

Contents :

1. Introduction

p. 1

- Automotive control systems
- Motivation for automotive control
- Integrated engine, driveline and vehicle control
- Modeling and controller design
- Measurement and practical implementation

2. Thermodynamic Engine Cycles

p. 9

- Thermodynamic principles
- Thermodynamic cycles
- Ideal combustion engines
 - Spark-ignition (SI) engine
 - Diesel engine
 - Seiliger process
 - Comparison of different engine concepts
- Alternative combustion engines
 - Gas turbine
 - Stirling engine
 - Steam engine
 - Potential of different fuels and propulsion systems

The detailed contents confirm these subsections and their page locations.

3. Engine Management Systems

p. 43

- Basic engine operation
 - Effective work
 - Air-fuel ratio
 - Engine concepts
 - Ignition of air-fuel mixtures
 - Flame propagation
 - Energy conversion
- Engine control
 - Emissions of internal combustion engines
 - Fuel measurement
 - Intermittent fuel injection
 - Injection-time calculation
 - Air mass per combustion cycle

- Intake-manifold dynamics
- Engine operating variables
- Engine management
- Electronic engine control

The book uses engine models to establish the relationships required for practical control-system design.

4. Diesel Engine Modeling

p. 75

- Diesel-engine principles
- Diesel combustion
- Diesel-engine modeling
- Air-path and fuel-path dynamics
- Engine torque and speed
- Model parameters
- Dynamic engine behavior

This is one of the areas specifically **expanded in the 2nd edition**.

5. Engine Control Systems

p. 99

This chapter contains several important practical control applications:

- **5.1 Lambda Control**
 - Stoichiometric operation of SI engines
 - Oxygen sensor
 - Engine model for lambda control
 - Lambda control circuit
 - Measurement results
 - Adaptive lambda control
- **5.2 Idle Speed Control**
 - Energy-conversion model and torque balance
 - State-space control
 - Measurement results
- **5.3 Knock Control**
 - Knocking in SI engines
 - Knock sensors
 - Signal processing
 - Knock control
 - Adaptive knock control
- **5.4 Cylinder Balancing**
 - Residuals at stationary engine operation
 - Residuals during engine transients
 - Adaptation of the injection map

These detailed subsections are explicitly listed in the 2005 contents record.

6. Diagnosis

p. 149

- Diagnosis of automotive engines
- Need for on-board diagnosis
- OBD II
- Introduction to diagnosis
- Fault detection
- Fault isolation
- Residual generation
- Diagnostic signals
- Model-based diagnosis
- Practical automotive diagnostic systems

The 2005 edition specifically adds/expands **diagnosis**, including OBD II.

7. Driveline Control

p. 193

- Driveline modeling
- Modeling of neutral gear
- Driveline control
- Driveline speed control
- Control for gear shifting
- Anti-jerking control for passenger cars
- Clutch and transmission dynamics
- Drive-shaft torsion
- Transmission speed and torque

The detailed contents specifically identify **7.2 Modeling of Neutral Gear**, **7.3 Driveline Control**, **7.4 Driveline Speed Control**, **7.5 Driveline Control for Gear-Shifting**, and **7.6 Anti-Jerking Control for Passenger Cars**.

8. Vehicle Modelling

p. 301

- Vehicle dynamics
- Vehicle body
- Longitudinal vehicle dynamics
- Lateral vehicle dynamics
- Tire-road interaction
- Wheel dynamics
- Forces and moments
- Vehicle equations of motion
- Modeling of vehicle behavior

9. Vehicle Parameters and States

p. 351

- Vehicle parameters
- Vehicle states
- Vehicle mass and inertia
- Center of gravity
- Tire parameters
- Slip
- Side-slip angle
- Yaw rate
- Parameter estimation
- State estimation

The second edition specifically introduces/expands **vehicle modeling and parameter estimation**.

10. Vehicle Control Systems

p. 409

- Vehicle control
- Longitudinal control
- Lateral control
- Vehicle dynamics control
- Feedback control
- Stability-related control functions
- Controller implementation

11. Road and Driver Models

p. 425

- Road models
- Road disturbances
- Driver models
- Driver behavior
- Driver–vehicle interaction
- Vehicle response to road and driver inputs

The Springer record confirms the chapter sequence and page ranges: **Vehicle Modelling pp. 301–349; Vehicle Parameters and States pp. 351–408; Vehicle Control Systems pp. 409–424; Road and Driver Models pp. 425–464.**

Appendices and reference material

Appendix A — Appendix — p. 465

Appendix B — Nomenclature — p. 483

Bibliography — p. 497

Index — p. 507

