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## *Book review*

**J. Robert Mahan: Radiation Heat Transfer. A Statistical Approach,**
Publisher: John Wiley & Sons, Ltd., 500 p.

The well-known, Publisher John Wiley & Sons, Inc. published the book of J. R. Mahan in the present year. The book of 500 pages has a nice form. Compact disc is enclosed to help the reader to use the knowledge getting from this book.

The three modes of the heat transfer, the conduction, the convection and the radiation was already taught in the secondary school. The conduction heat transfer has a huge literature everywhere in the irreversible thermodynamics, in the solid-state physics and in the materials science. The topic of the convection heat transfer is a part of the hydrodynamics, especially of the reology. For the radiation heat transfer the situation is different. The electrodynamics and the quantum electrodynamics describe the fundamental processes but the books don't contain the details. The book having this theme deals only with the generalities. The present book is the only one, which contains the details of the radiation processes; it has the information, what is the colour of white and black.

The author is familiar with the topic of heat radiation. At present time he is department head at Virginia Tech. The book is the results of his experience teaching and directing research and it contains the knowledge of the author to give them to the next generation of the scientists. The whole work strives after completeness, describes the bases of the radiation, the traditional and the new numerical methods. The Monte Carlo Ray-Trace Method (MCRT) invented by the author is very effective for the model of the radiation problems.

The topics of the book are divided into three parts. In a one-semester course only the first part, in the one-years course the first and the second part is proposed. The whole book takes two years.

The first part contains the fundamentals of thermal radiation. The heat conduction and the heat convection are resumed in four pages. The discussion of the radiation is started with the introduction of the black body and the Stefan-Boltzmann-law. Same aspects of the radiation, e.g. the polarisation and the dual behaviour of the electromagnetic radiation are surveyed. All of them are only in a short chapter together with the details. The black body, the pressure of the radiation field is treated more detailed than in any other book. This is a textbook for students, therefore team projects, discussion points and some problems together with the solutions can be found in the end of the chapters.

The properties of the real surfaces belong to the fundamental characteristics of the radiation space. These real surfaces differ essentially from the black body. The book deals with these facts circumstantially. The Kirchoff's law of the radiation is introduced to the reader in the most general form.

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Beyond the details, when a new topic starts, the book returns to the solution of the Maxwell-equations. It also discusses the optical properties of the materials (transparent, opaque materials and the metals). The phenomena erected from the wave properties of the light. The transfer through the materials and the dispersion are also discussed in the first chapter.
The second part deals with the traditional methods of the radiation heat transfer. The starting points in all cases are the differential equation of the heat flux together with the auxiliary conditions. The optical thin material, transfer through the material are all discussed. Majority of the methods are analytical, but in some cases at practical problems, computer could help the calculation.
The third part of the book is the Monte Carlo Ray-Trace Method. The process is a statistical approach, in which the analytical solution of the problem is composed with numerical simulation. The radiation energy is divided into bundles, and the surfaces emit, absorb and reflect these bundles.
Several numerical examples demonstrate the application ability of the method. One can meet the same special cases, what the second part includes and it shows the solution of same interesting and useful problems.
The end of the book contains appendices. In Appendix A the Maxwell-equation is solved for electric dipole radiation. The same derivation can be found in any textbook of electrodynamics. The Appendix B shows the program UNO. The program written in FORTRAN refers to the Mie-scattering (chapter 6.), how the program operates and what is scheme of the input and output. The Appendix C shows another program titled FELIX. The use of the FELIX (Functional Environment for Longwave Infrared eXchange) determines the radiation in an enclosure using the MCRT. The appendix and the enclosed compact disk contain the student version. The descriptions of the random number generator and the autoregression analysis are summarized in appendix D. These mathematical tools are important parts of the MCRT method.
The ‘Radiation Heat Transfer, A Statistical Approach’ written by J. Robert Mahon is a textbook giving a comprehensive knowledge. I commend the book to the students; engineers and scientist who are involved with the heat radiation, or who wants enumerate radiation fields, or who wants to get a deep knowledge in this topic. The book also deals some of the interesting and useful problems. The readers being keenly interesting in physics can enjoin the first part.

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