of their dynamic behavior. Dynamics is a subject which has traditionally been poorly taught in most engineering courses. The book was conceived as a way of providing an engineer with a deeper knowledge of dynamic analysis and it indicates to them how some of the new vibration problems can be solved." Starting with the elementary basis of vibration, it continues to the more advanced and includes the latest random vibration and its variants accompanied by detailed applications. Although small in the number of pages for the topics covered, it does encompass a tremendous amount of territory in a well-explained fashion. The book consists of 17 chapters.

The initial chapter introduces the subject of vibration and continues with single degree of freedom equations of motion, response and dynamic interaction of an elastic body on a rigid body which in turn is mounted on soil. Chapter 2 dwells on free vibration, resonances, and damping. It contains simple spring-mass and pendulum systems, beam with central load, springs in series and parallel and derivation of potential and kinetic energy. The latter part of this chapter considers damped and undamped free response, damped, and undamped transient response.

Chapter 3 delves into free vibration of two and multi-degree of freedom systems, orthogonality of mode shapes and modal decomposition. The chapter concludes with a discussion of damped free and forced vibrations of multi-degree of freedom systems. Chapter 4 introduces the eigenvalue-eigenvector problem and solutions. A three degree of freedom system with its associated matrices opens up the chapter. This leads to banded and symmetric matrices, reduction of eigenvalue equation to standard form and solution of standard eigenvalue and original equation employing Sturm's theorem or sequence. This continues with a short discourse on direct iteration and then compares the four different solutions of the eigenvalue problem. It concludes with a very sparse and too brief node condensation and substructuring analysis. The next chapter covers approximate methods for calculating natural frequencies and dynamic response of elastic systems. Beginning with the equivalent one degree of freedom (mass and stiffness), this leads to simple and continuous beams plus derivation of the dynamic "three moment equation" and simple multi-story frames. Chapter 6 focuses on the determination of steady state response with and without damping, truncation of series solution, and response spectrum methods.

Chapter 7 considers the finite element (FE) technique. Starting with the principle of virtual displacements, it goes forward into the determination of the triangular and rectangular element and their formulation in meshes and matrix derivation of a beam element containing an applied distributed load. The stiffness and continuous mass matrices are derived and applied to a two element beam. The chapter concludes with a system of equations and their solutions. An informative chapter but too condensed!

Chapter 8 delves into two dimensional and plate bending applications. The inplane plate elements and plate bending elements are derived in matrix form. They are then applied to the solution of a plane and transverse vibration of plates. The chapter ends with the formation of a system of equations for the combination of plate and beam elements.

Chapter 9 speaks about the transient response of structures with and without damping. The final section draws upon the finite difference method and Newmark's β methods and applies them in interesting examples. Mention is made of Wilson θ method and Houbolt method as applied to transient response. Chapter 10 considers the make-up of machine foundations. Initially, the topic expounds upon the transmissibility of foundation on a rigid or flexible base. This brings into play the damped and undamped dynamic absorber. The chapter concludes with a short discussion of British and German codes and the use of response analysis in designing steel foundations for turbo-alternators. Chapter 11 reports on the vibration of shells of revolutions. Employing Novozhilov's thin shell theory, the equilibrium equations are derived and stress-strain and stress-displacement relations are proposed. The book leads us into the development of stiffness and mass matrices for the shell of revolution element. A short discussion on reduction of mass and stiffness via Guyan's method and Henshall's extension to element matrices. Chapter 12 proposes some recent advances in structural vibration. They are direct integration (Park, Hilber, etc.) and Newmark β. The author concludes that the Newmark average acceleration method is the best since it doesn't introduce any artificial attenuations of modal contribution to response. A short discussion on nonlinear problems with partitioning into (*a*) explicit, (*b*) explicit/explicit, (*c*) explicit/implicit, (*d*) implicit, and (*e*) implicit/implicit.

Chapter 13 is an informative chapter and considers fluid/structure interaction. Beginning with fluid flow, the author describes vortex shedding, pressure distribution over a cylinder, linear wave theory, various inertia constants, axial drag and inertia forces for slender bodies. This continues with the computation of inertia coefficients using potential theory, wave diffraction analysis, and hydrodynamic forces. The author suggests the use of the Pierson-Moskowitz wave spectrum relationship. Chapter 14 is a short introduction into random vibration. This covers basic probability distributions, idea of a stationary ergodic random process, and spectral density functions. The autocorrelation function is introduced via Weiner-Khinchin relationships. An example of a simple spring system subjected to random load concludes the chapter.

The next chapter briefly discusses earthquake response and spectral density of response with examples in application to a cantilever beam and a cooling tower shell. Chapter 16 covers response of structures and response of shells to wind loading. The Davenport spectrum equation is stressed.

The final chapter dwells upon random response analysis to off-shore structures. Beginning with analysis of a one degree of freedom system, this progresses into multi-degree of freedom systems. The Pierson-Moskowitz relationship is discussed exclusively. The chapter concludes with a good derivation of the above equation and applied to random responses.

In summary, this is a good book. The reviewer found some of the contents and subjects to be very sketchy. Reference must be made to the original source. However, the book covers a tremendous amount of subjects. This could easily be expanded to double the size. The reviewer recommends this book to those interested in the many facets of structural dynamics. At times the reader must employ additional reading to acquire a full understanding of the particular subject.

Stochastic Processes in Engineering Systems, E. Wong and B. Hajek, Springer-Verlag, New York, Berlin, 1985, 361 pages.

Reviewed by H. Saunders

This is not just another book on stochastic systems. The text covers both the traditional topics of stationary processes in linear time invariant systems as well as the more modern theory of stochastic systems where dynamics play one of the leading roles. As stated by the authors, "Our aim is to provide a high level, yet readily accessible treatment of these topics in the theory of continuous stochastic processes that are important in the analysis of information and dynamic systems."

The book consists of 8 chapters.

Chapter 1 reviews the element of probability. The Heine-Borel theorem is employed which then leads to measures on three-dimensional spaces. Continuing with Borel functions, we proceed to define the probability density function and the joint probability distribution function. The book continues with a discussion of events and random variables. This leads to expectations of random variable and convergence concepts. The chapter concludes with the concept of individual and conditional expectations.

Chapter 2 introduces stochastic processes. This is a family of random variables indexed by a real parameter and depends on a common probability space. This leads to the idea of separability, measurability and then to Gaussian processes and Brownonian motion. The latter is a specific kind of Gaussian process and is discussed more in detail in later chapters. We now meet the Markov process, martingale, and the concept of continuity. The author introduces Chapman-Kolmogorov equations and concludes with stationarity and ergodicity. This chapter is a forerunner of later chapters.

Chapter 3, the lengthiest, treats second-order processes. The mean, correlation function and covariance and defined. They play important roles in stochastic theory. This leads to Hilbert space, the idea of orthogonal expansions, and eigenfunctions. The book continues with wide sense stationarity where its covariance function is an action of only the time difference. This follows with Fourier integral/transform and spectral representation. Low pass and band pass processes, white noise and its integrals, linear prediction, and filtering are topics associated with data reduction. The chapter concludes with the Weiner filter.

Chapter 4 covers stochastic integrals and stochastic differential equations. The latter are differential equations driven by Gaussian white noise. The relationship between stochastic integral, martingale, and the Brownonian process are clearly brought out in a mathematical fashion. The kinship between white noise and stochastic calculus are identified. This leads to generalization of the stochastic integral. The forward diffusion equation is solved by means of the Fokker-Planck equation.

Chapter 5 delves into one dimensional diffusion and introduces the semigroup treatment of Markov processes with stationary transition functions. The authors go to great length in stating and deriving the strong Markov processes. The most important class of Markov times is the well-known first passage time. The chapter concludes with a thorough discussion and derivation of the diffusion process.

Chapter 6 treats martingale calculus. The latter is defined as a complex-valued stochastic process. The various properties are discussed at great depth with the aid of a number of sampling theorems. This includes predictable processes, isometric integrals, and relationships of the quadratic variation and change of variable formula to martingale. Continuing, the book points out the semi-martingale exponentials and their applications.

Chapter 7 reports on detection and filtering. Here the role of the observation is to provide information. This leads to the likelihood ratio representation and the filter representation. They are a change of measure and innovative derivation.

The last chapter encompasses random fields (collection of random variables defined on a common probability space). The initial introduction to homogeneous random fields is the most straightforward generalization to wide sense stationarity processes. We meet the idea of spherical harmonics in an isotropic random field. The next important topic is the Markovian random field and the multiparameter martingales. The latter plays an important role in the detection and filtering idea. The chapter concludes with various stochastic differential forms with the Markovian process playing a very definite role.

In summary, this is a good book for the mathematically inclined and must be read and interpreted very carefully. The book contains an excellent bibliography and solutions to the problems given at the end of each chapter. The reviewer feels that a good section on data processing would help the reader by exposing him to the real world of random processes. An appendix containing the various terms and their definitions would be a boon to the reader.