Preface

Information Technology (IT) has taken the world by storm. Everyone has been influenced by IT, in every step of the life. Civil Engineers have always been adaptive in using these developments for their disciplines such as *Structural Engineering, Transportation Engineering, Water Resources Engineering, Geo-technical Engineering* and *Environmental Engine*ering. And they have achieved tremendous amount of success in many fronts. In this volume of lecture notes, we intend to deliberate on various applications of IT in different disciplines of civil engineering. This volume is the first step towards taking stock of present scenario of IT and its importance in the context of Civil Engineering Applications.

In the first section, Prof. P P Chakrabarti, introduces the present trends in IT and its future.

In the section on ***Artificial Intelligence (AI) and Knowledge Based Expert Systems (KBES)***, Dr. Sudhirkumar Barai introduces to the reader the recent developments taking place in the field of computer science in AI and KBES domain and demonstrates KBES application in instrumentation selection. This section gives an exposure to potential of AI and KBES in developing user-friendly decision support systems.

In the section on ***Fuzzy Logic***, Prof. D Nagesh Kumar introduces basics of fuzzy logic and their applications to multicriteria decision making (MCDM) problems of water resources engineering. Dr. Sudhirkumar Barai highlights the use of fuzzy logic to assess the damage of bridges through visual inspection. The concepts of fuzzy logic help in handling qualitative information.

In the section on ***Artificial Neural Networks (ANN)***, Dr. Sudhirkumar Barai discusses the Introduction and application of ANN to structural engineering. Prof. K S Reddy takes this topic further in using ANN for Pavement Engineering. Prof. D Nagesh Kumar elaborates on Recurrent Neural Networks for water resources engineering applications. The discussion on ANN applications to various disciplines of civil engineering demonstrates the strength and weakness of this technique in this section.

In the section on ***Genetic Algorithms (GA),*** Dr. L S Ramachandra gives background of basic concepts of GA and demonstrates them with engineering optimization problems. Prof. K S Reddy and Prof. D Nagesh Kumar explain in-depth about GA applications for pavement engineering and water resources engineering problems respectively. This section shows the novel applicability of GA in various disciplines of civil engineering optimization problems.

In the section on ***Parallel Processing***, Prof. Swapan Majumdar introduces the algorithms of parallel processing and demonstrates its application in Finite Element Method. Dr. Dhrubajyoti Sen gives an overview of its applications in civil engineering field.

In the section on ***Geographic Information Systems (GIS),*** Prof. A K Dikshit introduces GIS and shows its applicability to environmental engineering. Dr. V R Desai and Prof. N S Raghuvanshi & Mr. Biju A George demonstrate GIS applications to water resources engineering. This section highlights potential of GIS on some important problems of water resources and environment.

For an in-depth treatment of topic on ***Satellite Remote Sensing***, Prof. D Nagesh Kumar discusses the basics of digital image analysis and uses of this analysis in satellite images for irrigation management. This section highlights the future potential of remote sensing applications to water resources management.

Prof. A K Ray discusses computer assisted teaching systems and integration of multimedia in enhancing engineering education approach in the ***Multimedia Applications*** section.

In the section of ***Web Based Applications***, developments taking place in the field are discussed. Prof. Nirjhar Dhang explains the basics of JAVA and its application in developing Structural Analysis and Design programs for Internet applications. Dr. T I Eldho discusses web applications for hydroinformatics system. This section gives glimpses of web-based applications and shows the future potential of its applications.

The topic on ***Virtual Reality*** by Dr. C S Kumar takes reader into *Virtual World* through his virtually researched studies on this topic. This section covers various aspects of VR applications to Civil Engineering.

The section on ***General Applications*** highlights IT applications to different walks of life. The lecture notes by Prof. K S Reddy and Dr. Dhrubajyoti Sen discuss in-depth about the IT applications to transportation engineering and geotechnical engineering respectively. Dr. D Roy briefly introduces Chaos starting from its basic mathematical background and its engineering significance. Dr. Subhasish Dey talks about Computer applications in hydraulics and highlights mathematical basis and computational aspects. Dr.Sudhirkumar Barai discusses the advances in wearable computing. Prof. D Nagesh Kumar elaborates in detail on Global Position System and its applications. Finally, Prof. A K Dikshit gives an overview and discusses about Case Based Reasoning and its applications to civil engineering problems. This section covers various applications of IT to civil engineering.

The above mentioned various sections just give a global view of IT domain and its relevance to civil engineering. There is plenty of scope to embrace this technology to make a better world of civil engineering. But even from this brief summary of the emerging possibilities, it is clear that more significant impact of information technologies is yet to come.

It is the privilege of the coordinators to have contributions from some of the most acclaimed academicians of this premier institute for the compilation of this volume. Our gratitude and appreciation of their efforts, in the preparation and delivery of the lectures, are unbounded.

IIT Kharagpur
December 4, 2000

D Nagesh Kumar and Sudhirkumar Barai