Mechanics is the oldest physical science that deals with both stationary and moving bodies under the influence of forces. The branch of mechanics that deals with bodies at rest is called statics, while the branch that deals with bodies in motion is called dynamics. The subcategory named fluid mechanics is defined as the science that deals with the behavior of fluids at rest (fluid statics) or in motion (fluid dynamics) and the interaction of fluids with solids or other fluids at the boundaries. Fluid mechanics is also referred as fluid dynamics by considering fluids at rest as a special case of motion with zero velocity. It has several sub disciplines including aerodynamics and hydrodynamics. Fluid dynamics has a wide range of applications, including calculating forces and moments on aircraft, determining the mass flow rate of petroleum through pipelines, predicting weather patterns, understanding nebulae in interstellar space and reportedly modeling fission weapon detonation.

The study of boundary layer flow, heat and mass transfer over an inclined plate has generated much interest from astrophysical, renewable energy systems and also hypersonic aerodynamics researchers for a number of decades. There has been a renewed interest in studying magnetohydrodynamic (MHD) flow and heat transfer in porous medium due to the effect of magnetic fields on the boundary layer flow control and on the performance of many systems using electrically conducting fluids. In addition, this type of flow having large number of applications in many engineering problems such as MHD generators, plasma studies, nuclear reactors, MHD pumps, MHD bearing and geothermal energy extractions.

The combined effects of convective heat and mass transfer on the flow of a viscous, incompressible and electrically conducting fluid has many engineering and geophysical applications such as geothermal reservoirs, drying of porous solids, thermal insulation, and enhanced oil recovery, cooling of nuclear reactor and underground energy transports. Keeping the above applications in view an attempt is made to investigate on convective heat and mass transfer in MHD boundary layer flow past an infinite porous
plate with radiation, chemical reaction, viscous dissipation and Soret effects with different conditions.

The present thesis is an investigation on “A STUDY ON CONVECTIVE HEAT AND MASS TRANSFER EFFECTS ON MHD BOUNDARY LAYER FLOW PAST AN INFINITE POROUS PLATE WITH RADIATION AND CHEMICAL REACTION”. In this thesis, a boundary layer flow of a viscous, incompressible and electrically conducting fluid past an infinite vertical porous plate has been considered. The thesis is divided into seven chapters. The basics of heat and mass transfer and the basic governing equations related to conservation of mass, conservation of momentum, energy and species diffusion are presented in chapter-1. In second chapter the survey of literature is presented. In the third chapter, an analysis of unsteady MHD mixed convection flow past an infinite vertical porous plate embedded in a porous medium in the presence of thermal radiation and chemical reaction with viscous dissipation, heat source and soret effect is performed. A uniform magnetic field acts perpendicular to the porous surface. The governing equations of this investigation are solved analytically by using a two-term harmonic and non-harmonic functions. The effects of various parameters on the velocity, temperature and concentration fields have been examined with the help of graphs. The skin friction, rate of heat transfer in the form of Nusselt number and rate of mass transfer in the form of Sherwood number are also derived and discussed through tables. In the fourth chapter, an analysis is performed on the heat and mass transfer effects of an unsteady hydromagnetic free convective boundary layer flow of viscous, incompressible, electrically conducting fluid, along a vertical plate with suction embedded in porous medium, in the presence of transverse magnetic field, by taking into account of the effects of radiation, Hall current, chemical reaction, viscous dissipation with heat source. The equations of continuity, motion, energy and mass transfer, which govern the flow field is solved by using a regular perturbation method. The expressions for velocity, temperature and concentration are obtained and discussed through graphs. The skin friction, rate of heat transfer in the form of Nusselt number and
the rate of mass transfer in the form of Sherwood number are also derived and discussed through tables.

In the **fifth chapter**, the study of non-linear MHD flow with heat and mass transfer characteristics of an incompressible, viscous, electrically conducting and Newtonian fluid over a vertical porous plate embedded in a porous medium with heat source in the presence of chemical reaction and thermal radiation effects has been analyzed. The fluid considered here is a gray, absorbing/emitting radiation, but a non-scattering medium. At time \( t>0 \), the plate temperature and concentration levels near the plate raised linearly with time \( t \). The dimensionless governing coupled, non-linear boundary layer partial differential equations are solved by Laplace transform technique. The expressions for velocity, temperature and concentration are obtained and discussed through graphs. The skin friction, rate of heat transfer in the form of Nusselt number and the rate of mass transfer in the form of Sherwood number are also derived and discussed through tables. In the **sixth chapter**, an analysis has been carried out to study the effects of Hall current and radiation of MHD free convective heat and mass transfer flow past an accelerated inclined plate with temperature and concentration in a porous medium in presence of thermal diffusion and heat source. The solutions for velocity field, temperature field and concentration distribution are obtained by using Laplace transform technique. The expressions for skin friction, Nusselt number and Sherwood number are also derived. The variations in fluid velocity, fluid temperature and species concentration are also derived. The numerical values of skin friction, Nusselt number and Sherwood number are presented in tabular form for various values of physical parameters. In the **seventh chapter**, summary, conclusions and scope for future study are presented.