

Table of Contents

Content	Page No.
Acknowledgements	VII
Preface	IX
Table of Contents	XII
Figures caption	XIX
Tables caption	XXVI
Nomenclature	XXVIII
 Chapter 1 Fundamental Concepts and Introduction	
1.1 Fluid, Types of Fluid	1
1.2 Newtonian and non-Newtonian fluid	1
1.3 Classification of Non-Newtonian fluid	1
1.3.1 Time Independent Fluids	2
1.3.2 Time dependent Fluids	2
1.3.3 Visco-elastic fluids	2
1.4 Micro-polar fluid	3
1.5 Second Grade fluid	3
1.6 Casson fluid	4
1.7 Types of Fluid flow	4
1.7.1 Steady and unsteady fluid flow	4
1.7.2 Compressible or incompressible fluid flow	4
1.7.3 Rotational or Irrotational flow	4
1.8 Magnetohydrodynamics Flow	4
1.9 Heat transfer	5
1.10 Mass Transfer	6
1.11 Porous media	7

1.12	Chemical reaction effects	8
1.13	Soret effects	9
1.14	Hall current effects	9
1.15	Fundamental Equations	9
1.15.1	Equation of continuity	9
1.15.2	Equation of motion	10
1.15.3	Energy equation	10
1.15.4	Mass transfer equation	10
1.15.5	Maxwell equations	10
1.16	Constitutive equations of micro-polar fluid	11
1.17	Constitutive equations of Second grade fluid	11
1.18	Constitutive equations of Casson fluid	12
1.19	Laplace Transform Technique (LTT)	12
1.19.1	Advantages of this methods	13
1.19.2	Laplace transforms technique in MHD	13
1.19.3	Solving PDE using Laplace transform technique	14
1.20	Review of Relevant Literature	14
1.21	Dimensionless Parameters	20

Chapter 2 Study of heat transfer effects on unsteady free convective MHD flow

2.1	Introduction of the Problem	22
2.2	Novelty of the Problem	23
2.3	Mathematical Formulation of the Problem	23
2.4	Numerical solution	25
2.5	Steady state Analytical solution	25
2.6	Result and Discussion	27
2.7	Conclusion	42

Chapter 3 Study of heat and mass transfer effects on unsteady free convective MHD flow in porous medium.

3.1 Section I: Heat and Mass transfer in MHD Casson fluid flow past over an oscillating vertical plate embedded in porous medium with ramped wall temperature

3.1.1	Introduction of the Problem	43
3.1.2	Novelty of the Problem	45
3.1.3	Mathematical Formulation of the Problem	45
3.1.4	Solution of the Problem	47
3.1.4.1	Solution for plate with ramped wall temperature	47
3.1.4.2	Solutions for plate with isothermal temperature	49
3.1.4.3	Nusselt number	51
3.1.4.4	Sherwood number	51
3.1.4.5	Skin friction	51
3.1.5	Result and Discussion	53
3.1.6	Concluding Remark	65

3.2 Section II: Heat and Mass transfer in MHD Second grade fluid flow with ramped wall temperature through porous medium

3.2.1	Introduction of the Problem	66
3.2.2	Novelty of the Problem	66
3.2.3	Mathematical Formulation of the Problem	67
3.2.4	Solution of the Problem	69
3.2.4.1	Solutions for plate with ramped wall temperature	70
3.2.4.2	Solution for plate with isothermal temperature	71
3.2.4.3	Nusselt number	72
3.2.4.4	Sherwood number	72
3.2.4.5	Skin friction	72

3.2.5	Result and Discussion of the Problem	73
3.2.6	Concluding Remark	80

Chapter 4 Study of thermal radiation and chemical reaction effects on MHD flow in porous medium

4.1 Section I: Radiation and Chemical reaction effects on MHD Casson fluid flow past an oscillating vertical plate embedded in porous medium

4.1.1	Introduction of the Problem	82
4.1.2	Novelty of the Problem	82
4.1.3	Mathematical Formulation of the Problem	83
4.1.4	Solution of the Problem	85
4.1.4.1	Solutions for plate with ramped wall temperature	86
4.1.4.2	Solution for plate with isothermal temperature	87
4.1.4.3	Nusselt number	89
4.1.4.4	Sherwood number	89
4.1.4.5	Skin friction	89
4.1.5	Result and Discussion	91
4.1.6	Concluding Remark	101

4.2 Section II: Effect of thermal radiation and chemical reaction on MHD Casson fluid flow past over an exponentially accelerated vertical plate embedded in porous medium

4.2.1	Introduction of the Problem	103
4.2.2	Novelty of the Problem	104
4.2.3	Mathematical Formulation of the Problem	104
4.2.4	Solution of the Problem	106
4.2.4.1	Solutions for plate with ramped wall temperature	107
4.2.4.2	Solution for plate with isothermal temperature	107

4.2.4.3 Nusselt number, Sherwood number and Skin friction	109
4.2.5 Result and Discussion	111
4.2.6 Conclusion	119

Chapter 5 Study of heat generation effects on MHD flow in porous medium.

5.1 Introduction of the Problems	120
5.2 Novelty of the Problem	121
5.3 Mathematical Formulation of the Problems	121
5.4 Solution of the Problems	123
5.4.1 Solutions for plate with ramped wall temperature	123
5.4.2 Solution for plate with isothermal temperature	123
5.4.3 Nusselt number	125
5.4.4 Sherwood number	125
5.4.5 Skin friction	125
5.5 Result and Discussion	127
5.6 Concluding Remark.	136

Chapter 6 Study of thermo-diffusion effects on unsteady MHD flow in porous medium

6.1 Section I: Soret and heat generation effects on MHD Casson fluid flow past an oscillating vertical plate embedded in porous medium

6.1.1 Introduction of the Problem	137
6.1.2 Novelty of the Problem	138
6.1.3 Mathematical Formulation of the Problem	138
6.1.4 Solution of the Problem	141
6.1.4.1 Solution of the problem for ramped temperature and ramped surface concentration	141
6.1.4.2 Solution of the problem for isothermal temperature and ramped surface concentration	141

6.1.4.3 Solution of the problem for isothermal temperature and constant concentration	141
6.1.4.4 Nusselt number, Sherwood number and Skin friction	141
6.1.5 Result and Discussion	142
6.1.6 Concluding Remark	151

6.2 Section II: Effect of thermo-diffusion and parabolic motion on MHD Second grade fluid flow with ramped wall temperature and ramped surface concentration

6.2.1 Introduction of the Problem	152
6.2.2 Novelty of the Problem	153
6.2.3 Mathematical Formulation of the Problem	153
6.2.4 Solution of the Problem	155
6.2.4.1 Solutions for plate with ramped wall temperature	155
6.2.4.2 Solution for plate with isothermal temperature	156
6.2.4.3 Nusselt number, Sherwood number and Skin friction	157
6.2.5 Result and Discussion	158
6.2.6 Concluding Remark	167

Chapter 7 Study of hall current effects on MHD flow in rotating system through porous medium

7. 1 Section I: Heat generation/Absorption and Hall effects on MHD Casson fluid flow past an oscillating vertical plate with ramped wall temperature in rotating system through porous medium

7.1.1 Introduction of the Problem	168
7.1.2 Novelty of the Problem	169
7.1.3 Mathematical Formulation of the Problem	169
7.1.4 Solution of the Problem	172
7.1.4.1 Solutions for plate with ramped wall temperature	172

7.1.4.2 Solution for plate with isothermal temperature	172
7.1.4.3 Nusselt number, Sherwood number and Skin friction	173
7.1.5 Result and Discussion	174
7.1.6 Concluding Remark.	185
 7.2 Section II: Soret and Hall effects on MHD flow of radiating and chemically reactive Casson fluid past an exponentially accelerate moving vertical plate with ramped wall temperature and ramped surface concentration in rotating system	 186
7.2.1 Introduction of the Problem	186
7.2.2 Novelty of the Problem	186
7.2.3 Mathematical Formulation of the Problem	187
7.2.4 Solution of the Problem	189
7.2.4.1 Solution of the problem for ramped temperature and ramped surface Concentration	189
7.2.4.2 Solution of the problem for constant temperature with constant surface Concentration	189
7.2.4.3 Nusselt number	192
7.2.4.4 Sherwood number	192
7.2.4.5 Skin friction	192
7.2.5 Result and Discussion	194
7.2.6 Concluding Remark	206
 Conclusion and future scope	 207
Appendix	208
Bibliography	218
List of published/accepted research work	234
List of communicated research work	236
List of presented research work in conferences	237