## **CONTENTS**

| S.NO      | TITLE   | PAGE NO. |
|-----------|---|----------|
|           | Acknowledgements                                | iv       |
|           | Abstract  | V        |
|           | List of Abbreviations                           | viii     |
|           | List of Figures                                 | ix       |
|           | List of Tables                                  | X        |
| Chapter 1 | Significance and Basics of Power Systems        | 1-5      |
| 1.1       | Introduction                                    | 1        |
| 1.2       | Basics of Power Systems                         | 2        |
| 1.3       | Power Transmission Lines                        | 3        |
| 1.4       | Problem Statement                               | 4        |
| Chapter 2 | Background and Related Work                     | 6-15     |
| 2.1       | Introduction                                    | 6        |
| 2.2       | Faults on Transmission Lines                    | 6        |
|           | 2.2.1 Series Faults                             | 6        |
|           | 2.2.2 Shunt Faults                              | 6        |
| 2.3       | Causes of Electric Faults                       | 8        |
| 2.4       | Literature Survey                               | 9        |
| 2.5       | Survey of Method                                | 13       |
|           | 2.5.1 Fault Classification Techniques           | 13       |
|           | 2.5.2 Fault Location Identification Techniques  | 14       |
| 2.6       | Performance Metrics                             | 15       |
| Chapter 3 | Machine Learning                                | 16-26    |
| 3.1       | Introduction                                    | 16       |
| 3.2       | Artificial Neural Networks                      | 17       |
|           | 3.2.1 Importance and Learning Techniques of ANN | 20       |
|           | 3.2.2 Characteristics of ANN                    | 21       |
|           | 3.2.3 Advantages and Disadvantages of ANN       | 21       |
| 3.3       | Deep Neural Networks                            | 22       |
| 3.4       | Recurrent Neural Networks                       | 24       |
| Chapter 4 | Simulations                                     | 27-32    |
| 4.1       | Tools Used                                      | 27       |

|           | 4.1.1 MATLAB/SIMULINK                    | 27    |
|-----------|--|-------|
|           | 4.1.2 NeuroSolutions                     | 27    |
| 4.2       | Data Generation                          | 28    |
| 4.3       | Network Training                         | 29    |
|           | 4.3.1 Fault detection and classification | 29    |
|           | 4.3.2 Fault location identification      | 31    |
| 4.4       | Network Testing                          | 31    |
|           | 4.4.1 Fault detection and classification | 31    |
|           | 4.4.2 Fault location identification      | 32    |
| Chapter 5 | Results and Discussions                  | 34-37 |
| 5.1       | Results                                  | 33    |
| 5.2       | Conclusions                              | 33    |
| 5.3       | Future Scope                             | 34    |
| 5.4       | Finance and Project Management           | 34    |
|           | 5.4.1 Hardware                           | 34    |
|           | 5.4.2 Software                           | 34    |
|           | 5.4.3 Time Management                    | 35    |
|           | 5.4.4 Societal and Environmental Impact  | 35    |
|           | References                               | 36    |