

Contents

1 Tyres and Wheels	1
1.1 Terms	2
1.2 Tyres	9
1.2.1 Requirements	10
1.2.2 Basics	10
1.2.3 Influence on Driving Behaviour	14
1.2.4 Choosing of Tyres	51
1.2.5 Tire Data	55
1.2.6 Types of Tyres	55
1.2.7 Valve	57
1.3 Wheels	59
1.3.1 Requirements	59
1.3.2 Designation of Wheels	59
1.3.3 Types of Wheels	61
1.3.4 Choice of Wheel Size	65
1.4 Wheel Mounting	67
References	75
2 Suspension	77
2.1 Function	78
2.2 Terms and Kinematic Quantities	83
2.2.1 Terms	84
2.2.2 Development Goals	106
2.3 Parts of the Suspension	123
2.3.1 Wheel-Carrying Elements	129
2.3.2 Linkages	129
2.3.3 Joints	132
2.3.4 Wheel Bearing	135
2.3.5 Calculation	155
References	160

3	Springs and Dampers	163
3.1	Springs	164
3.1.1	Function and Choice	164
3.1.2	Spring Actuation	174
3.1.3	Spring Calculation	176
3.2	Damper	181
3.2.1	Oscillations	181
3.2.2	Vibration Dampers (Shock Absorbers)	190
3.3	Stabilisers, Anti-Roll Bars, AE: Sway Bars	216
3.3.1	Calculation	220
3.3.2	Design of Anti-Roll Bars	228
3.3.3	Examples of Anti-Roll Bars	234
	References	237
4	Types of Suspensions	239
4.1	Suspensions of Passenger Cars	240
4.2	Racecar Suspensions	241
4.2.1	Double Wishbone Suspension	241
4.2.2	Parts of Double Wishbone Axles	252
4.2.3	McPherson Axle	292
4.2.4	Beam Axle (Rigid Axle)	293
4.3	Examples of Race Car Suspensions	295
4.4	Data	300
	References	303
5	Steering	305
5.1	Requirements	306
5.2	Terms	308
5.2.1	Steer Angle, Ackermann Angle	308
5.2.2	Parameters of Steering Geometry	314
5.2.3	Steering Ratio	322
5.2.4	Steering Assistance	330
5.3	Steering Shaft	335
5.4	Steering Gear	347
5.4.1	Rack-and-Pinion Gear	351
5.5	Transmitting Device and Axle Bearing	357
5.6	Shimmy (Vibrations of the Steering System)	369
5.7	Four-Wheel Steering	375
5.8	Alternative Steering Systems	376
	References	379

6	Braking System	381
6.1	General	382
6.2	Brake System Requirements	384
6.3	Physical Basics	384
6.4	Brake Constructions and Arrangements	399
6.4.1	Drum Brake	399
6.5	Parameters	402
6.5.1	Brake Sensitivity and Friction	402
6.6	Components of Braking Systems	413
6.7	Brake Installation	443
6.8	Design Criteria for Braking Systems	444
6.9	Standards	446
	References	446
7	Comparison Series: Racing	449
7.1	Introduction	449
7.2	Development <i>Process</i>	450
7.3	Development <i>Goals</i>	451
7.4	Research and Development (R&D)	452
7.5	<i>Costs</i>	453
7.6	Environmental Protection	455
7.7	Technology	456
7.7.1	Frame and Body	456
7.7.2	<i>Engine</i>	457
7.7.3	<i>Power Train</i>	459
7.7.4	<i>Suspension</i>	460
	References	462
	Appendix	465
	Glossary	465
	References	482
	Index	485