Contents	
Acknowledgement	iii
List of Publications	vi
List of Figures	XV
List of Tables	xvi
CHAPTER 1	
INTRODUCTION	1
1.1 Introduction	2
1.2 Literature survey	3
1.3 Accelerator Driven Sub-critical system (ADSs)	4
1.4 Nuclear reactions	8
1.4.1. Neutron induced reactions	8
1.5 Motivation	8
1.6 Objective	10
1.7 Content of the present thesis	10
References	11
CHAPTER 2	
EXPERIMENTAL DETAILS	15
2.1 Introduction	16
2.2 Particle accelerators	16
2.2.1 FOTIA, Van-De-Graff, BARC: Construction and working	17
principle	17
2.2.2 Experimental details of the irradiation done at FOTIA	17
2.2.3 Irradiation set-up at six meter height of BARC-TIFR Pelletron:	•
Construction and working principle	20
2.2.4 Experimental details using irradiation set-up at six meter height	20
of BARC-TIFR Pelletron	20
2.3 Neutron sources	23
2.3.1 Fission	23
2.3.2 Neutron sources based on (α, n) reaction	23
2.3.3 Neutron sources based on accelerated charged particle	23

	2.3.4 Photo-neutron sources	24
2.4	Target preparation	24
	2.4.1 Preparation of targets by rolling technique	24
	2.4.2 Preparation of lithium fluoride target by pelletization method	26
	2.4.2 Preparation of lithium target by rolling technique and pressing technique	26
2.5	Detection and measurement of γ -rays	26
	2.5.1 Nuclear radiation detectors	29
	2.5.2 Semiconductor detectors	29
	2.5.3 Construction and working principle of HPGe detector	29
	2.5.4 Measurement of γ-ray activity	30
2.6 1	Neutron activation technique	33
2.7 ľ	Neutron energy calculation	35
2.8 1	Neutron flux calculation	35
2.9 H	Reaction cross-section derivation	36
2.10	Error in the calculation of the cross-section	39
Refe	prences	40
CHA	APTER 3	
THE	EORETICAL ASPECTS	42
3.1 Introduction		43
3.2	TALYS	43
	3.2.1 Overview	44
	3.2.2 RIPL (Reference Input Parameter Library)	44
	3.2.3 Different nuclear models related to TALYS	45
	3.2.4 Different level densities	45
	3.2.5 How to run TALYS code	45
	3.2.6 Output quantities calculated with the help of TALYS	46
3.3 EMPIRE		47
	3.3.1 Overview	47
	3.3.2 Different nuclear reactions	48
	3.3.3 Different reaction models associated with EMPIRE	48
	3.3.4 Description of the code	48
	3.3.5 How empire executes	49

	3.3.6 Input parameters	50
3.4	Data libraries	52
	3.4.1 EXFOR	52
	3.4.2 ENDF	52
Ref	erences	53
CH	APTER 4	
ME	CASUREMENT OF ¹⁹⁷ Au(n,γ) ¹⁹⁸ Au REACTION CROSS-	54
SEC	CTIONS USING ACTIVATION TECHNIQUE	54
4.1	Introduction	55
4.2	Experimental method	55
4.3	Calculations	61
	4.3.1 Calculation of neutron flux	61
	4.3.2 Calculation of cross-section	61
	4.3.3 Uncertainty calculation	63
4.4 Calculation of 197 Au(n, γ) 198 Au reaction cross-sections		63
4.5 Result and discussion		66
4.6 Conclusion		67
References		70
CH	APTER 5	
ME	ASUREMENT OF THE ⁵⁴ Mn(n, γ) ⁵⁵ Mn REACTION CROSS-	72
SEC	CTIONS USING ACTIVATION TECHNIQUE	12
5.1	Introduction	73
5.2	Experimental details	73
5.3	γ-ray spectroscopy	75
5.4	Calculation of neutron energy	78
5.5	Calculation of neutron flux	79
5.6	Calculation of the 54 Mn(n, γ) 55 Mn reaction cross-sections	80
5.7	Result and discussion	80
5.8	Conclusion	85
References		86
CH	APTER 6	
ME	ASUREMENT OF ²³² Th(n, y) AND ²³⁸ U(n, y) REACTION CROSS-	89
SECTIONS USING ACTIVATION TECHNIQUE		

6.1 Introduction		
6.2 Experimental method		
6.3 Data analysis		
6.3.1 Calculation of neutron energy, flux and 232 Th(n, γ) and 238 U(n, γ)		
reaction cross-sections	98	
6.3.2 Co-variance analysis	101	
6.4 Result and discussion		
6.5 Conclusion		
References		
CHAPTER 7		
SUMMARY AND CONCLUSION	115	
7.1 Summary and conclusion	116	
7.2 Future scope	118	
Reprints of Published papers		