AORSI-100-TIRE Workbook

Overview

This course covers the science and practical considerations of tires, wheels, and alternative track systems, focusing on terrain suitability, safety, and maintenance. Students will learn how to select, maintain, and repair tires for a variety of conditions, as well as when alternative traction systems are appropriate.

Learning Objectives

- Understand tire construction, tread types, and load ratings.
- Learn how air pressure impacts traction and performance.
- Perform proper tire repair and wheel alignment procedures.
- Evaluate when tracks or specialty tires are necessary.

Module 1: Tire Anatomy & Ratings (Load, Ply, Speed)

Tires are built from multiple layers, including tread, sidewall, belts, and beads. Students must understand how construction impacts performance, durability, and safety. Load ratings define how much weight a tire can safely carry, ply ratings reflect strength, and speed ratings define safe operating ranges. Misunderstanding ratings can lead to blowouts, premature wear, or unsafe handling.

Instructor Guidance: Use real tire samples to show differences in tread depth, ply construction, and sidewall strength.

Course Design Suggestion: Provide students with tire spec sheets and have them decode load, ply, and speed ratings.

Exercise: Identify the load rating and ply construction of a sample tire and explain its suitability for off-road use.

Reflection Question: Why are load ratings critical when outfitting vehicles for heavy off-road gear loads?

Module 2: Terrain Matching – Mud, Sand, Rock, Snow

Different terrains require specialized tread patterns and rubber compounds. Mud tires feature deep, aggressive lugs; sand tires have wider footprints; rock tires require reinforced sidewalls; and snow tires rely on siping and softer compounds. Selecting the wrong tire for terrain reduces traction and increases risks.

Instructor Guidance: Display examples of terrain-specific tires and highlight differences in tread design.

Course Design Suggestion: Assign teams to recommend tires for specific terrain scenarios such as desert dunes or icy trails.

Exercise: Match five different tire treads with the terrains they are best suited for.

Reflection Question: How does mismatching tires to terrain increase the likelihood of recovery operations?

Module 3: Tire Pressure Management Systems (TPMS, Beadlocks)

Air pressure directly affects tire footprint, traction, and durability. Lower pressures improve grip in sand and rocks but increase puncture risk. Beadlocks secure tire beads when pressures drop extremely low. TPMS provides real-time data to prevent failures. Students should practice adjusting pressures for terrain while monitoring heat buildup and sidewall flex.

Instructor Guidance: Demonstrate deflation and reinflation techniques using portable compressors and deflators.

Course Design Suggestion: Have students perform pressure adjustments for multiple terrains, recording performance differences.

Exercise: Document recommended pressure ranges for mud, sand, and rocky terrain.

Reflection Question: Why is beadlock installation recommended only for experienced operators?

Module 4: Tracks, Specialty Setups & Emergency Repair

In some cases, traditional tires are insufficient. Track systems provide extreme flotation in snow or mud but add complexity, cost, and strain on drivetrains. Specialty tires, such as run-flats, offer redundancy for remote travel. Students must also practice emergency repair techniques like plug kits, patches, and field inflations.

Instructor Guidance: Showcase track systems and specialty tire options with diagrams or real examples if available.

Course Design Suggestion: Conduct a lab where students repair a punctured tire using plugs and patches.

Exercise: List the advantages and disadvantages of using track systems over traditional tires.

Reflection Question: Why is it important to practice emergency tire repair before field operations?

Final Assessment

Task: Complete a tire identification quiz where students decode ratings and match treads to terrain. Additionally, perform a hands-on inflation and repair drill using deflation tools, compressors, and plug kits. Sample written questions include:

1. What does a tire’s ply rating indicate?

2. Which tire type provides the best performance in sand, and why?

3. How does lowering air pressure improve traction in rocks?

4. What are the risks of operating at extremely low tire pressures?

5. Why are track systems not practical for all off-road users?

Duration: 4 hours