ACKNOWLEDGEMENTS

First and foremost, I owe my deepest thanks to the Almighty. In humility, I thank You for Your grace and mercy that allowed me to complete this milestone.

My work bears the imprints of several distinguished persons of diverse fields and without their support; this research would not have been possible. To acknowledge such help support within writing a framework is a pleasure though difficult task.

My first and earnest acknowledgement must go to my venerated teachers, Dr. Jaimal Singh Khamba, Professor and Director in University College of Engineering, Punjabi University, Patiala and Dr. Sehijpal Singh, Professor and Head, Department of Mechanical Engineering, Guru Nanak Dev Engineering College, Ludhiana. I would like to express my deepest sense of Gratitude for their support, continuous advice, intelligent approach, constructive criticism, whole hearted and ever available help and encouragement throughout the Ph.D. program. Thanks to them from the depth of emotions for their invaluable and incessant support. Without their support, encouragement, fruitful discussions and guidance, this work would never have been possible. With their support, I was able to sustain my enthusiasm for the research despite many adversities.

I am extremely thankful to Mr. B. S. Sangha, General Manager, Institute of Auto Parts and Hand Tools (IAPT), Ludhiana, India for his valuable suggestions and acknowledge the help rendered by him in carrying out the cryogenic treatment of samples and providing machining and testing facilities for experimentation.

This research at various times was supported by Saru Precision Wires Pvt. Ltd. Meerut, UP, India. I also acknowledge the support rendered by department of Mechanical and Industrial Engineering, IIT Roorkee and Department of Mechanical Engineering, IIT Ropar to allow me use their experimental facilities.

I am thankful to Dr. M. S. Saini, Director, Guru Nanak Dev Engineering College, Ludhiana for the support and encouragement. In addition, I thank all my
faculty colleagues, office staff, friends, well–wishers and other resource persons, who
have immensely contributed in compilation of the research work in the present form.

I am extremely grateful to my family for showering their love, inspiration, emotional support, understanding, persistence, prayers and endless encouragement to pursue this research work. Thank you for always being there and for making this pursuit worthwhile.

JATINDER KAPOOR