Eastern Economy Edition

Engineering Ethics

Includes **Human Values**

M. Govindarajan • S. Natarajan
V.S. Senthilkumar

PHI

Engineering Ethics

includes

Human Values

M. Govindarajan
Formerly Assistant Professor
Department of Mechanical Engineering
Anna University, Chennai

S. Natarajan
Formerly Professor and Head
Department of Mechanical Engineering
Anna University, Chennai

V.S. Senthilkumar
Associate Professor
Department of Mechanical Engineering
Anna University, Chennai

PHI Learning Private Limited

New Delhi-110001
2011

ENGINEERING ETHICS (includes Human Values)
M. Govindarajan, S. Natarajan and V.S. Senthilkumar

ISBN-978-81-203-2578-4

Twelfth Printing ... ... **October, 2011**

Published by Asoke K. Ghosh, PHI Learning Private Limited, M-97, Connaught Circus, New Delhi-110001 and Printed by Rajkamal Electric Press, Plot No. 2, Phase IV, HSIDC, Kundli-131028, Sonepat, Haryana.

To

The Lotus Feet of the Holy Mother

A Prayer

"I stretch it out to Thee with both arms
in a gesture of offering and I ask of Thee:

If my understanding is limited, widen it;
if my knowledge is obscure, enlighten it;
if my heart is empty of ardour, set it aflame;
if my love is insignificant, make it intense;
if my feelings are ignorant and egoistic,
give them the full consciousness in the Truth"!

On the Mother
by **K.R. Srinivasa Iyengar**

Contents

Preface

Engineering Ethics, as a subject of study, owes its origin not only to the lack of ethics that led to the engineering disasters that have been recorded over a period of time but also to the day-to-day ethical behaviour that ought to be followed by engineering professionals. In the case of disasters, several factors were responsible—overconfidence (Titanic disaster), impatience (space shuttle Challenger explosion), negligence and poor maintenance (Bhopal Gas Tragedy). Most of the disasters could have been prevented if the necessary code of ethics was observed. In order to cut down on the number of errors, both human and mechanical, many codes of ethics were established. The main purpose of these ethical codes is to ensure public safety.

Ethics presupposes understanding of human nature and values. Values provide each one of us with a unique, personal, and moral template that we use to assess the intentions and actions of others and ourselves and the importance of the likely outcome of these various actions and reactions. By values, we mean an in-built mechanism which distinguishes the right from the wrong. Right or wrong should be interpreted only in the context of the social environment in which a person lives. There is a growing concern about deteriorating values because deviation from accepted values threatens the stability of society. Excessive technological growth has created an environment in which life has become physically and mentally unhealthy. The quality of work-life in any organization is greatly influenced by the ethical and moral values prevalent in that organization. The ethical quality of managerial decision-making can be improved through a full understanding and internalization of the doctrine of *karma*. All decisions depend critically on the purity of mind of the decision-maker.

There are five system values and many sub-values, or virtues that come from these. They contain all that makes a human being noble, caring, and kind. The Five Universal Values from which the other values and virtues stem are Right Conduct (using the tool of the body), Peace (using the tool

of the mind), Truth (using the power of discrimination and intellect), Love (using the power of energy), and Non-Violence (awakening to the Spirit within). Indian ethos asserts that the spirit must lead matter and not vice versa. Since all minds and all lives are interconnected, a respectful attitude of honesty, help, care and encouragement are not only the best policy but the only policy in management. These ideas are explained in detail in Chapter 0.

The material for the book is taken from different sources like scriptural writings, the contemporary writings on professional ethics, and the Internet. Whatever presented is only 'received knowledge'. The objectives of the book are to introduce the readers to the ethical concepts that are relevant to resolving moral issues in engineering, to impart reasoning and analytical skills needed to apply ethical concepts to engineering decisions, to identify the moral issues involved in both management and engineering areas, and to provide an understanding of the interface between social, technological and natural environments.

Chapter 1 presents the fundamentals of ethics, starting from the Indian ethos and goes on to explain the various concepts of engineering ethics. Deontological, consequentialist, and virtue approaches to the study of ethical behaviour are explained. Engineering as a profession is discussed by comparison with Medicine and Law. The pros and cons of social involvement of business are explained. The code of ethics and how to solve ethical conflicts have also been covered. Chapter 2 deals with moral reasoning and ethical theories. Theories of right action using the concept of utilitarianism, cost-benefit analysis, and duty and right ethics are also discussed. Three kinds of inquiries—normative, conceptual, and factual—are explained. Types of moral dilemmas, various models of moral development and value-based ethics are dealt with. Engineering as social experimentation is discussed in Chapter 3. The engineers' responsibility for safety and risk is explained in Chapter 4. Collegiality and loyalty are discussed in Chapter 5. Also discussed are the rights and responsibilities of engineers in an organizational setting. Global issues like environmental ethics, weapons development, and Intellectual Property Rights (IPRs) are detailed in Chapter 6. The final chapter deals with ethical audit.

Review questions and four case studies are provided to sharpen the analytical skills of the students.

Teaching a course on Professional Ethics is difficult for two reasons. First, understanding the subject matter is difficult as it is somewhat amorphous. The teacher should have a good grasp of the principles of general ethics before branching out into engineering ethics. Secondly, the teacher should have good vocabulary and presentation skills. Hence, fluency in oral presentation and the ability to impart reasoning and analytical skills needed to apply ethical concepts to engineering decisions are emphasized.

Writing a book is often a tedious job. It requires lot of reading, writing, typing and editing. We acknowledge with thanks the excellent support given by Mrs. Prabha in typing the manuscript and Mr. S. Muthukrishnan for his help in page layout and in improving the general getup.

I thank Prentice-Hall of India for bringing out a sleek edition of the book.

Any constructive comments for improving the contents will be greatly appreciated.

M. Govindarajan
S. Natarajan
V.S. Senthilkumar

Chapter 0

Human Values

"udyamam sahasam dhairyam buddhih saktih parakramah sadete yatra vartante tatra devah sahayakrt"

—a Sanskrit verse

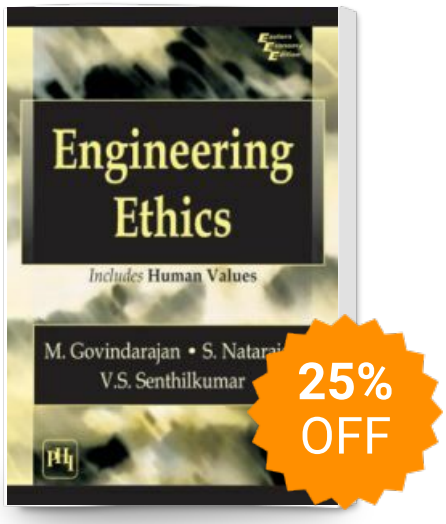
(Where the six qualities of right effort, enterprise, courage, know-how, resources, and the ability to reshuffle priorities reside, there God lends a hand.)

Values mean an in-built mechanism which distinguishes the right from the wrong. Right or wrong should not be interpreted in any absolute metaphysical sense and should be interpreted only in the context of the social environment in which a person lives, moves and acts. There is a growing concern for deteriorating values because deviation from accepted values threatens the stability of society. Irrespective of religious diversity, there exists a remarkable degree of agreement about values such as honesty, integrity, compassion, tolerance and selflessness.

Values serve the process of 'becoming', in the sense of transformation of the level of consciousness to purer, higher levels. Skills are concerned with the method of 'doing', in the sense of speed, dexterity, efficiency, etc. Values are, therefore, essentially subjective while skills are objective. While education is more germane to values, training relates more closely to skills.

Values provide us with a unique, personal, and moral template that we use subconsciously to assess and judge the intentions and actions of others and ourselves, and the importance of the likely outcome of various actions and reactions. Many of our values are derived from the myths about ourselves, our culture and our place in the universe (our personal cosmology), which make up the largely unconscious framework within which we live and have our being. They are the pragmatic outcome of what we have acepted as true answers (without much critical consideration) to the fundamental questions posed by philosophy, ethics and religion. And for most of us, the personal cosmology is derived far more from intuition and faith than from logic.

Engineering Ethics (Includes Human Values)



Publisher : PHI Learning

ISBN : 9788120325784

Author : M. Govindarajan, S. Natarajan, V. S. Senthilkumar