement experience is obtained through the cooperation of a CAT Dealer. Students needs and objectives determine major emphasis.

Diesel Technology

Prefix	Number	Course Title	LRSC	NDSCS	WSC
DTEC	106	Drive Lines Theory			2.5
DTEC	107	Drive Lines Lab			3.5
DTEC	112	Intro to Diesel Engines		3	
DTEC	115	Introduction to Light & Medium Duty Engines		4	
DTEC	123	Diesel Electrical Systems	2		
DTEC	125	Hydraulic Systems	4		
DTEC	126	Clutch Theory			2.5
DTEC	127	Clutch Lab			3.5
DTEC	136	Brake Theory		2	1.5
DTEC	137	Brake Lab		2	2.5
DTEC	145	DT Alignment/Brakes		4	

Prefix	Number	Course Title	LRSC	NDSCS	WSC
DTEC	146	Suspension Theory			1
DTEC	147	Suspension Lab			1
DTEC	155	Electricity for Diesel Technology		4	
DTEC	156	Electrical Theory			2.5
DTEC	157	Electrical Lab			3.5
DTEC	215	Heavy Duty Diesel Engines		7	
DTEC	216	Diesel Engines Theory			5.5
DTEC	217	Diesel Engines Lab			8.5
DTEC	220	Power Trains			.5
DTEC	225	Heavy Duty Drive Systems	5	7	
DTEC	251	Advanced Hydraulic Systems		3-10	
DTEC	252	Advanced Heavy-Duty Engine Rebuild	9		
DTEC	255	Heavy Duty Chassis Electrical Systems	8	7	
DTEC	266	Hydraulics Theory			2.5
DTEC	267	Hydraulics Lab			3.5
DTEC	276	Electronic Diesel Theory			2.5
DTEC	277	Electronic Diesel Lab			3.5

DTEC 106 Drive Lines Theory

Introduction to the fundamentals and operation of drivelines and differentials used in light and heavy-duty trucks, agricultural equipment, and heavy equipment.

DTEC 107 Drive Lines Lab

Maintenance, disassembly, inspection, reassembly, and adjustments according to manufacturers' specifications of various drivelines and differentials used in light and heavy-duty trucks, agricultural equipment, and heavy equipment.

DTEC 112 Intro to Diesel Engines

A study of various diesel engines used in agricultural equipment. Engine disassembly is performed, and basic parts operation and service are explained.

Troubleshooting and tune-up procedures are performed on the different engine designs.

DTEC 115 Introduction to Light & Medium Duty Engines

A theory and lab course covering rebuilding of Heavy-Duty Gas and Light & Medium Duty Diesel Engines. Students will disassemble, rebuild, and assemble an engine during this class. Topics covered are measurement fundamentals, basic engine operating principals, cylinder and piston service, cylinder head rebuilding & valve reconditioning, crankshaft and bearing service, lubrication, and cooling systems. Alternative fuels such as LPG and basic engine trouble shooting are also covered. This class is a prerequisite for DTEC 215, DTEC 112 and JDAT 215. This is a 9-week course. It is offered the first and second nine weeks of both semesters.

DTEC 123 Diesel Electrical Systems

Introduction to the technical fundamentals of electricity and magnetism. This course is designed to give the student the background and working knowledge of the electrical circuit and its components which are necessary for assembly on internal combustion equipment. It covers the battery, capacitor, generator and/or alternator, regulator, cranking motor, relays; the tools and instruments required to test and service the electrical system of an internal combustion powered piece of equipment or vehicle.

DTEC 125 Hydraulic Systems

A course designed to acquaint the student with basic hydraulic laws and formulas. Properties of hydraulic oil, pump operating principles, control devices, cylinders, tubing heat exchangers, hydraulic motors, testing and servicing are included.

DTEC 126 Clutch Theory

Introduction to the fundamentals and operations of clutches and transmissions used in light and heavy duty trucks, agricultural equipment, and heavy equipment.

DTEC 127 Clutch Lab

Maintenance, disassembly, inspection, reassembly and adjustment according to manufacturers' specifications of various clutches and transmissions used in light and heavy duty trucks, agricultural equipment, and heavy equipment.

DTEC 136 Brake Theory

Introduction to the fundamentals and operation of brake systems. Operation of hydraulic brake systems, including agricultural brake systems, air brake systems and anti-lock brake systems.

DTEC 137 Brake Lab

Practical application of the theory of hydraulic, air, and mechanical brakes. Diagnosis and repair in accordance with established rules and safety standards.

DTEC 145 DT Alignment/Brakes

A lecture and lab type course which provides the student with theory and hands-on operation and repair of computerized heavy duty truck front end alignment. Medium and heavy truck suspension, steering and breaking systems. DOT Safety Inspection is also covered in this course. This is a nine-week course.

DTEC 146 Suspension Theory

Introduction to the theory of steering geometry, front and rear suspension systems, wheel alignment procedures, manual and power steering gear systems. Factory specifications and procedures are stressed.

DTEC 147 Suspension Lab

Manual and power steering units disassembled, inspected, and reassembled according to manufacturers' specifications. Leaf spring systems, king pins and bushings, removal, inspection, and reinstallation according to manufacturers' specifications. Alignment

DTEC 155 Electricity for Diesel Technology

An introductory lab/theory class in electrical fundamentals. A practical approach to the study of electricity including Ohm's Law, power, series, and parallel circuits, direct and alternating current, with strong emphasis on diagrams and troubleshooting. T

DTEC 156 Electrical Theory

Introduction to the theory of electricity and its uses in automobile, light and heavy-duty trucks, agricultural, and industrial equipment; Operation of charging and starting systems. Reading and use of wiring diagrams when troubleshooting electrical systems.

DTEC 157 Electrical Lab

Starters and alternators diagnosed, disassembled, inspected, repaired, and properly reassembled and tested. Practical use of wiring diagrams and proper use of meters used in troubleshooting electrical systems.

DTEC 215 Heavy Duty Diesel Engines

A lecture and lab type course of current heavy-duty diesel engines. Students gain knowledge in operation, troubleshooting, rebuilding, and tuning all types of diesel engines. Work includes disassembly, dynamometer testing, injection timing and adjustment common to diesel engines used in the agricultural, transportation and industrial industries. This is a nine-week course.

DTEC 216 Diesel Engines Theory

Introduction to fundamentals of diesel engines and diesel fuel systems; engine principles, fuel system principles, engine measuring, types of engine designs, types of fuel system designs, basic engine construction, cylinder heads and valves, lubrication systems, and cooling systems.

DTEC 217 Diesel Engines Lab

Diagnosis, removal from chassis, disassembly, cleaning, and inspecting components for possible future failure; cleanliness and attention to detail emphasized; all aspects of major overhaul demonstrated, including reconditioning and proper reassembly according to manufacturers' specifications; practice including fuel systems, cylinder head service, piston ring and cylinder preparation, camshaft installation, connecting rod and main bearing installation, methods for checking clearances, and proper torquing of bolts.

DTEC 220 Power Trains

Review trouble shooting, repairing, and adjusting all aspects of the drivetrain.

DTEC 225 Heavy Duty Drive Systems

A lecture and lab type course which provides the student with theory and hands-on operation and repair of the latest types of heavy duty drive systems that the agricultural, transportation, and industrial industries use on their equipment.

DTEC 251 Advanced Hydraulic Systems

A lab/lecture course covering agricultural and industrial hydraulic systems commonly found in the mobile industry. Prerequisites exist.

DTEC 252 Advanced Heavy-Duty Engine Rebuild

An independent study course covering the latest overhaul procedures on agricultural and industrial engines.

DTEC 255 Heavy Duty Chassis Electrical Systems

A lecture and lab type course covering the theory of operation, repair, and diagnostic procedures used on heavy duty truck and tractor electrical systems, electronic engines, and transmissions. This is a nine-week course.

DTEC 266 Hydraulics Theory

Principles and operation of various hydraulic systems and system components; hydrostatic drives.

DTEC 267 Hydraulics Lab

Practical experience testing, diagnosing, and rebuilding hydraulic systems and their components.

DTEC 276 Electronic Diesel Theory

Introduction to computers and their sensors as applied in modern diesel engines. Introduction to the fundamentals of the computerized fuel systems components. Prerequisites: DTEC 156 and 216.

DTEC 277 Electronic Diesel Lab

Practical application in diagnosing with modern diagnostic equipment on vehicles with onboard computers; proper procedures in testing, repairing, and replacing components stressed.

John Deere Ag Sales

Prefix	Number	Course Title	NDSCS
JDAS	110	John Deere Technologies	4
JDAS	112	John Deere Systems	2
JDAS	115	John Deere Nomenclature	3
JDAS	174	John Deere Presentation Sales and Finance	3

JDAS 110 John Deere Technologies

This course introduces John Deere parts microfiche and reference manuals. Additionally, John Deere merchandising sales manuals, bearing guides, seal guides, parts marketing guides, and all other available cross reference information or manuals will be covered. The student will continue to learn nomenclature through the process of using microfiche and reference manuals. Information contained on the special microfiche regarding materials and safety data will also be discussed.

JDAS 112 John Deere Systems

This course is designed to provide identification of components, and functions of JD Drive Systems. Includes, but not limited to Electrical, Hydraulics, Engines, Air Conditioning and Fuel Systems.

JDAS 115 John Deere Nomenclature

This course focuses on the function, composition, life expectancy, and nomenclature of commonly requested John Deere parts. This course begins with identification of the various types of John Deere equipment. The student will learn the function and operation of tractors and commonly used tillage, hay, planting, and harvesting equipment. The student will also identify parts on this equipment as well as the relationship of components on these machines.

JDAS 174 John Deere Presentation Sales and Finance

This course is designed to introduce the student to sales presentation and financing tools needed by a John Deere Ag Salesperson in today's competitive marketplace. Presentation tools include web site creation, word processing, publishing, and presentation software. Financing tools include using John Deere Financing and Credit materials. An understanding of the financial and credit procedures required by John Deere are included.

John Deere Ag Tech

Prefix	Number	Course Title	NDSCS
JDAT	105	Supervised Occupational Experience I	2
JDAT	106	John Deere Time Service Management	2
JDAT	110	Supervised Occupational Experience II	5
JDAT	114	Supervised Occupational Experience III	4
JDAT	116	John Deere Equipment Operation and Adjustment	4
JDAT	215	John Deere Engine Rebuild	6
JDAT	225	John Deere Powertrains	7
JDAT	255	John Deere Electrical/Electronics	5
JDAT	265	John Deere Tractor Hydraulic Systems Diagnosis	5

JDAT 105 Supervised Occupational Experience I

The student will receive on-the-job experience at a John Deere dealership prior to the first semester on-campus classes. This will mainly consist of shadowing personnel in the three areas of the service department. Two weeks will be spent in the set-up area, two weeks in the combine area and two weeks in the tractor area. This work experience will be supervised by the North Dakota State College of Science John Deere Ag Tech Coordinator.

JDAT 106 John Deere Time Service Management

This course will cover operational policies followed by a typical dealership service department. Included will be Time Service Management, Publication, Tech Manuals, and DTAC.

JDAT 110 Supervised Occupational Experience II

The student will receive on-the-job experience in a John Deere dealership. This will allow the student to practice and utilize the skills and knowledge learned during the previous on-campus instructional period. This work experience will be supervised by the North Dakota State College of Science John Deere Ag Tech Coordinator.

JDAT 114 Supervised Occupational Experience III

The student will receive on-the-job experience in a John Deere dealership. This will allow the student to practice and utilize the skills and knowledge learned during the previous on-campus instructional period. This work experience will be supervised by the North Dakota State College of Science John Deere Ag Tech Coordinator.

JDAT 116 John Deere Equipment Operation and Adjustment

This course will cover the operation and adjustment of various types of John Deere equipment. Students will operate and field adjust this equipment for optimum performance.

JDAT 215 John Deere Engine Rebuild

A lab/lecture course covering diesel engines used in John Deere equipment. Students will disassemble, reassemble, adjust, and test these engines. The proper use of technical manuals will be stressed.

JDAT 225 John Deere Powertrains

A lab/lecture course covering the power train used in John Deere tractors. Students will disassemble, reassemble, adjust, and test these components. Proper use of technical manuals will be stressed.

JDAT 255 John Deere Electrical/Electronics

A lab/lecture course covering electrical and electronic fundamentals applied to John Deere equipment. This course includes the study of Ohm's Law and series and parallel circuits. The proper use of digital multimeters and other testing equipment will also be covered. Techniques of circuit diagnosis will be demonstrated with electrical schematics. The function, operation and testing of semiconductors and transistors are covered. Microprocessors operation, including inputs and outputs, are explained, and studied. Tractor circuits including lighting, accessory, safety, instrumentation, and gauges are tested. Electronic monitoring systems for planting and harvesting equipment are covered.

JDAT 265 John Deere Tractor Hydraulic Systems Diagnosis

A lab/lecture course covering the operation, testing, diagnosis, and repair of the hydraulic systems found on John Deere utility, row crop, and four-wheel drive tractors.

Manufacturing Technologies

Prefix	Number	Course Title	NDSCS
MFGT	120	Basic Welding I	1

MFGT 120 Basic Welding I

Basic training in Oxy-Acetylene Welding (OAW) and Cutting, Shielded Metal Arc Welding (SMAW), and Gas Metal Arc Welding (GMAW). Equipment, safety, and the common joints are covered. Lecture and shop instruction stress the application of welding techniques and processes used to repair and fabricate parts in any of the trade/technical areas. Welding fuels, gasses, electric current, electrodes, and their applications are introduced.

Process Plant Technology

Prefix	Number	Course Title	BSC
PROP	235	Hydrocarbon Chemistry	3
PROP	237	Distillation Refinery Operations	4
PROP	239	Gas Conversion	3

PROP 235 Hydrocarbon Chemistry

Chemistry studies as related to hydrocarbon processes in the gasification, refinery, and fermentation fields.

PROP 237 Distillation Refinery Operations

Study of distillation and gasification cycle and principles as well as discussion of the necessary lab tests and their interpretation.

PROP 239 Gas Conversion

Study of the gas conversion systems in the field of gas processing.

Recreational Engines Tech

Prefix	Number	Course Title	NDSCS
RET	101	Outdoor Power Equipment Theory	4
RET	102	Snowmobile Theory I	3

Prefix	Number	Course Title	NDSCS
RET	103	Snowmobile Theory II	3
RET	104	Motorcycle and Marine Theory	5
RET	111	Outdoor Power Equipment Lab	2
RET	112	Snowmobile Lab I	2
RET	113	Snowmobile Lab II	2
RET	114	Motorcycle and Marine Lab	2
RET	115	Motorcycle Rider Course	1
RET	201	Motorcycle Theory II	3
RET	202	Outboard Theory II	4
RET	203	Stern Drive Theory	4
RET	211	Motorcycle Lab II	5
RET	212	Outboard Lab II	2
RET	213	Stern Drive Lab	2
RET	222	Motorcycle Electronics Systems	3

RET 101 Outdoor Power Equipment Theory

A theory course covering basic tools and service equipment, operating principles, and construction of four-cycle engines. Instruction includes tune-up and service procedures for lawn and garden equipment. This is a 9 week course offered the first 9 weeks of the fall semester.

RET 102 Snowmobile Theory I

A theory course covering two stroke operating principles as well as complete service and troubleshooting of the engine and its accessory systems. Discussion will cover engine diagnostic and overhaul procedures, as well as related items. This is a 9 week course offered the second 9 weeks of the fall semester.

RET 103 Snowmobile Theory II

A theory course covering operating principles of the snowmobile chassis. Discussion will include clutches, drive systems, front and rear suspensions (fox shocks), and track systems. Theory will cover proper service procedures for proper set up and service of the snowmobile chassis and related systems. This is a 9 week course offered the first 9 weeks of the spring semester.

RET 104 Motorcycle and Marine Theory

A lecture course covering fundamental motorcycle and outboard marine engine theory and service practices. Motorcycle instruction will include engines, transmissions, and clutches. Outboard instruction will include the powerhead, mid-section and gearcases. This is a 9 week course offered the second 9 weeks of the spring semester.

RET 111 Outdoor Power Equipment Lab

Lab application of engine rebuilding, troubleshooting, and diagnostic procedures for four cycle engines and accessory support systems. Students will use manufacturers' recommended overhaul procedures and special tools to service outdoor power equipment.

RET 112 Snowmobile Lab I

Lab application of engine rebuilding, troubleshooting, and testing procedures of the two-cycle engine and its accessory systems. Students will use manufacturers' recommended procedures and specifications to properly service various brands of snowmobiles.

RET 113 Snowmobile Lab II

A lab covering complete chassis, drive and suspension systems used on various brands of snowmobiles. Students will repair and adjust the machines to maintain proper operation. This is a 9 week course offered the first 9 weeks of the spring semester.

RET 114 Motorcycle and Marine Lab

Lab application of fundamental motorcycle engine and outboard marine engine service procedures. Projects will include engine and drive train overhaul and troubleshooting procedures. This is a 9 week course offered the second 9 weeks of the spring semester.

RET 115 Motorcycle Rider Course

A hands-on course designed to promote the safe and responsible operation of motorcycles. Students will learn how to drive motorcycles. Safety will be emphasized. This is a 20 hour course.

RET 201 Motorcycle Theory II

An extension of RET 104. This lecture course will study basic theory, service and troubleshooting of motorcycles. Systems included will be engine, drive train, suspension, wheel, tire, and fuel systems. Shop management procedures will be introduced. This is a 9 week course offered the first 9 weeks of the fall semester.

RET 202 Outboard Theory II

An extension of RET 104. This lecture course will study basic theory, service and troubleshooting of outboard marine engines. Systems included will be powerheads, gearcases, electrical, fuel, lubrication, and basic tune-up. This is a 9 week course offered the first 9 weeks of the spring semester.

RET 203 Stern Drive Theory

This lecture course will study basic operating theory, maintenance, and rebuilding procedures of various inboard marine engines and drives. Systems included will be engines, transom assemblies, vertical drives, hydraulic accessory systems, propellers, and winterization. This is a 9 week course offered the second 9 weeks of the spring semester.

RET 211 Motorcycle Lab II

A hands on lab application of service procedures for motorcycles and ATV's. Projects will include tune-up and overhaul of engines, transmissions, and clutches. Chassis work will include inspection and service procedures for brakes, suspension, wheels, tires, and drive train. Manufactures' service literature and recommended service procedures will also be emphasized.

RET 212 Outboard Lab II

A hands on lab course which includes diagnosis and repair of powerheads, gearcases, electrical systems, fuel systems, and lubrication systems on outboard marine engines. Shop experiences will include use of diagnostic equipment, diagnostic techniques, special service procedures and literature. The student will also receive shop practice of production work, quality control, and cost estimating. This is a 9 week course offered the first 9 weeks of the spring semester.

RET 213 Stern Drive Lab

A hands on lab course which includes diagnosis and repair of inboard marine engines and drives. Systems included will be upper and lower gear housings, transom assemblies and basic engine tune-up. Manufacturers' service literature and recommended service procedures also will be emphasized. This is a half-semester course.

RET 222 Motorcycle Electronics Systems

An extension of TECH 112. This lecture course will study basic theory, service and troubleshooting of motorcycle electrical systems. Systems included will be batteries, ignition, charging, lighting, starting, and wiring diagrams. Prerequisite: TECH 112. This is a 9 week course offered the second 9 weeks of the fall semester.

Technology

Prefix	Number	Course Title	NDSCS
TECH	112	Applied Transportation Electronics	3
TECH	121	Engine Fundamentals	3

TECH 112 Applied Transportation Electronics

A lecture, demonstration, and performance type course covering the basic fundamentals of electronics. Included is the study of Ohm's law, series and parallel circuits, test instruments, and various semiconductors. Also included is the study of electrical symbols and wiring diagrams of accessory circuits as found in manufacturers service manuals. This is a half-semester course. It is offered the first and second halves of both semesters.

TECH 121 Engine Fundamentals

A theory and lab course covering basic engine operating principles, cylinder and piston service, valve service, crankshaft and bearing service, lubrication systems, rebuilding procedures, measurement fundamentals and basic engine troubleshooting. This is a nine week course. It is offered the first and second nine weeks of both semesters.

The following individuals are liaisons for this discipline. Those marked with an asterisk (*) are chairs.

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