Index

ABS braking	395,400	88,134,341,360,413,417,452,462,634
Adhesion	82	Carcass distortion 78
Aerodynamic drag	g 525	Caster length (trail) 8,312,320,544
Aligning torque, o	definition 3	Centre of gravity 24,312,544,546,551
Aligning torque, s	steady state	Cheli 462
4,96,113,	177,183,188,190,208	Characteristic equation 30,298,331
Aligning stiffness	, definition 5	Characteristic speed 26
Aligning stiffness	97,159,234	Characteristics, cf. tyre characteristics
Axes system	4,64	Clark 388,465
Axle characteristic	cs 7,12,37,43	Cleat 484
Axle cornering sti	ffness 9,11	Coefficient of friction 5,6,83,134,186
Axle side force	11	Combined slip 104,134,164,181,434
D. 1.1	D - 1 404	Combined slip with F_x as input 170
Badalamenti and l	•	Composite slip 183,434,438
Bakker	172,176,179	Conicity 81,137,198
Bandel	472,486,487	Constitutive relations 461
Bayer	518	Contact centre 64,206
Bayle	172,182	Contact length 99,161,291,461,632
Belt distortion	78,134	Contact patch mass 359,396,452
Belt dynamics	277,413,452	Contact patch slip model 414,422,427
Bernard	86,92	Contact width 461
Berritta Berzeri	518 435	Cornering force, cf. side force
	· • •	Cornering on uneven road 293,367
Bessellik 2	218,261,295,312,318,	Cornering stiffness, definition 5
Dinal	320,322,360,631 518	Cornering stiffness 6,97,234
Biral Böhm		vs normal load 5,159,176,270,368
Brake lever arm	90,92 466,468	loss (side force) 293,367,372,374
Braking	51,148,395,505,557	Cornering stiffness string model 270
Breuer	51,148,393,303,337	Cossalter 518
Brockman and Bra		Critical speed 26,29,58,151,542,559
Bruni	462	Cross section 78,100,206,521
Brush model	86,90,94,124,413	Curvature factor 174
Diusii inodei	00,70,74,124,413	Cut-off frequency 238,241,242,416
Calspan flat track	test stand 209	
Camber angle	71,73,78,81,118,124,	Damping:
163,176,206,2	261,342,353,452,505	vehicle handling 31
Camber stiffness	80,162	shimmy 299,301,315
Camber reduction	factor 80,119,146	tyre 328,346,375,407,462,474,636
Capsize mode	542	motorcycle steer 546
Carcass compliand	ce	Davis 486

Deflections (tyre)	76,147	Frank	91
Delft-Tyre	172,512,514	Frequency response:	
Delft dyn. brake and cleat rig 470,591		vehicle handling	33,365
Delft flat plank 236,350,497,499,590		string model	237,239,272
Delft pendulum test stand	472,592	- and approximatio	ns 257,258
Delft tyre test trailer	209,587	string with approx.	dynamics 281
Delft University of Techno	logy	longitud. force (sin	gle point) 383
	412,470,592	long. force (SWIFT	
Delft yaw oscillation test ri	g 472,593	lateral force (SWIF	T) 419,478
Differential equations:		aligning torque (SV	VIFT) 426,478
string approximations	253,255	steering vibrations	393,394
single contact point	341,360	SWIFT (zero belt n	nass) 441-446
contact patch 420,4	127,430,459	braked wheel	400
 with carcass complian 	nce 436	Freudenstein	92,146
Dijks	186	Fritz	218
Discrete Element Model	514,515	Fromm	90,92,295
Dugoff	85,92	FTire	414,512,514
Effective inputs	413,483		
Eff. road pl. height/slope 4		Geometric filtering	505
Effective rolling radius, def		Gillespie	16
Effective rolling radius	iiitioii 3,03		88,414,484,514
101,208,376,466,468,4	105 /100 632	Goncharenko	261
Eigenvalues:	.93,499,032	Gong	484,486
vehicle handling	30	Gough	100,483
motorcycle	540,577	Green function	87
	587,590,592	Growth (centrifugal)	464,632
Empirical model	85,156	Guan, Dihua	88
	324,327,467	Guntur	400
	13,483,512	Guo	88,92
Equations of motion:	13, 103,512	Gyroscopic couple	06 212 250 544
vehicle handling 20,21,	.23.148.364	275,302,30	06,313,358,544
car-trailer	56	Handling curve	37
shimmy	296,304	Handling diagram	37,43,569,572
steering vibrations	392	Hasegawa	518
braked wheel system	398	_	19,236,350,373
contact patch mass	432,456	Ho and Hall	218
rigid belt	454	HSRI (UMTRI)	85
motorcycle	537	Human rider model	518,539,548
-		Hurwitz stability criteriu	ım 57,298,308
Fancher	85	Hysteresis	375
Fiala	86,90,92	Iffolohomoon	E10
Finite Element Model	515	Iffelsberger	518
Forissier	179	Inclination angle, cf. car	•
Four wheel steer	36	Influence function	87

Instability:	Magic Formula with turn slip 191
divergent 29,58,152,300,560	Magic Formula motorcycle 528,578
oscillatory 58,300,388	Manoeuvring 54,518
Jagt, van der 205,207,211,360,395,448	Mastinu 88
Jianmin 375	Maurice 219,412,421,435,473,477
Julien 90	Meier-Dörnberg 218
	MF-Tyre 513
Karlsruhe University of Techn. 590	Michelin 172,179
Katayama 518	Milliken 16,53,55,157
Keldysh 218,261	Milliken Research Associates 53
Kluiters 218,250	Mitschke 16,466
Kobiki 476	Modes of vibration 319,323,389,474
Koenen 518,577	Moment method 53
Kortüm 16	Moreland 218,262
Laerman 219	Motorcycle dynamics 517
Lafon 179	Motorcycle tyre force/ and moment
Lagrange's equations 17,56,512,532	527,579,583
Lateral acceleration response 35	Mousseau 484
Lateral force, cf. side force	MTS Flat Trac III 209
Lateral slip 73	MTS Flat Trac Roadway Simulator 55
Lateral slip stiffness, cf. cornering	Natural frequencies:
stiffness	vehicle handling 31
Lateral stiffness	tyre out-of-plane 277,280,476,512
standing tyre 234	tyre in-plane 462,474,476,512
suspension 305,310	shimmy 301,319
Lateral c.g. offset (motorcycle) 562	steering vibration 389,393
Lee 199	Neutral steer 25
Limit-cycle 295,330,334	Neutral steer point 24
Lippmann 483	Nishimi 518
Load transfer 9,14,526	Non-dimensionalisation 157
Load variations 284,446	Non-holonomic constraint 305
Loaded radius 207,377,465,468,631	Non-lagging part 355,360
Longitudinal force, definition 3	Non-linear system 46,330,333
Longitudinal force 4,187,189,375	Non-steady state 217,414
Longitud. slip, def. 3,65,67,68,73,103	Non-uniformity 375,379
Longitudinal slip 101,414	Normal force, load 62,190,358,463,632
Longitudinal slip stiffness, def. 3	Normal deflection 207,358,464,507,631
Longitudinal slip stiffness 6,104	Nyquist plot:
Lugner 16	tyre measurements 274,275,282
C	string model 243,244
Magic Formula 6,44,156,160,169,	and approximations 259,260
345,397,412,413,436,437,513	- with gyroscopic couple 277
Magic Formula, cosine version 178	string with approx. dynamics 282
Magic Formula Tyre Model 172,184	appron. ajmaninos 202

SWIFT (zero belt i	mass) 442	Response successive steps 362,481,483
Observats	412 402 404	Rider robot 518,54°
Obstacle	412,483,484	Rigid ring 413,455
Oertel	414,484,515	Rigid wheel 305,492
Olley	295	Rise time 32
Oosten, van	176,631	RMOD-K 414,512,513
Out of roundness	379	Road camber 50:
Oversteer	25,37	Road unevenness 375,403,412,483
Overturning couple		Rogers 218,248
63,64,190,2	203,206,211,554	Roll angle motorcycle 553
Parameter assessment		Roll axis
	470,477,631,512	Roll steer/camber 10,22
Parameters Mag. Form.		Rolling resistance 375,455,465,63
Parking manoeuvre	447,451	Rolling resist. moment 62,64,190,469
Path curvature 25,118,1	,	Rotation transformation 523
		Ruijs 518,547
Pevsner Phase plane	16 46	•
Phase plane		Sakai 92,93
Physical model 85.		Savkoor 90
Ply-steer	81,137,198	Scaling factors 186
Pneumatic trail, definit	ion 5	Schlippe,von
Pneumatic trail	20 161 155 121	217,226,246,247,281,295,299
6,28,45,98,108,1		Schmeitz 487,491,493,500,502,509
Point of intersection	64	Segel 6,16,85,217,219,226,246,355
Pothole response (SWII		Self aligning torque, cf. aligning torque
Pressure distribution	83,97,134	Self-excited oscillations 295
Pure slip	4	Separatrix 48,334
Radial stiffness	464,632	Shang, Jin 88
Radt	16,157	Shape factor 174
Regression technique	176	Sharp 88,517,518
Reimpell	186,206,464	Sharpness factor 176
Relaxation length:	160,200,404	Shimmy 295,337
single point model	2/1 2/9 261	Side force, definition
	22,238,242,260	Side force 4,96,187,189,527
string moder 2		Side force steer 9,10
vehicle handling	22,472	Side slip, definition 3
vs normal load	270	Side walls 100,462
		Sign convention 3,65,612
contact patch mode		Similarity modelling method 157,397
- with carcass comp		Single point approximations
motorcycle tyre	527,542	linear 251,297,340
	13,452,456,463	semi-non-linear 345,404
Residual torque	162,177,199	fully non-linear 346,405
Response to cleats (SW		restr. fully non-linear 348,406,411
Response to load var. 2	84,350,371,374	enhanced model 359,396,406,411
		cimaneed model 333,330,400,411

Single track vehicle	517	String model 217,220,222
Singular point	41,48	String with tread elements 263,284
Sliding region	97,122	Suspension compliance 305,310,389
Sliding velocity	77,82	SWIFT model 412-516,513,629,631
Slip angle, definition	3,4,69	Synchronous oscillation 336,337
Slip angle	23,96,525	System of axes, cf. axes system
Slip components	69,106	System of axes, ci. axes system
Slip point	65,101,356,378	Takahashi 219,348,369,373,518
Slip radius	65	Tandem 'cam' technique 493,501
Slip ratio, cf. longitud		Tandem rear axle 44
Smiley	217,246,248	Test facilities 470,586
Speed of revolution		TNO-Automotive 172,412,587,631
•	68 lar 67,72	Toe angle 10
Speed of rolling, angu	•	Torsional stiffness:
Speed of rolling, linea		standing tyre 234,242
• ' • '	69,191,342,448	motorcycle 542
Stability:	16 00 41 47 40	Trailer 55
vehicle handling		Trajectory 47
car-trailer	57,59	Transfer function:
motorcycle	540	
Stability boundary 42	2,58,300,314,322	string model 227 string with tread elements 268
Standing waves	466	
Standstill (stop, start)	344,404,447	Transient slip values 345,396,538
State space	333	Transient tyre behaviour 344
Steady-state cornering	29,37,550,568	Tread compliance 413
Steady-state response:		Tread simulation model 134,613
string model	230	Tread width effect
vehicle handling	29,37	131,134,242,252,301
Steer angle	25,553,556	Truck 44,146,212,337
Steer compliance	9,10,11	TU-Delft 172
Steer stiffness	302	Turn slip 71,73,139,145,
	451,547,563,573	185,191,236,342,353,430
Steering vibrations	389	Turn-slip stiffness 235,243
Step response (tyre):	30)	Turning 118,124,146,447
measured	236,351,354	TYDEX 631
string model	230,233	Tyre characteristics (steady-state):
and approximation		example 4,5
single point model	,	brush model 99,109,110,112,116
SWIFT (zero belt		brush model, spin 125,132
vehicle handling	366,518	brush model, camber 127
motorcycle	547,549	Magic Formula 181,182,183,210
		Mag. Form. mot.cycle 530,569,584
Stepan	299	Magic Form. with turn slip 197,439
Strackerjan	218,276	measured 114,169,210,583
Straight tangent appro	x. 246,250,296	non-dimensionalised 157

similarity method	168,169	Vries, de	472,474,529,578
spin, turn slip	144,145,192	Wavelength 216.	371,396,413,483,510
string with tread ele	ments 266	Weave mode	542
tread simulation mo	del 141-145	Weighting function	
Tyre dynamics	277,452	Weir	518
Tyre inertia	277,452,636	Wet road	6,186
Tyre models	84	Wheel lock	148,166,349,408
Tyre pull	202	Whipple	517
UMTRI	85	Willumeit	88
Unbalance	336,337	Wind-up oscillation	ons 408
Understeer	25,37,553,556	Winkler	45
Understeer at braking	51	Wisselman	518
g	• •	Wobble mode	542
Vehicle handling	16	37 1	2.5
Vehicle model	8,16	Yaw velocity response	onse 35
Vehicle slip angle respor	ise 35	Zegelaar 2	19,412,461,468,471,
Vehicle stability, cf. stab	ility	477,484,4	487,491,497,500,505
Volvo	172		