Figure No	Figure Captions	Page No
Figure 1.1	Components of Biosensor	2
Figure 1.2	Classification of Sensors/Biosensors	8
Figure 1.3	Potentiometric titration curves for a platinum indicator electrode vs SCE [Electrochemical methods by Bard et al.]	9
Figure 1.4	Excitation signal for Voltammetry	10
Figure 1.5	Current potential curves at platinum electrodes for Fe ²⁺ titration [Electrochemical methods by Bard et al.]	11
Figure 1.6	Impedance plot for an electrochemical system (showing regions of mass-transfer and kinetic control are found at low and high frequencies).	13
Figure 1.7	H ₂ O ₂ detection scheme using HRP/CeO ₂ -rGO modified glassy carbon electrode [Radhakrishnan et al., 2015].	18
Figure 1.8	An example of immunosensor	19
Figure 1.9	Showing DNA structure and interaction between base pairs	21
Figure 1.10	A typical DNA biosensor	22
Figure 1.11	Showing a typical example of microbial cell biosensor [Hassan et al ., 2012]	23
Figure 1.12	Showing Immobilization methods	28
Figure 1.13	Total biosensors market: Percent Revenues (World) [Frost & Sullivan]	28
Figure 1.14	Applications of Biosensors	28
Figure 2.1	Flowchart showing steps for isolation of DNA	41
Figure 2.2	Schematic representation (a) Polished gold electrode with alumina slurry. (b) Electropolymerization of 5-carboxyindole. (c) Carbadiimide coupling of probe of hlyA gene of L. monocytogenes over poly-5-carboxyindole. (d) Target DNA	41

	hybridization on poly-5-carboxyindole modified electrode.	
Figure 2.3A	Cyclic voltammograms of 5-carboxyindole over gold electrode in acetonitrile and TBAP for 10 cycles at the scan rate 50 mVs ⁻¹ .	43
Figure 2.3B	Cyclic voltammogram of poly-5-carboxyindole coated over gold electrode in acetonitrile and TBAP (monomer free) solution at various scan rates.	43
Figure 2.4	Optical images of poly 5-carboxyindole electrode surface (left images) and modified electrode (right images) formed by immobilizing probe of <i>hlyA</i> gene of <i>Listeria monocytogenes</i> .	43
Figure 2.5	Enrichment of Bacteria (a) Absence of <i>L. monocytogenes</i> (b) Presence of <i>L. monocytogenes</i> in Fraser broth.	46
Figure 2.6	Colonies of Listeria monocytogenes on PALCALM Agar	47
Figure 2.7	Nyquist plots showing effect of hybridization time on change in impedance of poly 5-carboxy indole/ssDNA immobilized electrode for hybridization event with a fixed concentration of 10 ⁻⁸ M DNA for various time periods: (a) 0 min (b) 5 min (c) 10 min (d) 15 min and (e) 20 min.	49
Figure 2.8	Nyquist plots for (a) poly 5-carboxyindole film, (b) poly 5- carboxyindole with probe of <i>hlyA</i> , after hybridization with (complementary) target DNA of concentration from (c) 1×10^{-12} ; (d) 1×10^{-10} (e) 1×10^{-8} (f) 1×10^{-6} and (g) 1×10^{-4} M. (B) Calibration plot for ΔR_{CT} vs. concentration of target (genomic) DNA sequence.	49
Figure 2.9	Nyquist plots for (a) Poly 5-carboxyindole with probe of $hlyA$ after hybridization event with target DNA (1x10 ⁻⁸ M), and (b) After heat treatment and dip wash.	50
Figure 3.1	Schematic of the synthesis of platinum nanomaterials.	58
Figure 3.2	Schematic illustration for the fabrication of the genosensors electrode (CS-PtNPs) assembly for DNA detection.	60
Figure 3.3	UV-Vis absorption spectrum of (a) Chitosan, (b) H_2PtCl_6 (c) Chitosan-capped PtNP.	62
Figure 3.4	FT-IR Spectra of a) Chitosan b) CS-PtNPs.	63
Figure 3.5	Cyclic voltammetric responses obtained for (A) bare GCE in 0.1M PBS at pH 7.0, (B) GCE modified with PtNPs showing	64

	characteristic CV.	
Figure 3.6	(a) TEM image of As-prepared PtNPs and (b) Corresponding SAED pattern.	65
Figure 3.7	(a) TEM image of CS-PtNPs and DNA (after interaction) (b) Corresponding disappearance of the SAED pattern.	66
Figure 3.8	Nyquist plot for (a) GCE\CS-PtNPs\24mer ssDNA\albumin and after hybridization with real sample (genomic DNA in milk sample) at concentrations of (b) 1 X 10^{-12} M, (c) 1 X 10^{-10} M, (d) 1 X 10^{-8} M, (e) 1 X 10^{-6} M, (f) 1 x 10^{-4} M. (b) Corresponding calibration plot for real sample (genomic DNA, R _{CT} . vs. log concentration (M)).	68
Figure 3.9	Nyquist plot for (a) GCE\CS-PtNPs\24mer ssDNA\albumin and after hybridization with the complementary oligomer at concentrations of (b) 1 X 10^{-12} M, (c) 1 X 10^{-10} M, (d) 1 X 10^{-8} M, (e) 1 X 10^{-6} M, (f) 1 X 10^{-4} M. (b) Corresponding calibration plot for the 24mer oligonucleotide of hlyA Listeria monocytogenes RCT vs. log concentration in M.	68
Figure 3.10	Showing Nyquist plot for GCE/PtNp@CS modified electrode immobilized with (a) ssDNA and hybridized with (b) mismatch DNA and (c) complementary DNA.	69
Figure 4.1	Schematic illustration for fabrication of the biosensor electrode (PtNPs@CS assembly for DNA detection.	74
Figure 4.2	ETEC colonies grown on EMB Agar [Courtesy: Amity university, Gwalior; Dr Anurag Jyoti Lab].	77
Figure 4.3	Amplification of ST1Gene from ETEC. [M: denotes the DNA ladder of known base pair and presence of 145 bp band confirms the presence of ST 1 gene.	78
Figure 4.4	FT-IR Spectra of (a) Chitosan and (b) CS-PtNPs (c) DNA (d) CS-PtNPs/DNA.	82
Figure 4.5	Cyclic voltammogram of PtNP/GCE (at different scan rates: 20, 80, 100, 200, 400 mV/s) in 0.1M Phosphate buffer solution containing 0.1 mM K ₃ [Fe(CN) ₆]. Inset showing the fitted anodic current versus square root of scan rate.	83
Figure 4.6	TEM images of (A) PtNP and (B) EDAX of PtNP nanoparticles.	84
Figure 4.7A	Nyquist plot for (a) GCE/CS-PtNPs/ssDNA and after	86

	hybridization with complementary target ssDNA of 145mer of concentration range from (b) $1x10^{-14}M$ (c) $1x10^{-12}M$ (d) $1x10^{-10}M$ (e) $1x10^{-8}M$ (f) $1x10^{-6}M$ (g) $1 X10^{-4}M$.	
Figure 4.7B	Corresponding calibration plot for complementary oligomer in form of R_{CT} vs. log concentration (M).	86
Figure 4.8A	Nyquist plot for (a) GCE\CS-PtNPs\ denatured ds DNA and after hybridization with real sample (genomic DNA) of concentration range from (b) $1x10^{-12}M$ (c) $1x10^{-10}M$ (d) $1x10^{-8}M$ (e) $1x10^{-6}M$ (f) $1x10^{-4}M$.	87
Figure 4.8B	Corresponding calibration plot for corresponding complementary bounded target DNA in form of R_{CT} vs. log concentration (M).	87
Figure 4.8C	Nyquist plot (a) PtNP with probe ST gene of E.coli after hybridisation event with target DNA (1×10^{-8} M) (b)After heat treatment and dip wash (showing the stability).	87
Figure 4.8D	Nyquist plot showing optimisation of hybridisation time (a) Response after 5 min (b) after 10 min (c) after 15 min (d) after 2 min.	87
Figure 4.9	Nyquist plot for (A) GCE/CS-PtNPs/ssDNA and after hybridization with complementary target ssDNA of 150 mer of concentration range from (B) $1x10^{-12}M$ (c) $1x10^{-10}M$ (d) $1x10^{-8}M$ (e) $1x10^{-6}$ M (f) $1x10^{-4}$ M.	88
Figure 4.10	Nyquist plot for (A) GCE\CS-PtNPs\ssDNA and after hybridization with complementary target ssDNA of 150 mer of concentration range from (B) $1x10^{-12}M$ (c) $1x10^{-10}M$ (d) $1x10^{-8}M$ (e) $1x10^{-6}M$ (f) $1x10^{-4}M$.	89