

A TEXTBOOK OF
**ENERGY,
ENVIRONMENT,
ETHICS AND SOCIETY**

Dr. Harish Kumar Gupta | Kiran Gupta



**A TEXTBOOK OF
ENERGY, ENVIRONMENT, ETHICS AND SOCIETY**

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**Common to All Branches of Engineering and Technology
(Strictly According to Syllabus Approved by RGPV, Bhopal)**

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*Dedicated to
My unforgettable father
Late Amar Chand Gupta
for his enormous support, fascination,
consistent assistance and inspiration*

FOREWORD

I am very much pleased to recommend the projected work on this subject of **ENERGY, ENVIRONMENT, ETHICS AND SOCIETY** written by **Dr. Harish Kumar Gupta** and **Mrs. Kiran Gupta**. I know them personally for the last 5 years, when we were under *Fast Tract Scheme as Young Scientist Fellowship* programme for three years, which was sponsored by *Department of Science and Technology, New Delhi*. Indeed, they have performed untiring efforts to bring it into precious technological observations and supportive notes in the field of environmental engineering. Latest edition of the book pretends to be unanimously unique version, which not only explains about the recent findings and approaches applied in the field of environmental engineering, but also upgrades the skills through technical innovative points chapter-wise in every unit of this proposed book.

To explore, innovate and excel the projected work in the book will create strength among readers to accomplish their goals as and when mandatory in the field of environmental engineering. In short, directly or indirectly nobody can give the formula for success, but try this formula to conquer or to become successful- which is '**Try to please everybody and natural phenomena existing on the precious planet earth**'. The ultimate value of life depends upon universal awareness and the power of contemplation rather than upon mere survival in nature and its system. Undeniably, I feel that all contents in this edition entirely differ from the previously published books and are moderately informative, which may enhance the knowledge as well as sensible aptitude among students, beginners, learners, professionals, academicians and various other research organizations; industries associated with the anticipated work.

I wish them all success in their life.

Dr. Sunil K. Singh
Dean (Academics)
Oriental Group of Institutes, Bhopal-462021;

PREFACE

This thoroughly revised and updated edition completely covers the latest theory syllabus of Energy, Environment, Ethics and Society offered to third year B.E./B. Tech. students of Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P.). The importance of preserving the earth's environment and its biological diversity was amply and duly focused at the meeting of the 'Earth Summit' held in June 1992 at Rio de Janeiro in Brazil.

The following points have been included in this edition:

Ecology is the correlation between science and technology. Taking the perception of environmental attentiveness and global energy concern from school to higher technical institutions is an immeasurable challenge. The utility of the book has been enhanced with new figures to promote visual, spontaneous learning. Emphasis has been placed on case studies and applications for explaining the usefulness of various topics aimed in **Appendix-B** as an *Innovative Updated Precious Point in Science and Technology Analytical Gallery (IUPPSTAG)*, in which the complete coverage of research as per the latest inventions has also been included.

The book aims at:

Imparting intensive and extensive knowledge on the subject so that readers can understand the role of the environment in the field of engineering. Developing analytical as well as technical skill capabilities of students so that they can characterize, transform and use materials in engineering and apply knowledge gained in solving related engineering problems. Developing the habit of scientific reasoning in the students so that they can work with open and curious mind.

Salient features of the book are:

It offers easy, compact and accurate study material. Independent, up-to-date and complete coverage of various topics in almost all the chapters is contained in this book. Simple, systematic and logical development of the subject with emphasis on the underlying fundamental concepts, principles and technical applications can be found here. It incorporates question bank and latest RGPV Examination Papers. It also incorporates suggestions from students and advice from reputed faculty members. It enables you to perform effectively and with confidence in the examinations in the concerned field of the subject.

Basic knowledge about environment and pollution control is absolutely essential for any scientist or engineer anywhere in the world. Any research and developmental project or any technological innovation has to be planned and executed with the intellectual support of scientists and engineers. Any such enterprise will have to get prior clearance by the

Ministry of Environment or other statutory Environmental Protection Agency before it can take off. Environmental audit has been made compulsory for all industrial establishments in our country and many other countries in the world. Thus, it is obvious that basic principles regarding environment and pollution control must form an essential component of science and engineering curriculum at undergraduate and post-graduate levels. It is precisely in this context that the present effort is undertaken. This book is expected to fill the gap of a much needed textbook on "*Environmental Pollution and its Control for Students of B.E./B. Tech. and M. Tech (Environmental Engineering)*".

I hope, this book will serve its purpose and prove beneficial to its readers. Finally, I express my sincere thanks to the publisher for early publication of this text.

Any suggestion and constructive criticism towards the further improvement of the book is most welcome.

—Authors

ABSTRACT

This book covers major topics on **ENERGY, ENVIRONMENT, ETHICS AND SOCIETY** in the field of environmental discipline and especially it fulfills the requirement of engineering students of RGPV Syllabus and with subject code BE-302, Energy Environment Ethics and Society for ME, CS, EX, IT, CE, EC, 3rd semester examination pattern, recommended as compulsory subject for all branches by Rajiv Gandhi Technological University, Bhopal (MP), INDIA.

Environmentalism or ecology is the correlation between science and technology. Taking the perception of environmental attentiveness and global energy concern from school to higher technical institutions is an immeasurable challenge. The effectiveness of the book has been enhanced with new figures to promote visual, impulsive learning. Emphasis has been positioned on case studies and applications for elucidating the worth of a variety of topics aimed in *Appendix-B* as an *Innovative Updated Precious Points in Science and Technology Analytical Gallery (IUPPSTAG)*, in which the complete coverage of research as per the most up-to-date inventions has also been incorporated and almost certainly, which has not so far been covered in other books.

The book imparts an extensive knowledge as a core and compulsory subject in environmental connection, so that the readers can understand the role of the environment in the field of engineering. It develops diagnostic technical skill capabilities of students to help them characterize, transform and use materials in engineering and apply this achieved acquaintance in solving engineering related problems. It also helps them develop the habit of scientific reasoning, with the intention of assisting them to work with open and curious mind in the field of engineering.

In addition, a number of self-made analytical technical figures, graphs and tables have been presented in the book for better understanding of the theme. In the end scientific issues at a glance are being used in the book. **“Curious questions with scientific observations”** subdivision is also added to learn the subject more specifically. Mostly advanced **Appendices A-E** are added to cover the subject issue **‘Beyond the Syllabus’**.

Targeted group of readers of this book entitled **ENERGY, ENVIRONMENT, ETHICS AND SOCIETY** in Bhopal on an average is 50 to 60 thousand students as per their semester programme approved by Rajiv Gandhi Technological University, Bhopal (MP), as mandatory subject for all branches *ME, CE, CS, EX, IT, EC* of engineering and skilled applications starting from first semester up to 4th semester students.

This book completely represents new approaches in this subject and current references with website are also integrated to update the student’s comprehension and technical

proficiency through comprehensive study in terms of chapter or unit-wise, *i.e.*, 1st to 5th intervals in A **Textbook of ENERGY, ENVIRONMENT, ETHICS AND SOCIETY**. The recent book references, modifications, updates and latest websites are also enclosed at the end of the book in **Appendix Section A to F** along with worth mentioning **Bibliography** and **Glossary**.

In this competitive world, the marketplace of written book would be on local, regional and global extent. At present condition the inhabited human beings, laymen, intellectual people are surviving on the earth despite the scarcity of expensive resources, which are the need of our daily habitual life. In short, directly or indirectly natural ecosystem is getting disturbed and affected, which is influencing animals, birds, plants, flora and fauna of this precious planet **"THE EARTH"**.

The market potential of this book will depend on the quality matter content inside the book with technical talent and relevance commonly used in sophisticated learning starting from lower level module to higher level curriculum. Environment related topics and courses have been designed as core-compulsory subject for all level classes starting from School (Classes)/UG/UG (Hons.)/PG/Doctoral level programmes under private, autonomous as well as government universities, who are awarding degrees like B.E., M.E., M. Tech., and Ph.D. in environmental engineering and technology.

ACKNOWLEDGEMENT

I feel greatly indebted to my teachers, especially to **Dr. Sunil Singh**, Dean of Students Academics, Oriental Group of Institutes, Bhopal and **Dr. D. G. Gajghate**, Scientist-E, Air Pollution Control Division, National Environmental Engineering Research Institute, Nagpur, because they created in me an immense interest in this field. One of the main sources of inspiration for writing this book has been the interested students in my classes. This book is based mainly on the lecture notes which are prepared for B.E./B. Tech. classes on the subject and on the tutorial discussions with the students at Oriental College of Technology (OCT), Bhopal. I am grateful to all the authors of the books I have used in preparing the notes.

I express my sincere gratitude to **Shri K. L. Thakral**; founder Chairman of Oriental Group of Institutes, Bhopal for his constant inspiration and encouragement. I am grateful to all my colleagues who made suggestions, pointed out errors, responded to my questions and helped in other ways.

I am grateful to **Dr. Kavita Burse**, Director and **Dr. R. R. Nijhawan** Principal and **Mr. Sonendra Gupta**, Head of the Department of Basic Science, Oriented College of Technology of Oriental Group of Institutes, Bhopal for their motivation and eternal support. I am thankful to **Dr. R. P. Singh**, Professor, Geotechnical Engineering, Indian Institute of Technology, Kanpur for his continued guidance and encouragement.

Each one and many more have boosted my confidence to serve the academic community much better. It has been a pleasure to work with all of them. I am grateful in measure beyond words, and have learned a lot from their wise advice. I deeply acknowledge my parents for their never ending encouragement, moral support, and patience, thank my wife, **Mrs. Kiran Gupta** for editing and moral support.

A sincere expression of thanks goes to the entire staff of the Laxmi Publications (P) Ltd., New Delhi. Generous participation of faculties and students to eliminate errors in the text and to refine the presentation is greatly acknowledged.

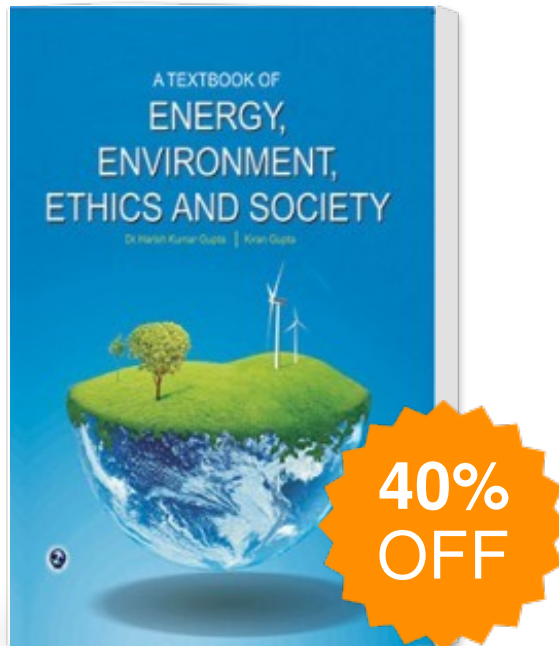
“Real Life and Natural Ecosystem System is like a Mirror, What You Give, Reflects Back to You”.

— Authors

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