

KPBSD Power Mechanics I & II Curriculum – 2017

Industry Standards	
<p>National Standards NATEF Program Automobile Accreditation Standards http://www.asealliance.org/wp-content/uploads/2016/12/2017-Auto-Program-Standards-Print-Version.pdf</p> <p>ALASKA STANDARDS ALIGNMENT: Power Mechanics</p>	Transfer Goals
	<p>Students will be able to independently use their learning to...</p> <ul style="list-style-type: none"> Gain understanding and appreciation for careers in vehicle/transportation repair. Diagnose and repair of a variety of systems, tools, and parts that effect engine performance and provide preventative maintenance. Comply with personal and environmental safety practices in all areas of vehicle/transportation services and repair industry.
	Meaning
	<div style="flex: 1; padding: 5px;"> <p style="text-align: center;">ENDURING UNDERSTANDINGS</p> <p>Students will understand...</p> <ul style="list-style-type: none"> Practical technological methods to a hands-on approach to problem solving major engine components and their functions. Technological methods to diagnosing and solving problems to small engines. Different forms of alternative energy and their effects on the environment. Math and science concepts to diagnose and solve practical mechanical problems. Vocabulary used. Operating principles of internal and external combustion engines. The steps of the design process and how to use the design process to solve problems. Mechanical and vehicle systems and their relationships to various technological systems. How advanced computer technology affects vehicle performance. How proper maintenance of a vehicle effects performance and safety of the vehicle. The basic function of the major parts of a vehicle engine. </div> <div style="flex: 1; padding: 5px;"> <p style="text-align: center;">ESSENTIAL QUESTIONS</p> <p>Students will keep considering...</p> <ul style="list-style-type: none"> Why is it important to be an advocate for safe working practices? What knowledge, skills, tools, and safety practices are required to apply practical technological methods to various vehicle systems? How do safety procedures, different vehicle materials, and engineering design principals play a role in vehicle design? Why is it important to understand relationships between systems which function together? What is the impact of internal combustion? How does an understanding of electricity facilitate problem solving with electrical/electronic systems? How have new technologies impacted diagnosis and repair of operational systems? What impact have electric motors made on transportation systems? Why are emission controls important to our environment? </div>

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	<ul style="list-style-type: none"> • The operating principles of internal and external combustion engines. • How electricity functions in electronic components in a vehicle. • The operating principles of a vehicle ignition system. • How electronics, ignition systems, and computers operate to efficiently control a vehicle. • The operation of the starting and charging systems and how to diagnose their problems. • Emission control systems can be operated by computer or engine control modules. • Fuel injection and throttle body systems control the efficiency and environmental impact of a modern vehicle engine. • Cooling system parts and solution protect the engine from wear, overheating, and freezing. • Major functions from brake systems and their operational features. • Modern vehicles are controlled by anti-lock brakes, traction, and stability control. • Hydraulic and mechanical principles of a brake system. • Suspension systems affect the overall ride-ability of the vehicle. • Suspension problems will effect wear and tear of the vehicle and drivability. • Steering and alignment effect tire wear and drivability. • Steering and alignment interact to control a vehicle. • Fundamental operations of manual transmissions. 	<ul style="list-style-type: none"> • What are sources of a vehicle’s emissions and how are they controlled? • How are modern fuel systems impacting efficiency? • Why is knowledge of thermal dynamics important in understanding cooling systems? • Why are oil rating systems used? • What are the impacts of control systems applied to braking systems? • How do components of the suspension system effect each other? • What is the role of the suspension system? • How does steering and alignment effect wear and drivability? • What effect does malfunctioning parts have on steering and alignment systems? • What impact do gear ratios have on power applied to motive force? • How does clutch operation connect and disconnect the engine and manual transmission?
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	<ul style="list-style-type: none"> • Clutches and manual transmissions operate to give a vehicle power transmission and movement. 	
Acquisition		
	<p>The Basic Small Engine, Basic Hand Tools, and Safety Students will know...</p> <ul style="list-style-type: none"> • The basic parts and function of a simple engine and its major functions. • The function and operation of a four-stroke and two-stroke engine. • Different types of engine designs and their uses. • Advantages and disadvantages of two-stroke and four-stroke engines. • The appropriate uses and practices for personal protective equipment. <p>Engine Fundamentals and Design Students will know...</p> <ul style="list-style-type: none"> • Operating principles of internal and external combustion engines. <p>Basic Electricity/Electronics Students will know...</p> <ul style="list-style-type: none"> • Principles of electricity. • How electricity functions in electronic components. 	<p>Students will be skilled at...</p> <ul style="list-style-type: none"> • Selecting, identifying, and using appropriate hand tools and power tools. • Identifying the basic components of a small engine and describe the function of each. • Selecting and using tools safely while following shop safety rules. • Safe handling of hazardous materials. • Lubricating a four-stroke engine. • Reassembling and disassembling small engines. • Trouble shooting and resolving problems through practice experiences using science and math concepts. <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • Explaining the function of a two-stroke and four-stroke engine. • Identifying different types of engine design. • Testing and diagnosing engine compression and determining the necessary action. <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • <u>Solving electrical problems using Ohms’s Law.</u> • <u>Identifying basic electric and electric terms and components.</u>

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	<ul style="list-style-type: none"> • Basic electric and electronic terms and components. <p>Ignition Systems, Computer Systems Students will know...</p> <ul style="list-style-type: none"> • The function of major ignition system components. • How a computer uses sensor inputs to determine correct outputs. • How electronics, ignition systems, and computers operate to efficiently control a vehicle. • The use of scan tools and how they simplify reading of trouble codes. • How to describe the input, processing, and output sections and operation. <p>Charging Systems, Starting Systems Students will know...</p> <ul style="list-style-type: none"> • Charging systems replenish battery voltage. • The difference between DC alternator and AC generator. 	<ul style="list-style-type: none"> • <u>Checking for shorts, opens, and grounds.</u> • <u>Measuring resistance, voltage, and current.</u> • Check problems in electrical systems using a test light, voltmeter, oscilloscope, and wiring schematic. • Diagnosing and repairing lighting systems. • Repairing/replacing lights, sockets, wires, and switches. <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • Conducting engine performance tests using engine analyzers and determining necessary actions. • Performing on-board diagnostics and read trouble codes with a scan tool. • Inspecting, repairing, and replacing primary and secondary ignition components. • Adjusting ignition systems to manufacture’s specifications. • Inspecting, cleaning, and replacing spark timing controllers. • Removing, cleaning, and inspecting alternator and determining necessary action. • Repairing/replacing internal alternator or generator components. <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • <u>Cleaning and inspecting battery clamps, cables, and connectors.</u> • <u>Performing battery condition tests.</u> • <u>Charging and installing a battery.</u> • <u>Jump starting a vehicle.</u>
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	<ul style="list-style-type: none"> • Basic parts of the charging system and starting system. <p>Emission Controls Students will know...</p> <ul style="list-style-type: none"> • A vehicle’s emission is controlled by sensors, actuators, computer control modules, and the catalytic converter. • Through the vehicle’s computer system, sensors, and actuators control vehicle emissions. • Vehicle emissions are controlled by sensors, actuators, the computer control module, and the catalytic converter. <p>Fuel Injection Systems Students will know...</p> <ul style="list-style-type: none"> • The components of a fuel injection system. • The advantages of a fuel injection system vs. a carburetor system. • How electronic throttle body injection systems operate. • Fuel injection and throttle body systems control the efficiency and environmental impact of a modern vehicle engine. • The advantages of gasoline injection. <p>Cooling Systems, Lubrication Students will know...</p> <ul style="list-style-type: none"> • The functions of the cooling system. 	<ul style="list-style-type: none"> • Repairing/replacing charging system components. <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • Diagnosing emission control systems and determining necessary actions. • Diagnosing and repairing exhaust system problems. • Inspecting, cleaning, and replacing positive crankcase ventilation systems and components. • Inspecting, cleaning, and replacing air management system components. • Identifying how sensors and actuators control vehicle emissions. • Utilizing a scanner to test diagnostic trouble codes. <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • Inspecting, cleaning, and replacing inlet air temperature control system components. • Inspecting, cleaning, and replacing intake manifold heat controls. • Comparing and contrasting the advantages, differences, and similarities of various types of injection systems. <p>Students will be skilled at ...</p>
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	<ul style="list-style-type: none"> • Cooling system parts and solutions protect the engine from wear, overheating, and freezing. • Lubrication system parts and lubricants protect the engine from wear. • The appropriate rating of engine oil to use. • The importance of anti-freeze and coolant. <p>Brakes, Anti-Lock Brakes, Traction, and Stability Control</p> <p>Students will know...</p> <ul style="list-style-type: none"> • The major parts and operational features of a vehicle brake system (including a typical anti-lock brake system). • The difference between disc and drum brakes. • Brake systems differ from vehicle to vehicle. • Common brake problems associated with a vehicle. • The purpose of anti-lock brakes. • Traction and stability control systems help control the vehicle. <p>Suspension</p> <p>Students will know...</p> <ul style="list-style-type: none"> • The major components of the suspension system. • The role the suspension plays in the overall drivability of the vehicle. 	<ul style="list-style-type: none"> • Inspecting and testing service engine cooling systems and components and determining necessary action. • Draining, flushing, and pressure testing the cooling system. • Diagnosing problems with the cooling and lubrication systems. <p>Students will be skilled at ...</p> <ul style="list-style-type: none"> • Diagnosing and determining necessary actions of hydraulic, drum and disc brake systems. • Inspecting master cylinder and hydraulic lines of the system. • Inspecting, testing, and replacing switches, valves, and control devices. • Removing, cleaning, and inspecting drum brake assemblies. • Repairing, replacing, and adjusting drum brake assemblies. <p>Students will be skilled at ...</p> <ul style="list-style-type: none"> • Inspecting and diagnosing front suspension systems to determine necessary actions. • Inspecting and replacing front and rear shock absorbers and stabilizer assemblies. • Repairing, replacing, and adjusting wheel bearings. • Dismounting, inspecting, repairing, and mounting tire and wheel assemblies.
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	<p>Steering Students will know...</p> <ul style="list-style-type: none"> • Tire alignment angles: caster, camber, and tow. • Alignment effects steering and tire wear. • Accurate steering is effected by physical conditions, tire wear and alignment. <p>Drive Systems Students will know...</p> <ul style="list-style-type: none"> • Basic parts and the operation of an automatic transmissions, drive shafts, transfer cases, differentials, transaxles, and CV axles. • How an automatic transmission shifts gears. • The types and purpose of manual transmission fluid. • Major parts of a transaxle assembly. • The operation of a transfer case. 	<ul style="list-style-type: none"> • Rotating and balancing wheel assemblies. • Performing pre-alignment inspection and measure vehicle ride height; determine necessary action. <p>Students will be skilled at ...</p> <ul style="list-style-type: none"> • Diagnosing steering, tire wear, and alignment problems, and determining necessary actions. • Rotate tire according to manufacturer’s recommendations. • Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly. <p>Students will be skilled at ...</p> <ul style="list-style-type: none"> • Constructing and deconstructing a clutch. • Explaining the operation of an automatic transmission, drive shaft, transfer cases, differentials, transaxles, and CV axels. <p style="text-align: center;"><u>Underlined skills are those identified for all three levels.</u></p> <p style="text-align: center;"><u>Level II & III students are expected to perform the additional skills not underlined.</u></p>
Evidence		
Evaluative Criteria	Assessment Evidence	
	<p>Shop Safety Quiz, Basic Hand Tools, Basic Electricity and Electronics.</p> <ul style="list-style-type: none"> • Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. • Construction and testing of simple circuit board. • Ignition System Fundamentals. 	

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- Fundamentals of all automotive systems.
- On-Board Diagnostics and Scan Tools.
- Drive shafts and transfer cases.
- Differentials.
- Transaxle and front drive axle.
- Engine parts analysis check list – hands-on experience.
- Type written manual – service form.
- NATEF.org Maintenance and Light Repair Task List.
- ASE Certification – National Institute for Automotive Service Excellence.
- EETC 2 Stroke.
- OSHA Pre and Post Assessment.

Resources

<http://www.natef.org>

[ASE: Automotive Service Excellence](#)

SkillsUSA.org

Small Engines (by Briggs and Stratton), 3rd Edition, by Bruce Radcliff,

American Technical Publishers, Inc.

Assessments available for SkillsUSA

<http://www.skillsusa.org/contests.html>

AK EED Safety Manual: <http://www.eed.state.ak.us/tls/CTE/docs/resources/safetymanual.pdf>

Kawasaki Education Material

Polaris Education Material

Yamaha Education Material