

**SOUTHEAST COMMUNITY COLLEGE**  
**TRANSPORTATION DIVISION**  
**JOHN DEERE CONSTRUCTION & FORESTRY EQUIPMENT TECH**  
**COURSE SYLLABUS**  
**December 12, 2022**

**I. CATALOG DESCRIPTION**

Course Number: JDCE1135  
Course Title John Deere C&F Engines & Fuel Systems  
Prerequisite(s): JDCE1220, JDCE1240

Catalog Description: This course explains the design and function of 2-stroke and 4-stroke engines including engine cycles. The elements needed for combustion, engine horsepower and the principles of volumetric and thermodynamic efficiency. Topics include Intake and exhaust systems, turbo chargers, cylinder heads, camshafts, valve trains, cylinder blocks, piston assemblies, crankshafts, connecting rods, bearings, lubrication systems, cooling systems, oil seals and gaskets. Study fuels for combustion engines, engine displacement, compression ratios, compression ignition, air-fuel ratios and spark ignition. The design and function of diesel fuel injection systems, injectors, injection pumps, pump installation and engine ignition timing is demonstrated. Use test equipment and service tools to complete hands on fuel system and engine repair lab activities for John Deere systems. Lab activities include diesel fuel injection component inspection, testing and adjustments. Engine systems testing, disassembly, precision measuring of components, parts inspection, condition evaluation, engine adjustments, reassembly, first start-up and break-in procedures. Safety when working with engines, chemicals and fuels will be practiced.

Credit Hours: 6  
Class Hours: 45  
Lab Hours: 135  
Total Contact Hours: 180

**II. COURSE OBJECTIVES:** *Course will:*

- A.** Explain basic engine design, function, and operation.
- B.** Explain the elements needed for combustion.
- C.** Explain the physical elements needed for engines to function.
- D.** Explain how engines produce power and how power is measured.
- E.** Explain engine efficiencies, mechanical, volumetric and thermodynamic.
- F.** Explain engine stroke cycles, and how to calculate displacement, and compression ratio.
- G.** Explain safety rules for working with engines, fluids, chemicals, fuel systems and fuels.
- H.** Explain the properties of fuels and fuel systems for internal combustion engines.
- I.** Explain the design and function of diesel fuel injection systems, pumps, speed governing, and injection nozzles.
- J.** Demonstrate fuel injection pump installation and engine ignition timing.
- K.** Demonstrate the operation of injection nozzles and injection nozzle testing procedures.
- L.** Demonstrate how to use engine test equipment and service tools.
- M.** Provide the opportunity for hands on fuel system and engine repair lab activities.

- N. Provide the opportunity to perform pre-overhaul inspection, testing and engine condition evaluations.
- O. Demonstrate engine removal and mounting engines onto repair stands.
- P. Provide the opportunity for hands on engine disassembly, inspection and evaluation.
- Q. Explain the design and function of Intake systems, air induction, exhaust systems, turbo charging and air coolers.
- R. Explain the design and function of cylinder heads and valves.
- S. Explain the design and function of camshafts and valve trains.
- T. Explain the design and function of timing gears.
- U. Explain the design and function of cylinder blocks.
- V. Explain the design and function of cylinders and piston assemblies.
- W. Explain the design and function of crankshafts, connecting rods and bearings.
- X. Explain the design and function of engine balancers, vibration dampers and flywheels.
- Y. Explain the design and function of oil seals, gaskets and the use of sealants.
- Z. Explain the design and function of lubrication and cooling systems.
- AA. Provide the opportunity for hands on engine assembly, adjustments and inspection.
- BB. Provide the opportunity to perform engine break in, final adjustments and inspection.

### III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES

#### A. STUDENT LEARNING OUTCOMES: *Student will be able to:*

1. Understand basic engine design, function, and operation.
2. understand the elements needed for combustion.
3. Understand the physical elements needed for engines to function.
4. Understand how engines produce power and how power is measured.
5. Understand engine efficiencies, mechanical, volumetric and thermodynamic.
6. Understand engine stroke cycles, and calculate displacement, and compression ratio.
7. Work safely with engines, fluids, chemicals, fuel systems and fuels.
8. Identify fuels and service fuel systems for internal combustion engines.
9. Understand the design and function of diesel fuel injection systems, pumps, speed governing, and injection nozzles.
10. Perform fuel injection pump installation and adjust engine ignition timing.
11. Perform injection nozzle testing procedures.
12. Use engine test equipment and service tools.
13. Perform fuel system and engine repairs.
14. Perform pre-overhaul inspections, tests and engine condition evaluations.
15. Remove and mount engines onto repair stands.
16. Disassemble engines and perform inspections and evaluations.
17. Service Intake systems, exhaust systems, turbo chargers and air coolers.
18. Inspect and evaluate the condition of cylinder heads and valves.
19. Inspect and evaluate the condition of camshafts and valve train components.
20. Properly install timing gears.
21. Inspect and evaluate the condition of cylinder blocks.
22. Measure clearances of cylinders and piston assemblies and evaluate their condition.
23. Measure and evaluate the condition of crankshafts, connecting rods and bearings.
24. Remove and install engine balancers, vibration dampers and flywheels.
25. Remove and install seals, and gaskets and use sealants properly when appropriate.
26. Service lubrication and cooling systems.
27. Assemble engines, and perform adjustments and inspections.

**B. GENERAL EDUCATION LEARNING OUTCOME:**

**GELO 3: Critical Thinking & Problem Solving**

1. Collect, identify, interpret and analyze data.
2. Synthesize information to arrive at reasoned solutions to problems.
3. Acquire and integrate knowledge and construct relationships across disciplines.
4. Evaluate the validity of arguments, alternatives, data, outcomes, and/or impacts of actions.

**IV. CONTENT/TOPICAL OUTLINE**

- A. Engines – How they work. Basic engine designs and theory of operation
- B. Elements for combustion, air, fuel, compression, ignition
- C. Engine physics, energy, force, inertia, momentum and torque
- D. Engine work and power
- E. Engine efficiencies, mechanical, volumetric and thermodynamics
- F. Engine cycles, displacement, and compression
- G. Safety rules for engines, fluids, chemicals, fuel systems and fuels
- H. Fuels and fuel systems for internal combustion engines
- I. Diesel fuel injection systems, pumps, speed governing, and injection nozzles
- J. Fuel injection pump installation and engine ignition timing
- K. Diesel fuel Injection systems lab
- L. Engine test equipment and service tools
- M. Diesel engine repair lab activities
- N. Pre-engine overhaul inspection, testing and condition evaluation
- O. Engine removal and mounting engines onto repair stands
- P. Engine disassembly, inspection and evaluation
- Q. Intake systems, air induction, exhaust systems, turbo charging and air coolers
- R. Cylinder heads and valves
- S. Camshafts and valve trains
- T. Timing gears
- U. Cylinder blocks
- V. Cylinders and piston assemblies
- W. Crankshafts, connecting rods and bearings
- X. Engine balancers, vibration dampers and flywheels
- Y. Oil seals, gaskets and sealants
- Z. Lubrication and cooling systems
- AA. Engine assembly, adjustments and inspection
- BB. Engine break in, final adjustments and inspection

**V. INSTRUCTIONAL MATERIALS**

**Required text(s):** Service Advisor (made available in the classroom)  
FOS Bearings and Seals  
FOS Engines  
FOS Fuels, Lubricants and Coolants

**Other material(s):** Required tool set, safety glasses (regulation Z87), leather shoes, John Deere uniform, colored pencils, notebook, writing instruments, calculator

## **VI. METHODS OF PRESENTATION/INSTRUCTION**

### **A. Methods of presentation typically include a combination of the following:**

1. Small and large group discussion
2. Video presentations
3. Demonstrations
4. Project boards
5. Flip charts
6. Handouts
7. Observations
8. Field trips

## **VII. METHODS OF EVALUATION**

### **A. Methods of evaluation typically include a combination of the following:**

1. Notebook (if required)
2. Quizzes
3. Tests
4. Lab Grades
5. Reflection assignments
6. Lab/classroom presentations

Grading will follow the SCC Standard Grade Scale Policy. See **Course Information Document** for specific details on how the course grades are calculated.

## **VIII. SPECIFIC COURSE REQUIREMENTS:**

- A.** Students must complete all tests, projects, assignments, and notebook (if required).
- B.** Students must earn a final grade of 70% (2.0) or higher.
- C.** Program safety rules will be followed. See the **Course Information Document** for any additional safety rules established by the instructor.
- D.** Safety belts will be worn at all times, on or in any motorized vehicle, if equipped.
- E.** Attendance and participation. See **Course Information Document** for attendance and participation policy.