

CONTENT	Page No.
LIST OF FIGURES	i-v
LIST OF TABLES	vii-viii
LIST OF SYMBOLS AND ABBREVIATION	ix-x
CHAPTER I	
INTRODUCTION	1-20
1.1 Introduction	3-9
1.2 Formulation of research problem and objectives	9-10
1.3 Thesis outline	11
References	12-20
CHAPTER II	
BANDWIDTH ENHANCEMENT IN LOW-PROFILED SIW INTEGRATED E-PATCH ANTENNA ARRAY WITH INBUILT CALIBRATION LINES	21-40
2.1 Introduction	23-24
2.2 Design and simulation	24-33
2.2.1 SIW integrated unit antenna element	24-27
2.2.2 Analysis of the SIW integrated E-shaped element in array environment	28
2.2.3 2×8 antenna array with inbuilt calibration line	28-30
2.2.4 8×8 antenna array with inbuilt calibration line	30-32
2.2.5 Simulated scan performance of 8×8 antenna array with calibration line	32-33
2.3 Implementation and performance evaluation	33-37
2.3.1 Fabrication of the proposed 8×8 antenna array with inbuilt calibration line	33-34
2.3.2 Performance study of the fabricated antenna array	34-37
2.4 Chapter summary	37
References	38-40
CHAPTER III	
MITIGATION OF MUTUAL COUPLING IN LINEAR ARRAY SYSTEMS INCORPORATING METASURFACE SUPERSTRATE	41-64
3.1 Introduction	43-44
3.2 Decoupling mechanism in metasurface design	44-45
3.3 Design and simulation	46-53

CONTENT	Page No.
3.3.1 Metasurface unit cell	46-48
▪ Parametric analysis	
3.3.2 1×3 antenna array	48-49
3.3.3 1×3 antenna array-metasurface assembly	49-52
3.3.4 1×7 array-metasurface assembly	52-53
3.4 Implementation and performance evaluation	54-60
3.4.1 S_{11} and radiation pattern measurement technique	54
3.4.2 Fabrication and performance study of 1×3 antenna array and metasurface assembly	55-59
3.4.3 Fabrication and performance study of 1×7 antenna array and metasurface assembly	59-60
3.5 Chapter summary	60-61
References	62-64
CHAPTER IV	
LOW-POWERED PROGRAMMABLE BEAM STEERING IN PATCH ANTENNA ARRAY	65-84
4.1 Introduction	66
4.2 Design and simulation	66-75
4.2.1 Metasurface unit cell	66-69
4.2.2 Single antenna with metasurface superstrate	70-73
▪ Single patch antenna	
▪ Patch antenna-metasurface assembly	
▪ Simulation result	
4.2.3 1×4 patch antenna array with metasurface superstrate	73-75
▪ Simulation result	
4.3 Implementation and measurement	75-81
4.3.1 Single antenna-metasurface assembly	75-78
1×4 antenna array-metasurface assembly	
▪ Fabrication	
▪ Radiation pattern measurement	
4.3.2 1×4 antenna array-metasurface assembly	79-81
▪ Radiation pattern measurement	
4.4 Chapter Summary	81-82
References	83-84

CONTENT	Page No.
CHAPTER V	
FLUIDIC-BASED PHASE RECONFIGURATION TECHNIQUE USING EMBEDDED SLOT-COUPLED TRANSMISSION LINES	85-103
5.1 Introduction	87
5.2 Design and simulation	87-95
5.2.1 Slot-coupled microstrip structure	87-88
5.2.2 Simulation results	89
5.2.3 Fluidic channel incorporated slot-coupled microstrip structure	89-91
5.2.4 Fluidic channel design and placement	91-95
▪ Fluid selection and its microwave characterization	
▪ Placement of fluidic channel	
▪ Performance study for different modes of fluid injection	
▪ Field analysis	
5.3 Implementation and experimental validation	96-102
5.3.1 Fabrication process	96-97
▪ Substrate preparation	
▪ Epoxy-based fluidic channel realization	
5.3.2 Experimental verification of effective dielectric constant with injected DI water	97-99
5.3.3 Performance study of the slot-coupled microstrip structure with fluidic channels	99-102
5.4 Chapter summary	102
References	103
CHAPTER VI	
ACHIEVEMENTS AND FUTURE DIRECTION	105-116
Publications	117-118
Appendix-I	119-130
Appendix-II	131-142