



Automotive Mechanical Faculty



Curriculum with Course Syllabus

Department: TRANSMISSION SYSTEMS

Semester 1-4 | Integrated Core + ATA 2040 Electives + SIWES + Capstone

TRN 101: Transmission Basics

Credit Hours	3 (2T/1P)
Course Description	Introduction to transmission systems, covering manual gearbox principles and operation.
Syllabus (Topics/Modules)	<ol style="list-style-type: none"> 1. Principles of power transmission 2. Manual gearbox types 3. Gear ratios & torque flow 4. Common transmission layouts
Practical Activities / Lab Work	Disassemble manual gearbox Measure gear ratios Reassemble gearbox
Assessment Methods & Learning Outcomes	Assessment: Practical test (40%) Quiz (20%) Final exam (40%) Learning Outcomes: Explain transmission basics Identify manual gearbox types Perform strip/rebuild of manual gearbox



Automotive Technical Academy (ATA)

TRN 102: Clutch & Driveline Systems

Credit Hours	3 (1T/2P)
Course Description	Study of clutch types, operation, and driveline components including propeller shafts and differentials.
Syllabus (Topics/Modules)	<ol style="list-style-type: none">1. Clutch principles & components2. Clutch actuation systems3. Propeller shafts & joints4. Differential systems
Practical Activities / Lab Work	Service clutch system Adjust clutch linkages Inspect driveline components
Assessment Methods & Learning Outcomes	Assessment: Lab work (40%) Mid-term (20%) Final exam (40%) Learning Outcomes: Describe clutch operation Service clutch systems Maintain driveline components

TRN 103: Digital Twin Simulation

Credit Hours	3 (1T/2P)
Course Description	Application of digital twin technologies in transmission training and virtual diagnostics.
Syllabus (Topics/Modules)	<ol style="list-style-type: none">1. Introduction to digital twin2. Virtual modeling of gearbox3. Simulated fault detection4. Integration with AI tools
Practical Activities / Lab Work	Run digital twin simulations Detect simulated faults Use AI integration for analysis
Assessment Methods & Learning Outcomes	Assessment: Simulation project (50%) Participation (20%) Exam (30%) Learning Outcomes: Operate digital twin systems Diagnose faults virtually Use AI tools with simulations



Automotive Technical Academy (ATA)

TRN E1: AI Predictive Maintenance

Credit Hours	2 (1T/1P)
Course Description	AI applications in predicting transmission system faults and maintenance scheduling.
Syllabus (Topics/Modules)	<ol style="list-style-type: none"> 1. Predictive maintenance principles 2. AI tools for fault prediction 3. Case studies on gearbox failures 4. Data analysis in transmission systems
Practical Activities / Lab Work	Analyze gearbox data using AI tools Predict maintenance schedules
Assessment Methods & Learning Outcomes	<p>Assessment: Project (40%) Lab work (30%) Exam (30%)</p> <p>Learning Outcomes: Apply predictive maintenance concepts Use AI tools to predict gearbox failures</p>

TRN 201: Automatic Transmission Technology

Credit Hours	3 (1T/2P)
Course Description	Study of automatic transmission systems, torque converters, and planetary gearsets.
Syllabus (Topics/Modules)	<ol style="list-style-type: none"> 1. Principles of automatic transmissions 2. Torque converters 3. Planetary gearsets 4. Hydraulic control systems
Practical Activities / Lab Work	Disassemble automatic transmission Inspect torque converter Assemble planetary gearset
Assessment Methods & Learning Outcomes	<p>Assessment: Lab work (50%) Assignments (20%) Exam (30%)</p> <p>Learning Outcomes: Explain automatic transmission operation Service torque converters Maintain planetary gearsets</p>



Automotive Technical Academy (ATA)

TRN 202: Mechatronic Systems

Credit Hours	3 (1T/2P)
Course Description	Covers mechatronic control systems in modern transmissions, including sensors and actuators.
Syllabus (Topics/Modules)	<ol style="list-style-type: none"> 1. Transmission mechatronics overview 2. Sensors & actuators 3. Hydraulic-electronic integration 4. Diagnostics of mechatronic faults
Practical Activities / Lab Work	<p>Test mechatronic components</p> <p>Use scan tools for diagnostics</p> <p>Service actuator systems</p>
Assessment Methods & Learning Outcomes	<p>Assessment:</p> <p>Lab test (40%)</p> <p>Exam (40%)</p> <p>Assignments (20%)</p> <p>Learning Outcomes:</p> <p>Diagnose mechatronic systems</p> <p>Troubleshoot sensors & actuators</p> <p>Perform mechatronic servicing</p>

TRN 203: AI in Transmission Diagnostics

Credit Hours	3 (1T/2P)
Course Description	Use of AI in diagnosing faults in transmission systems and improving service accuracy.
Syllabus (Topics/Modules)	<ol style="list-style-type: none"> 1. AI tools for diagnostics 2. Case studies on AI detection 3. Signal interpretation 4. Fault prediction with AI
Practical Activities / Lab Work	<p>Apply AI software to transmissions</p> <p>Simulate diagnostic cases</p> <p>Interpret AI output</p>
Assessment Methods & Learning Outcomes	<p>Assessment:</p> <p>Case study project (40%)</p> <p>Exam (30%)</p> <p>Lab (30%)</p> <p>Learning Outcomes:</p> <p>Use AI diagnostic tools</p> <p>Interpret AI results</p> <p>Apply AI to improve service accuracy</p>



Automotive Technical Academy (ATA)

TRN E2: Robotics in Assembly

Credit Hours	2 (1T/1P)
Course Description	Introduction to collaborative robotics (cobots) in transmission assembly and repair tasks.
Syllabus (Topics/Modules)	<ol style="list-style-type: none"> 1. Basics of cobotics 2. Cobots in assembly tasks 3. Safety in human-robot collaboration 4. Transmission repair with cobots
Practical Activities / Lab Work	<p>Operate cobots in simple tasks</p> <p>Demonstrate safe cobot collaboration</p>
Assessment Methods & Learning Outcomes	<p>Assessment:</p> <p>Lab work (50%)</p> <p>Exam (30%)</p> <p>Project (20%)</p> <p>Learning Outcomes:</p> <p>Explain cobotics principles</p> <p>Operate cobots in transmission tasks</p> <p>Apply cobots for assembly/repair</p>

TRN 301: SIWES Internship

Credit Hours	6 (0T/480P)
Course Description	Supervised industrial attachment in workshops, OEM transmission plants, or service centers.
Syllabus (Topics/Modules)	<ol style="list-style-type: none"> 1. Industry orientation 2. Hands-on maintenance tasks 3. Transmission fault diagnostics 4. Report writing
Practical Activities / Lab Work	<p>Work under industry supervision</p> <p>Maintain logbook</p> <p>Participate in repair & diagnostics</p>
Assessment Methods & Learning Outcomes	<p>Assessment:</p> <p>Industry evaluation (40%)</p> <p>ATA supervisor (30%)</p> <p>Final report/presentation (30%)</p> <p>Learning Outcomes:</p> <p>Apply ATA-acquired skills in industry</p> <p>Demonstrate teamwork & professional ethics</p> <p>Document industrial training in logbook</p>



Automotive Technical Academy (ATA)

TRN 401: Capstone Project

Credit Hours	6 (1T/8P)
Course Description	Final year project integrating transmission knowledge with innovation, e.g., AI predictive maintenance tools or digital twin-based gearbox testing.
Syllabus (Topics/Modules)	<ol style="list-style-type: none">1. Proposal & planning2. Project design/build3. Execution & documentation4. Final defense
Practical Activities / Lab Work	Prototype gearbox testing project Develop AI fault-prediction tool Write & present report
Assessment Methods & Learning Outcomes	Assessment: Proposal (20%) Execution (40%) Report (20%) Defense (20%) Learning Outcomes: Integrate transmission knowledge into project Demonstrate innovation & creativity Apply AI/digital twin tools Defend findings professionally

