Engine Repair
Course Outcome Summary

Course Information

Organization	Madison Area Technical College
Developers	David Biegel
Development Date	12/30/1998
Revised Date	3/23/2000
Course Number	10-070-191
Instructional Level	Associate Degree
Potential Hours of Instruction	144
Total Credits	6

Description
Study in this course will allow the student to develop a basic knowledge of combustion engine design and operation with the major emphasis on diesel engines. Experience in the course will provide the student with the skills and knowledge needed to diagnose, overhaul, maintain, adjust and repair engines found in agricultural machines and equipment.

Types of Instruction

Instruction Type	Contact Hours	Credits
A. Classroom Presentation	54	6
B. On Campus Laboratory and Clinicals	90	

Textbooks
Robert N. Brady. *Modern Diesel Technology*. Prentice Hall. 1996. **Edition:** First. **Source:** MATC Bookstore.
Wisconsin Technical College System. *Diesel Competency Profile Booklet*. 1994. **Edition:** First.

Learner Supplies
Safety glasses, steel toed safety shoes, coveralls, 3 ring binder, note pad and pencil.

Exit Learning Outcomes

Core Abilities
A. Communication
B. Critical thinking
C. Ethics
D. Global and cultural perspectives
E. Mathematics
F. Science and Technology
G. Self-management
H. Social interaction

Competencies

A. Determine the needed diesel engine repair

Competence will be demonstrated:

A.1. given personal and environmental safety equipment

A.2. in a simulated work environment
A.3. given a diesel engine or diesel engine components
A.4. given the proper tools and equipment
A.5. given the appropriate references
A.6. given the appropriate repair orders and forms
A.7. through a written objective examination
A.8. through instructor observation with the you identifying engine problems correct 4 out of 5 times

Criteria - Performance will be satisfactory when:

A.1. you select the appropriate tools and equipment
A.2. you meet rating scale #3 in the diesel competency profile booklet
A.3. you follow all personal and environmental safety practices
A.4. you meet industry standards for diesel engine repair and maintenance
A.5. you diagnose diesel engine failures
A.6. you determine needed repairs for diesel engine failures

B. Identify diesel engine parts and components

Competence will be demonstrated:

B.1. through the completion of assigned work sheet
B.2. through the identification of components and parts on demonstration boards, shop models, and vehicles

Criteria - Performance will be satisfactory when:

B.1. you identify diesel engine components and parts
B.2. you identify engine parts and components unique to specific sizes, types, and manufacturer's of diesel engines

C. Examine diesel engine operation and theory

Competence will be demonstrated:

C.1. on a written objective examination
C.2. without reference unless the exam is to to define certain complex components as they relate to specific diesel engine manufacturers

Criteria - Performance will be satisfactory when:

C.1. you examine internal combustion engine principles
C.2. you examine diesel engine theory of operation
C.3. you distinguish between 2-stroke- and 4-stroke-cycle diesel engine theory of operation

D. Calculate formulas associated with diesel engines

Competence will be demonstrated:

D.1. by completing assigned worksheet
D.2. with the use of reference material and formulas provided
D.3. on a written objective examination

Criteria - Performance will be satisfactory when:

D.1. you calculate horsepower of diesel engines
D.2. you calculate torque of diesel engines
D.3. you calculate piston speed of diesel engines
D.4. you calculate brake mean effective pressure of diesel engines
D.5. you calculate thermal efficiency of diesel engines
D.6. you calculate volumetric efficiency of diesel engines
D.7. you calculate mechanical efficiency, work, power, and energy of diesel engines
D.8. you use the terminology specific to diesel engines

E. Analyze engine identification

Competence will be demonstrated:

E.1. by completing assigned worksheet with no errors

E.2. with the use of reference materials

E.3. with the use of specific diesel engines provided

Criteria - Performance will be satisfactory when:

E.1. you identify engine manufacturer

E.2. you identify engine mode

E.3. you identify engine serial number

E.4. you identify type

E.5. you locate specific information about diesel engines in reference material and on engine data plates

F. Determine specific engine information

Competence will be demonstrated:

F.1. by completing assigned worksheet with no errors

F.2. with the use of reference materials

F.3. given diesel engines and engine data plates

Criteria - Performance will be satisfactory when:

F.1. you determine engine cylinder arrangement for specific engines

F.2. you determine firing order for specific engines

F.3. you determine rotation for specific engines

F.4. you determine timing for specific engines

F.5. you determine horsepower for specific engines

F.6. you determine torque for specific engines

F.7. you determine displacement for specific engines

F.8. you determine bore size for specific engines

F.9. you determine stroke for specific engines

F.10. you determine RPM's for specific engines

G. Explain diesel engine support systems operation and theory

Competence will be demonstrated:

G.1. on a written objective examination

G.2. without reference unless exam is used to evaluate the use of certain components as they relate to system operation

Criteria - Performance will be satisfactory when:

G.1. you explain diesel engine support systems operation and theory

G.2. you explain how support system parts and components function together as a unit

H. Analyze engine support systems components and parts

Competence will be demonstrated:

H.1. through the completion of assigned worksheet

H.2. through the identification of support system components on engines from different engine manufacturers

H.3. with the use of reference materials

Criteria - Performance will be satisfactory when:

H.1. you identify diesel engine support system components and parts

H.2. you explain different types of engine support system components and parts used by different engine manufacturers

H.3. you explain different types of engine support system components and parts used on different types of engines

I. Perform diesel engine maintenance

Competence will be demonstrated:

I.1. given personal and environmental safety equipment

I.2. in a simulated work environment
I.3. given the proper tools and equipment
I.4. given the appropriate references
I.5. given the appropriate repair orders and forms
I.6. when the maintenance has been performed and the engine is performing correctly
I.7. given a diesel engine or a diesel engine powered vehicle and the necessary supplies
I.8. when the forms and worksheets are complete with no errors
I.9. on a written objective examination

Criteria - Performance will be satisfactory when:

I.1. you select the appropriate tools, equipment and reference manuals
I.2. you meet rating scale #3 in the diesel competency profile booklet
I.3. you follow all personal and environmental safety practices
I.4. you perform diesel engine manufacturers recommended diesel engine maintenance
I.5. you complete engine maintenance worksheet, repair orders and forms

J. Remove and replace diesel engine

Competence will be demonstrated:

J.1. in a simulated work environment
J.2. given personal and environmental safety equipment
J.3. given a vehicle or piece of equipment
J.4. given the proper tools and equipment
J.5. given the appropriate references
J.6. given the appropriate repair orders and forms

Criteria - Performance will be satisfactory when:

J.1. you select the appropriate tools and equipment
J.2. you meet rating scale #3 in the diesel competency profile booklet
J.3. you follow all personal and environmental safety practices
J.4. you remove the engine from the chassis without damage to the vehicle or the engine and meeting industry standards for removing and lifting diesel engines
J.5. you mount the engine back into the chassis, make all adjustments, route all wires and hoses correctly with are no leaks, and the engine performs correctly

K. Work safely around diesel engines and diesel engine powered equipment

Competence will be demonstrated:

K.1. given personal and environmental safety equipment
K.2. in a simulated work environment
K.3. given the proper tools and equipment
K.4. given a diesel engine, a piece of equipment, or diesel engine components
K.5. given the appropriate references
K.6. given the appropriate repair orders and forms
K.7. on a written objective examination

Criteria - Performance will be satisfactory when:

K.1. you follow all personal and environmental safety practices
K.2. you meet industry standards for diesel engine repair and service
K.3. you meet rating scale #3 in the diesel competency profile booklet
K.4. you work safely when servicing and repairing diesel engines and diesel engine powered vehicles

L. Service cylinder head

Competence will be demonstrated:

L.1. given personal and environmental safety equipment

L.2. by completing the cylinder head worksheet

L.3. in a simulated work environment

L.4. given the proper tools and equipment

L.5. given the appropriate references

L.6. given the appropriate repair orders and forms

L.7. given the appropriate engine components and parts

Criteria - Performance will be satisfactory when:

L.1. you select the appropriate tools, equipment and reference manuals

L.2. you meet rating scale #3 in the diesel competency profile booklet

L.3. you follow all personal and environmental safety practices

L.4. you remove diesel engine cylinder head

L.5. you inspect diesel engine cylinder head

L.6. you recondition diesel engine cylinder head

L.7. you replace diesel engine cylinder head

L.8. you place the cylinder head back on the engine, make the necessary adjustments, and the engine performs correctly

M. Disassemble engine into subassemblies

Competence will be demonstrated:

M.1. given personal and environmental safety equipment

M.2. in a simulated work environment

M.3. given a diesel engine

M.4. given the proper tools and equipment

M.5. given the appropriate references

M.6. given the appropriate repair orders and forms

Criteria - Performance will be satisfactory when:

M.1. you meet rating scale #3 in the diesel competency profile booklet

M.2. you select the appropriate tools, equipment, and reference manuals

M.3. you follow all personal and environmental safety practices

M.4. you disassemble engine and components following the manufacturer's reference manual for correct procedures, meeting industry standards for removing and lifting diesel engines

N. Service engine support system components

Competence will be demonstrated:

N.1. given personal and environmental safety equipment

N.2. by completing support system components worksheet

N.3. in a simulated work environment

N.4. given the proper tools and equipment

N.5. given the appropriate references

N.6. given the appropriate repair orders and forms

N.7. given the appropriate engine components and parts

Criteria - Performance will be satisfactory when:

N.1. you meet rating scale #3 in the diesel competency profile booklet

N.2. you select the appropriate tools, equipment, and reference manuals

N.3. you follow all personal and environmental safety practices

N.4. you remove diesel engine support system components to include: cooling system, lubrication system, air induction system, exhaust system, and starting system components

N.5. you inspect diesel engine support system components to include: cooling system, lubrication system, air induction system, exhaust system, and starting system components

N.6. you repair diesel engine support system components to include: cooling system, lubrication system, air induction system, exhaust system, and starting system components

N.7. you adjust diesel engine support system components to include: cooling system, lubrication system, air induction system, exhaust system, and starting system components

N.8. you replace diesel engine support system components to include: cooling system, lubrication system, air induction system, exhaust system, and starting system components

N.9. the engine support system components are installed back on the engine and the engine is performing correctly

O. Service camshaft, gear and valve train components

Competence will be demonstrated:

O.1. by completing the assigned worksheet

O.2. given personal and environmental safety equipment

O.3. in a simulated work environment

O.4. given the proper tools and equipment

O.5. given the appropriate references

O.6. given the appropriate repair orders and forms

O.7. given the appropriate engine components and parts

Criteria - Performance will be satisfactory when:

O.1. you select the proper tools and equipment

O.2. you meet rating scale #3 in the competency profile booklet

O.3. you follow all personal and environmental safety practices

O.4. you remove camshaft, gear, and valve train components

O.5. you inspect camshaft, gear, and valve train components

O.6. you replace camshaft, gear, and valve train components and make necessary adjustments

O.7. the engine performs correctly

P. Service crankshaft

Competence will be demonstrated:

P.1. given personal and environmental safety equipment

P.2. by completing the crankshaft worksheet

P.3. given the proper tools and equipment

P.4. in a simulated work environment

P.5. given the appropriate references

P.6. given the appropriate repair orders and forms

P.7. given the appropriate engine components and parts

Criteria - Performance will be satisfactory when:

P.1. you meet rating scale #3 in the diesel competency profile booklet

P.2. you select the appropriate tools, equipment, and reference manuals

P.3. you follow all personal and environmental safety practices

P.4. you remove diesel engine crankshaft

P.5. you inspect diesel engine crankshaft

P.6. you determine needed repairs of diesel engine crankshaft

P.7. you replace diesel engine crankshaft and make necessary adjustments

P.8. the engine performs correctly

Q. Analyze the condition of used engine parts

Competence will be demonstrated:

Q.1. you completes Work Sheets #1 - 6

Q.2. given personal and environmental safety equipment

Q.3. in a simulated work environment

Q.4. given diesel engine parts and components

Q.5. given the proper tools and equipment

Q.6. given the appropriate references

Q.7. given the appropriate repair orders and forms

Criteria - Performance will be satisfactory when:

Q.1. you select the appropriate tools, equipment, and reference manuals

Q.2. you meet rating scale #3 in the diesel competency profile booklet

Q.3. you follow all personal and environmental safety practices

Q.4. you assess the condition of used engine parts

Q.5. you determine the needed repair of used engine parts in accordance with manufacturer's technical repair manual

R. Recondition the cylinder block assembly

Competence will be demonstrated:

R.1. by completing cylinder block and cylinder component worksheets

R.2. given personal and environmental safety equipment

R.3. in a simulated work environment

R.4. given the proper tools and equipment

R.5. given the appropriate references

R.6. given the appropriate repair orders and forms

R.7. given the appropriate engine components and parts

Criteria - Performance will be satisfactory when:

R.1. you meet rating scale #3 in the diesel competency profile booklet

R.2. you select the appropriate tools, equipment, and reference manuals

R.3. you follow all personal and environmental safety practices

R.4. you inspect cylinder block assembly including cylinder components

R.5. you determine needed repairs of cylinder block assembly including cylinder components

R.6. you reassemble cylinder block assembly including cylinder components

R.7. the engine performs correctly

S. Diagnose the cause of failed engine parts

Competence will be demonstrated:

S.1. by completing the failure analysis worksheets

S.2. given personal and environmental safety equipment

S.3. in a simulated work environment

S.4. given failed engine parts and components

S.5. given the proper tools and equipment

S.6. given the appropriate references

Criteria - Performance will be satisfactory when:

S.1. you select the appropriate tools and equipment

S.2. you meet rating scale #3 in the diesel competency profile booklet

S.3. you follow all personal and environmental safety practices

S.4. you determine the cause of failed engine parts and determine needed repairs

S.5. you determine needed repairs of failed engine parts

T. Reassemble diesel engine

Competence will be demonstrated:

T.1. given personal and environmental safety equipment

T.2. in a simulated work environment

T.3. given the proper tools and equipment

T.4. given the appropriate references

T.5. given the appropriate repair orders and forms

T.6. given a diesel engine and its parts and components

T.7. through written objective examination

Criteria - Performance will be satisfactory when:

T.1. you meet rating scale #3 in the diesel competency profile booklet

T.2. you select the appropriate tools, equipment, and reference manuals

T.3. you follow all personal and environmental safety practices

T.4. you reassemble diesel engine as required by manufacturer's technical repair manual

T.5. you make final adjustments as required by manufacturer's technical repair manual

T.6. the engine is completely assembled, all adjustments are made, and engine is operating correctly

U. Perform engine tests

Competence will be demonstrated:

U.1. given personal and environmental safety equipment

U.2. by completing the engine dynamometer test worksheet

U.3. in a simulated work environment

U.4. given the proper tools and equipment

U.5. given the appropriate references

U.6. given the appropriate repair orders and forms

U.7. given a diesel engine

Criteria - Performance will be satisfactory when:

U.1. you meet rating scale #3 in the diesel competency profile booklet

U.2. you select the appropriate tools, equipment, and reference manuals

U.3. you follow all personal and environmental safety practices

U.4. you tests diesel engine on dynamometer

U.5. you correct any leaks as required

U.6. you make final adjustments as required

U.7. the engine is tested under conditions recommended by the engine manufacturer, all leaks are corrected, final adjustments are made, and the engine performs correctly