COURSE OUTLINE: MPT234 - HD DRIVE TRAINS

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Course Code: Title	MPT234: HEAVY DUTY DRIVE TRAINS
Program Number: Name	4044: MOT POWER ADV REPAIR
Department:	MOTIVE POWER
Academic Year:	2024-2025
Course Description:	You will be introduced to the construction, operation, maintenance, and diagnosis of both highway truck and off road heavy machinery drive trains. The highway truck components will include tandem differentials, inter-axle differentials and twin countershaft transmissions. Off-road equipment drive trains will include, steering clutches and brakes, final drives, torque converters, power shift transmissions and hydrostatic drives. Students will be required to follow proper safety procedures when performing the above tasks according to both Sault College Motive Power Department Standards and Vehicle Manufacturers safety regulations and specifications.
Total Credits:	3
Hours/Week:	6
Total Hours:	42
Prerequisites:	MPF103, MPF127
Corequisites:	There are no co-requisites for this course.
Vocational Learning Outcomes (VLO's) addressed in this course: **Please refer to program web page for a complete listing of program outcomes where applicable.**	**4044 - MOT POWER ADV REPAIR** VLO 1 Analyse, diagnose, and solve various motive power system problems by using problem-solving and critical thinking skills and strategies and by applying fundamental knowledge of motor vehicle operation, components, and their interrelationships. VLO 5 Diagnose and repair drive train components and systems in compliance with manufacturer's recommendations. VLO 7 Disassemble and assemble components to required specifications by applying workshop skills and knowledge of basic shop practices. VLO 8 Select and use a variety of troubleshooting techniques and test equipment to assess electronic circuits, vehicle systems, and subsystems. VLO 9 Apply knowledge of hydraulics and pneumatics to the testing and analysis of motive power systems and subsystems. VLO 10 Communicate information effectively, credibly, and accurately by producing supporting documentation to appropriate standards. VLO 11 Use information technology and computer skills to support work in a motive power environment. VLO 16 Complete all assigned work in compliance with occupational, health, safety, and environmental law; established policies and procedures; codes and regulations; and

		in accordance with ethical principles.
Essential Employability Skills (EES) addressed in this course:	EES 1	Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.
	EES 2	Respond to written, spoken, or visual messages in a manner that ensures effective communication.
	EES 3	Execute mathematical operations accurately.
	EES 4	Apply a systematic approach to solve problems.
	EES 5	Use a variety of thinking skills to anticipate and solve problems.
	EES 6	Locate, select, organize, and document information using appropriate technology and information systems.
	EES 7	Analyze, evaluate, and apply relevant information from a variety of sources.
	EES 8	Show respect for the diverse opinions, values, belief systems, and contributions of others.
	EES 9	Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.
	EES 10	Manage the use of time and other resources to complete projects.
	EES 11	Take responsibility for ones own actions, decisions, and consequences.
Course Evaluation:	Passing Grade: 50%, D A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.	
Other Course Evaluation & Assessment Requirements:	EVALUATION PROCESS/GRADING SYSTEM: The final grade for this course will be based on the results of classroom, assignments and shop evaluations weighed as indicated: Classroom 30% of the final grade is comprised of term tests Assignments 20% of the final grade is comprised of a number of technical reports Shop 40% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude Employability Skills 10% of final grade is comprised of attendance, class participation, show ability to follow direction and being a team player. All Assignments must be typed. Assignments will be graded as follows: a) One day after the original due date 70% maximum. b) Two or more days after the original due date 50% maximum. (Student will be given notice of test and assignment dates in advance) The following semester grades will be assigned to students: Grade Definition A+ 90 - 100% A 80 - 89% B 70 - 79%	

C 60 - 69%
D 50 59%
F (Fail)49% and below

CR (Credit) Credit for diploma requirements has been awarded.
S Satisfactory achievement in field /clinical placement or non-graded subject area.
U Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR Grade not reported to Registrar`s office.
W Student has withdrawn from the course without academic penalty.

Books and Required Resources:

Heavy Duty Truck Systems by Bennett
Publisher: Cengage Learning Edition: 7th ed

Fundamentals of Mobile Heavy Equipment by Owen C. Duffy
Publisher: Jones & Bartlett Learning Edition: first edition
ISBN: 9781284112917
CDX Learning Systems

Course Outcomes and Learning Objectives:

Course Outcome 1	**Learning Objectives for Course Outcome 1**
Explain the construction, operating principles, testing and diagnosis required to repair torque converters, fluid couplings, and hydraulic retarders.	• static and dynamic friction • torque multiplication • centrifugal force • vortex and rotary flow • kinetic energy • hydrodynamic drive • hydrostatic drive • multiplication phase • coupling phase • hydraulic retarders • pumps • impeller • stator, fixed and rotating • overrunning clutch • flywheel • lock-up device HYDRAULIC RETARDERS • rotor and housing • control valve PERFORM A DEMONSTRATION OF TORQUE CONVERTER: • stall tests • relief valve tests • performance tests • Oil level check • Oil condition
Course Outcome 2	**Learning Objectives for Course Outcome 2**
HYDROSTATIC DRIVES Describe and define the	APPLICATION: • traction drives

purpose and fundamentals, types, designs and construction features and perform the inspection, testing, and diagnostic procedures following manufacturers` recommendations and perform assigned operations on hydrostatic drives.	• non-traction drives TYPES: • open loop circuits • closed loop circuits FUNDAMENTALS: • lubricant types • hydraulic pressures and output force • coolers and circuits PERFORM TEST PRESSURES OF HYDROSTATIC DRIVE SYSTEMS
Course Outcome 3	**Learning Objectives for Course Outcome 3**
POWER SHIFT TRANSMISSIONS. Define the purpose and fundamentals and perform inspection, testing, and diagnostic procedures following manufacturers` recommendations and perform assigned operations for power shift transmission systems.	Control Systems: • hydraulic • pneumatic • electronic Planetary Gear Sets: • simple • sun gear • planet pinions and carrier • ring gear • compound • lubrication • Check and test fluid levels and condition. • Perform a demonstration of recommended procedures to perform oil and filter changes.
Course Outcome 4	**Learning Objectives for Course Outcome 4**
TANDEM AND INTERAXLE DIFFERENTIALS Define the purpose, operation and fundamentals of, and describe the functions, construction, composition, types, styles and application and perform disassembly, inspection, testing, diagnostic and reassembly procedures of multiple speed and double reduction drive axle assemblies following manufacturers` procedures.	• Mechanical advantage • Laws of levers • Torque • Input / output rotational speed • Gear ratios • Loading characteristics • Differential action • Thrust loads • Power flow • Bearing preloads • Lubrication Outline procedure for checking lubricant levels • Outline recommended lubricant change levels • Verify lubricant type and application • Carrier removal, disassembly, reassembly and replacement • procedure

	Failure analysis to identify • Shock failures • Fatigue failures • Torsional failures • Surface failures • Spinout failures • Operational overloading • Temperature effects Demonstrate procedure for setting • Pinion bearing preload • Pinion depth • Carrier bearing preload • Drive gear set backlash Procedure for checking • Drive gear set contact patterns • Drive gear set backlash • Thrust screw adjustment
Course Outcome 5	**Learning Objectives for Course Outcome 5**
SERVICING TWIN COUNTERSHAFT TRANSMISSIONS Recommend reconditioning or repairs following manufacturers` procedures and perform assigned operations on multiple countershaft manual transmission and auxiliary sections.	Outline procedure for checking lubricant levels • Outline recommended lubricant change intervals and procedure • Verify lubricant types and application • Transmission removal, disassembly, reassembly, timing and replacement procedures • Auxiliary section removal, disassembly, reassembly, timing and replacement procedures • Air pressure adjustment • Pneumatic valve and cylinder replacement procedure • O-ring replacement • Air filter replacement • System contaminant flushing Perform failure analysis • Shock failures • Fatigue failures • Torsional failures • Surface failures
Course Outcome 6	**Learning Objectives for Course Outcome 6**
FINAL DRIVES Explain the principles of operation, define the purpose and fundamentals and perform inspection, testing, and diagnostic procedures following manufacturers` recommendations and	Final drives: • bevel gear • spiral gear • helical and hypoid gear • planetary • inboard and outboard • inspect final drives and check for: • gear contact patterns • gear backlash

	perform assigned operations of final drives.	• bearing pre-load • perform a demonstration of: • lubricating oil level checks • seal replacement procedures • mechanical face-type seal • bearing service • adjustment procedures

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Employability Skills	10%
Shop practical	40%
Theory Assignments	20%
Theory Tests	30%

Date: August 9, 2024

Addendum: Please refer to the course outline addendum on the Learning Management System for further information.