The thesis entitled “An Approach towards Reducing Transmit Signal Power Consumption in Digital Communication by Use of Low Overhead Multiple Error Correction Code” is submitted for the award of the degree of doctor of philosophy in Computer Science, Faculty of Engineering and Technology, Jagannath University, Jaipur. It embodies the investigations carried out under the guidance and supervision of Dr. Vivek Kumar Sharma, Professor, Department of Mathematics, Faculty of Engineering and Technology, Jagannath University, Jaipur.

The entire work reported in the present thesis consisting of seven chapters including the introduction chapter, is based on the following research papers:


The references have been indicated in thesis by serial number and listed in the order in which they are used. The tables, figures, algorithms, and equations are numbered in such a way that the digit before period refers to chapter number and digits after period shows their serial number. Practical implementation of
proposed algorithms/ error correction codes were carried out in MATLAB and results were depicted through graphs and tables.

The main objective of this thesis is twofold: firstly to minimize communication overhead and secondly to design block code and convolutional code which reduce transmit signal power consumption. This thesis focuses on LBC and CC codes which are used in terrestrial, space, and satellite communication. This work is devoted to the problem of high signal power consumption and communication overhead of error control bits (parity bits). The redundant overhead requires high bandwidth but simple encoding decoding algorithms and low overhead code requires less bandwidth but complex encoding decoding process.

Firstly, communication overhead analysis was performed for existing most popular codes like Hamming code, BCH code, RS code, Turbo code, FUSEC, and DECC. On the basis of LBC designing strategy some modifications were made in calculation of parity bits. This thesis presents BER performance for un-coded and for proposed block coded system.

Secondly, for designing convolutional code constraint length, code rate, and generator polynomial were selected and effects of these parameters were discussed. Thesis presents the selection process of generator polynomial by BER performance. The high code rate gives low overhead therefore code rate 1/2, 1/3, and 1/4 a list of good generator polynomial are presented.

Finally, BER performance and signal power consumption for un-coded and proposed block and convolutional coded system are presented. The power gain is estimated for un-coded and block code and presented according to BER level. The power gain by convolutional code for code rate 1/2, 1/3, and 1/4 are calculated and presented with compared to un-coded system.