

## TABLE OF CONTENTS

<b>Preface . . . . .</b>	<b>v</b>
<b>0. Introduction. Vibrating strings . . . . .</b>	<b>1</b>
<b>1. Linear evolutionary problems . . . . .</b>	<b>7</b>
1.1. The diagram $V \subset H = H' \subset V'$ . . . . .	7
1.2. The equation $u'' + Au = 0$ . . . . .	10
1.3. The wave equation . . . . .	11
1.4. A Petrovsky system . . . . .	13
1.5. Another Petrovsky system . . . . .	15
<b>2. Hidden regularity. Weak solutions . . . . .</b>	<b>18</b>
2.1. A special vector field . . . . .	18
2.2. The wave equation. The multiplier method . . . . .	19
2.3. The first Petrovsky system . . . . .	24
2.4. The second Petrovsky system . . . . .	29
<b>3. Uniqueness theorems . . . . .</b>	<b>35</b>
3.1. The wave equation. Dirichlet condition . . . . .	35
3.2. The first Petrovsky system . . . . .	40
3.3. The second Petrovsky system . . . . .	44
3.4. The wave equation. Mixed boundary conditions . . . . .	47
<b>4. Exact controllability. Hilbert uniqueness method . . . . .</b>	<b>53</b>
4.1. The wave equation. Dirichlet control . . . . .	53
4.2. The first Petrovsky system . . . . .	57
4.3. The wave equation. Neumann or Robin control . . . . .	59
<b>5. Norm inequalities . . . . .</b>	<b>63</b>
5.1. Riesz sequences . . . . .	63
5.2. Formulation of the results . . . . .	65
5.3. Proof of theorem 5.3 . . . . .	69
5.4. Proof of theorem 5.5 . . . . .	73
<b>6. New uniqueness and exact controllability results . . . . .</b>	<b>75</b>
6.1. A unique continuation theorem . . . . .	75
6.2. The wave equation. Dirichlet condition . . . . .	77
6.3. The first Petrovsky system . . . . .	79

6.4. The second Petrovsky system. Uniqueness theorems . . . . .	81
6.5. The second Petrovsky system. Exact controllability . . . . .	83
6.6. The wave equation. Neumann or Robin condition . . . . .	85
<b>7. Dissipative evolutionary systems . . . . .</b>	<b>90</b>
7.1. Maximal monotone operators . . . . .	90
7.2. The wave equation . . . . .	91
7.3. Kirchhoff plates . . . . .	97
<b>8. Linear stabilization . . . . .</b>	<b>103</b>
8.1. An integral inequality . . . . .	103
8.2. Uniform stabilization of the wave equation I . . . . .	104
8.3. Links with the exact controllability. Russell's principle . . . . .	108
8.4. Uniform stabilization of the wave equation II . . . . .	111
8.5. Strong stabilization. LaSalle's principle . . . . .	114
8.6. Uniform stabilization of the wave equation III . . . . .	116
8.7. Uniform stabilization of Maxwell's equations . . . . .	118
<b>9. Nonlinear stabilization . . . . .</b>	<b>124</b>
9.1. A nonlinear integral inequality . . . . .	124
9.2. Uniform stabilization of the wave equation I . . . . .	126
9.3. Uniform stabilization of the wave equation II . . . . .	134
9.4. Uniform stabilization of Kirchhoff plates . . . . .	135
<b>10. Internal stabilization of the Korteweg-de Vries equation</b> . . . . .	<b>144</b>
10.1. Well-posedness and conservation laws . . . . .	144
10.2. Uniform stabilization by linear feedbacks . . . . .	146
<b>References . . . . .</b>	<b>152</b>