AORSI Instructor Guide

Course Title: Engines & Power Systems (ENGPS)

Duration: 8 Hours (blended: classroom + shop)

Audience: Off-road operators, technicians, and instructors

Course Overview

This course provides a technical dive into how engines and drivetrains power off-road vehicles. Students learn to recognize systems, diagnose issues, and maintain reliability in the field. Mastery of these fundamentals improves both operator confidence and vehicle performance in diverse conditions.■187†AORSI-100-ENGPS Workbook†L1-L9■

Learning Objectives (Instructor Notes)

- Differentiate between gas, diesel, and electric powertrains.

- Understand how 4WD/AWD systems work.

- Perform basic diagnostics on drivetrain systems.

Module 1: Engine Types & Basics (ICE vs Electric) (2 hrs)

- Teach gasoline vs diesel vs electric drivetrains, fuel systems, ignition, cooling, and torque differences.

- Course Design Suggestion: Chart pros and cons of each system.

- Exercise: List three advantages of diesel engines in off-road applications.

- Reflection: Why might electric drivetrains change the future of off-road power systems?■187†AORSI-100-ENGPS Workbook†L11-L25■

Module 2: Transmissions & Transfer Cases (2 hrs)

- Teach manual, automatic, CVT transmissions and transfer cases (high/low ranges).

- Course Design Suggestion: Demonstrate gear engagement and transfer case use.

- Exercise: Explain the difference between part-time and full-time 4WD systems.

- Reflection: Why is understanding transfer case function essential for safe recovery operations?■187†AORSI-100-ENGPS Workbook†L27-L43■

Module 3: Differentials & Lockers (2 hrs)

- Teach open, limited-slip, and locking differentials.

- Course Design Suggestion: Demonstrate traction loss with open vs locked differential.

- Exercise: Identify three advantages of lockers in technical terrain.

- Reflection: Why must lockers be disengaged during normal driving conditions?■187†AORSI-100-ENGPS Workbook†L45-L59■

Module 4: Field Diagnostics & Troubleshooting (2 hrs)

- Teach systematic troubleshooting of drivetrain issues, checking fluids, noises, gear engagement.

- Course Design Suggestion: Simulate breakdowns for team troubleshooting.

- Exercise: Draft a troubleshooting checklist for drivetrain issues.

- Reflection: Why is documenting temporary field repairs critical for long-term safety?■187†AORSI-100-ENGPS Workbook†L61-L79■

Instructor–Student Alignment Chart

This chart aligns instructor activities with student workbook exercises for easy reference.■187†AORSI-100-ENGPS Workbook†L11-L79■

Module	Instructor Focus	Student Workbook Activity
1: Engine Types	Show cutaways and explain torque/maintenance differences	Create pros/cons of gas, diesel, electric■187†AORSI-100-EN
2: Transmissions	Demonstrate shifting and transfer case use	Explain part-time vs full-time 4WD■187†AORSI-100-ENGPS
3: Differentials	Use models or demos to show traction differences	List advantages of lockers■187†AORSI-100-ENGPS Workb
4: Diagnostics	Stage breakdowns for student troubleshooting	Draft drivetrain troubleshooting checklist■187†AORSI-100-E

Final Assessment

Task: Perform a hands-on evaluation of drivetrain function, including shifting, transfer case operation, and differential engagement. Written exam includes questions on powertrains, transmissions, differentials, and field diagnostics.■187†AORSI-100-ENGPS Workbook†L81-L95■

Instructor Preparation Checklist

- Provide cutaway diagrams or real engine samples.
- Set up transfer case and transmission demonstrations.
- Prepare differential models or animations.
- Stage simulated breakdowns for team troubleshooting.

Suggested Timing

- Introduction – 10 min
- Module 1 – 120 min
- Module 2 – 120 min
- Module 3 – 120 min
- Module 4 – 120 min
- Final Assessment – 30 min
- Wrap-up & Questions – 10 min