

Introduction To Mining Engineering Lecture Notes

This comprehensive textbook covers all major topics related to the utilization of mineral resources for human activities. It begins with general concepts like definitions of mineral resources, mineral resources and humans, recycling mineral resources, distribution of minerals resources across Earth, and international standards in mining, among others. Then it turns to a classification of mineral resources, covering the main types from a geological standpoint. The exploration of mineral resources is also treated, including geophysical methods of exploration, borehole geophysical logging, geochemical methods, drilling methods, and mineral deposit models in exploration. Further, the book addresses the evaluation of mineral resources, from sampling techniques to the economic evaluation of mining projects (i.e. types and density of sampling, mean grade definition and calculation, Sichel's estimator, evaluation methods – classical and geostatistical, economic evaluation – NPV, IRR, and PP, estimation of risk, and software for evaluating mineral resources). It subsequently describes key mineral resource exploitation methods (open pit and underground mining) and the mineral processing required to obtain saleable products (crushing, grinding, sizing, ore separation, and concentrate dewatering, also with some text devoted to tailings dams). Lastly, the book discusses the environmental impact of mining, covering all the aspects of this very important topic, from the description of diverse impacts to the environmental impact assessment (EIA), which is essential in modern mining projects.

This new edition has been completely revised to reflect the notable innovations in mining engineering and the remarkable developments in the science of rock mechanics and the practice of rock engineering that have taken place over the last two decades. Although "Rock Mechanics for Underground Mining" addresses many of the rock mechanics issues that arise in underground mining engineering, it is not a text exclusively for mining applications. Based on extensive professional research and teaching experience, this book will provide an authoritative and comprehensive text for final year undergraduates and commencing postgraduate students. For professional practitioners, not only will it be of interests to mining and geological engineers, but also to civil engineers, structural mining geologists and geophysicists as a standard work for professional reference purposes.

"Indeed, the most important part of engineering work—and also of other scientific work—is the determination of the method of attacking the problem, whatever it may be, whether an experimental investigation, or a theoretical calculation. ... It is by the choice of a suitable method of attack, that intricate problems are reduced to simple phenomena, and then easily solved." Charles Proteus Steinmetz. The structure of this book is to provide a sequence of theory, workshops and practical field sessions that mimic a simple survey project, designed for civil and mining engineers. The format of the book is based on a number of years of experience gained in presenting the course at undergraduate and post graduate levels. The course is designed to guide engineers through survey tasks that the engineering industry feels is necessary for them to have a demonstrated competency in surveying techniques, data gathering and reduction, and report presentation. The course is not designed to make engineers become surveyors. It is designed to allow an appreciation of the civil and mine engineering surveyor's job. There are many excellent text books available on the subject of engineering surveying, but they address the surveyor, not the engineer. Hopefully this book will distil many parts of the standard text book. A lot of the material presented is scattered through very disparate sources and has been gathered into this book to show what techniques lie behind a surveyor's repertoire of observational and computational skills, and provide an understanding of the decisions made in terms of the presentation of results. The course has been designed to run over about 6 weeks of a semester, providing a half unit load which complements a computer aided design (CAD) based design project.

This volume is the eleventh in a series which documents the technical papers of the mine ventilation symposium, which was initiated in 1982 by the Underground Ventilation Committee of the Society for Mining, Metallurgy, and Exploration, Inc. In more recent years, the event has expanded to include all of North America and is known as the US/North American Mine Ventilation Symposium. The US/North American Mine Ventilation Symposium 2006 designated 'Coal Mine Methane Capture and Utilization' and 'Diesel Issues for Underground and Surface Mines' as topics of special interest. Numerous papers discussed these two topics, and there were presentations on mine dusts, mine fires, ventilation in large-opening mines, and numerous other ventilation topics. The symposium was supplemented by short courses on state-of-the-art in diesel emissions technology, computer analysis of ventilation circuits, personal dust monitoring, and methane capture technology. In addition, field trips to mines, research facilities, and methane gathering sites were offered to participants of the symposium. The book is of special interest to practitioners, educators, and researchers in the field of ventilation of mines, tunnels, and other underground facilities. Includes a CD-ROM of the proceedings.

The Office of Industrial Technologies (OIT) of the U. S. Department of Energy commissioned the National Research Council (NRC) to undertake a study on required technologies for the Mining Industries of the Future Program to complement information provided to the program by the National Mining Association. Subsequently, the National Institute for Occupational Safety and Health also became a sponsor of this study, and the Statement of Task was expanded to include health and safety. The overall objectives of this study are: (a) to review available information on the U.S. mining industry; (b) to identify critical research and development needs related to the exploration, mining, and processing of coal, minerals, and metals; and (c) to examine the federal contribution to research and development in mining processes. This textbook sets the standard for university-level instruction of mining engineering principles. With a thoughtful balance of theory and application, it gives students a practical working knowledge of the various concepts presented. Its utility extends beyond the classroom as a valuable field reference for practicing engineers and those preparing for the Professional Engineers Exam in Mining Engineering. This practical guidebook covers virtually all aspects of successful mine design and operations. It is an excellent reference for engineering students who are studying mine design or who require guidance in assembling a mine-design project, and industry professionals who require a

comprehensive mine-design reference book. Topics include everything from mine preplanning to ventilation to pumping, power, and hauling systems. The text presents widely accepted principles that promote safe, efficient, and profitable mining operations. The book is an excellent text and self-study guide. Each chapter is organized to demonstrate how to apply various equations to solve day-to-day operational challenges. In addition, each chapter offers a series of practice problems with solutions.

This work features presentations by international experts on mine environment and ventilation. Topics covered include analysis and design of ventilation systems, coal bed methane and gas modelling, dust generation and control, and heat flow, fan and face ventilation.

"Everything" sums up what must be considered for a properly documented property evaluation. Less than 30% of the projects that are developed in the minerals industry yield the return on investment that was projected from the project feasibility studies. The tools described in this handbook will greatly improve the probability of meeting your projections and minimizing project execution capital cost blowout that has become so prevalent in this industry in recent years. Mineral Property Evaluation provides guidelines to follow in performing mineral property feasibility and evaluation studies and due diligence, and in preparing proper documents for bankable presentations. It highlights the need for a consistent, systematic methodology in performing evaluation and feasibility work. The objective of a feasibility and evaluation study should be to assess the value of the undeveloped or developed mineral property and to convey these findings to the company that is considering applying technical and physical changes to bring the property into production of a mineral product. The analysis needs to determine the net present worth returned to the company for investing in these changes and to reach that decision point as early as possible and with the least amount of money spent on the evaluation study. All resources are not reserves, nor are all minerals an ore. The successful conclusion of any property evaluation depends on the development, work, and conclusions of the project team. The handbook has a diverse audience:

- Professionals in the minerals industry that perform mineral property evaluations.
- Companies that have mineral properties and perform mineral property feasibility studies and evaluations or are buying properties based on property evaluation.
- Financial institutions, both domestic and overseas, that finance or raise capital for the minerals industry.
- Consulting firms and architectural and engineering contractors that utilize mineral property feasibility studies and need standards to follow.
- And probably the most important, the mining and geological engineering students and geology and economic geology students that need to learn the standards that they should follow throughout their careers.

An introductory text and reference on mining engineering highlighting the latest in mining technology Introductory Mining Engineering outlines the role of the mining engineer throughout the life of a mine, including prospecting for the deposit, determining the site's value, developing the mine, extracting the mineral values, and reclaiming the land afterward. This Second Edition is written with a focus on sustainability-managing land to meet the economic and environmental needs of the present while enhancing its ability to also meet the needs of future generations. Coverage includes aboveground and underground methods of mining for a wide range of substances, including metals, nonmetals, and fuels. Completely up to date, this book presents the latest information on such technologies as remote sensing, GPS, geophysical surveying, and mineral deposit evaluation, as well as continuous integrated mining operations and autonomous trucks. Also included is new information on landscape restoration, regional planning, wetlands protection, subsidence mitigation, and much more. New chapters include coverage of:

- * Environmental responsibilities
- * Regulations
- * Health and safety issues

Generously supplemented with more than 200 photographs, drawings, and tables, Introductory Mining Engineering, Second Edition is an indispensable book for mining engineering students and a comprehensive reference for professionals.

This book teaches readers ground engineering principles and related mining and risk management practices associated with underground coal mining. It establishes the basic elements of risk management and the fundamental principles of ground behaviour and then applies these to the essential building blocks of any underground coal mining system, comprising excavations, pillars, and interactions between workings. Readers will also learn about types of ground support and reinforcement systems and their operating mechanisms. These elements provide the platform whereby the principles can be applied to mining practice and risk management, directed primarily to bord and pillar mining, pillar extraction, longwall mining, sub-surface and surface subsidence, and operational hazards. The text concludes by presenting the framework of risk-based ground control management systems for achieving safe workplaces and efficient mining operations. In addition, a comprehensive reference list provides additional sources of information on the subject. Throughout, a large variety of examples show good and bad mining situations in order to demonstrate the application, or absence, of the established principles in practice. Written by an expert in underground coal mining and risk management, this book will help students and practitioners gain a deep understanding of the basic principles behind designing and conducting mining operations that are safe, efficient, and economically viable. Provides a comprehensive coverage of ground engineering principles within a risk management framework Features a large variety of examples that show good and poor mining situations in order to demonstrate the application of the established principles in practice Ideal for students and practitioners About the author Emeritus Professor Jim Galvin has a relatively unique combination of industrial, research and academic experience in the mining industry that spans specialist research and applied knowledge in ground engineering, mine management and risk management. His career encompasses directing ground engineering research groups in South Africa and Australia; practical mining experience, including active participation in the mines rescue service and responsibility for the design, operation, and management of large underground coal mines and for the consequences of loss of ground control as a mine manager; appointments as Professor and Head of the School of Mining Engineering at the University of New South Wales; and safety advisor to a number of Boards of Directors of organisations associated with mining. Awards Winner of the ACARP Excellence Research Award 2016. The Australian Coal Industry's Research Program selects recipients to receive ACARP Research and Industry Excellence Awards every two years. The recipients are selected on the recommendation of technical committees. They are honored for achievement of a considerable advance in an area of importance to the Australian coal mining industry. An important criterion is the likelihood of the results from the project being applied in mines. Winner of the Merv Harris Award from the Mine Managers Association of Australia. The Merv Harris Award is named for Merv Harris who donated money to be invested for a continuing award in 1988. With the award, the Mine Managers Association of Australia honors members of the Association who demonstrate technical achievement in the Australian Coal Mining Industry. The first award was granted in 1990, since then, only two people have received this honor. The book has received the following awards.... AGS (Australian Geomechanics Society) congratulates Dr Galvin for these awards Includes general and summer catalogs issued between 1878/1879 and 1995/1997.

Now in its second edition, this book focuses on practical algorithms for mining data from even the largest datasets. G.I.N. Rozvany ASI Director, Professor of Structural Design, FB 10, Essen University, Essen, Germany Structural optimization deals with the optimal design of all systems that consist, at least partially, of solids and are subject to stresses and deformations. This integrated discipline plays an increasingly important role in all branches of technology, including aerospace, structural, mechanical, civil and chemical engineering as well as energy generation and building technology. In fact, the design of most man made objects, ranging from space-ships and long-span bridges to tennis rackets and artificial organs, can be improved considerably if human intuition is enhanced by means of computer-aided, systematic decisions. In analysing highly complex structural systems in practice, discretization is unavoidable because closed-form analytical solutions are only available for relatively simple, idealized problems. To keep discretization errors

to a minimum, it is desirable to use a relatively large number of elements. Modern computer technology enables us to analyse systems with many thousand degrees of freedom. In the optimization of structural systems, however, most currently available methods are restricted to at most a few hundred variables or a few hundred active constraints. This book includes a set of rigorously reviewed world-class manuscripts addressing and detailing state-of-the-art research projects in the areas of Computer Science, Informatics, and Systems Sciences, and Engineering. It includes selected papers from the conference proceedings of the Ninth International Joint Conferences on Computer, Information, and Systems Sciences, and Engineering (CISSE 2013). Coverage includes topics in: Industrial Electronics, Technology & Automation, Telecommunications and Networking, Systems, Computing Sciences and Software Engineering, Engineering Education, Instructional Technology, Assessment, and E-learning. • Provides the latest in a series of books growing out of the International Joint Conferences on Computer, Information, and Systems Sciences, and Engineering; • Includes chapters in the most advanced areas of Computing, Informatics, Systems Sciences, and Engineering; • Accessible to a wide range of readership, including professors, researchers, practitioners and students.

Data Mining and Applications in Genomics contains the data mining algorithms and their applications in genomics, with frontier case studies based on the recent and current works at the University of Hong Kong and the Oxford University Computing Laboratory, University of Oxford. It provides a systematic introduction to the use of data mining algorithms as an investigative tool for applications in genomics. Data Mining and Applications in Genomics offers state of the art of tremendous advances in data mining algorithms and applications in genomics and also serves as an excellent reference work for researchers and graduate students working on data mining algorithms and applications in genomics.

Introduction to Engineering Design is a completely novel text covering the basic elements of engineering design for structural integrity. Some of the most important concepts that students must grasp are those relating to 'design thinking' and reasoning, and not just those that relate to simple theoretical and analytical approaches. This is what will enable them to get to grips with *practical* design problems, and the starting point is thinking about problems in a 'deconstructionist' sense. By analysing design problems as sophisticated systems made up of simpler constituents, and evolving a solution from known experience of such building blocks, it is possible to develop an approach that will enable the student to tackle even completely alien design scenarios with confidence. The other essential aspect of the design process - the concept of failure, and its avoidance - is also examined in detail, and the importance not only of contemplating expected failure conditions at the design stage but also checking those conditions as they apply to the completed design is stressed. These facets in combination offer a systematic method of considering the design process and one that will undoubtedly find favour with many students, teaching staff and practising engineers alike.

This volume presents the proceedings of a symposium on rock mechanics, held in the USA in 1995. Topics covered include: rock dynamics; tool-rock interaction; radioactive waste disposal; underground mining; fragmentation and blasting; theoretical and model studies; hydrology; and rock creep.

This edited volume contains research results presented at the 12th International Symposium Continuous Surface Mining, ISCSM Aachen 2014. The target audience primarily comprises researchers in the lignite mining industry and practitioners in this field but the book may also be beneficial for graduate students.

This third edition of the SME Mining Engineering Handbook reaffirms its international reputation as "the handbook of choice" for today's practicing mining engineer. It distills the body of knowledge that characterizes mining engineering as a disciplinary field and has subsequently helped to inspire and inform generations of mining professionals. Virtually all of the information is original content, representing the latest information from more than 250 internationally recognized mining industry experts. Within the handbook's 115 thought-provoking chapters are current topics relevant to today's mining professional: Analyzing how the mining and minerals industry will develop over the medium and long term--why such changes are inevitable, what this will mean in terms of challenges, and how they could be managed Explaining the mechanics associated with the multifaceted world of mine and mineral economics, from the decisions associated with how best to finance a single piece of high-value equipment to the long-term cash-flow issues associated with mine planning at a mature operation Describing the recent and ongoing technical initiatives and engineering developments in relation to robotics, automation, acid rock drainage, block caving optimization, or process dewatering methods Examining in detail the methods and equipment available to achieve efficient, predictable, and safe rock breaking, whether employing a tunnel boring machine for development work, mineral extraction using a mobile miner, or cast blasting at a surface coal operation Identifying the salient points that dictate which is the safest, most efficient, and most versatile extraction method to employ, as well as describing in detail how each alternative is engineered Discussing the impacts that social and environmental issues have on mining from the pre-exploration phase to end-of-mine issues and beyond, and how to manage these two increasingly important factors to the benefit of both the mining companies and other stakeholders

This is the second edition of Wil van der Aalst's seminal book on process mining, which now discusses the field also in the broader context of data science and big data approaches. It includes several additions and updates, e.g. on inductive mining techniques, the notion of alignments, a considerably expanded section on software tools and a completely new chapter of process mining in the large. It is self-contained, while at the same time covering the entire process-mining spectrum from process discovery to predictive analytics. After a general introduction to data science and process mining in Part I, Part II provides the basics of business process modeling and data mining necessary to understand the remainder of the book. Next, Part III focuses on process discovery as the most important process mining task, while Part IV moves beyond discovering the control flow of processes, highlighting conformance checking, and organizational and time perspectives. Part V offers a guide to successfully applying process mining in practice, including an introduction to the widely used open-source tool ProM and several commercial products. Lastly, Part VI takes a step back, reflecting on the material presented and the key open challenges. Overall, this book provides a comprehensive overview of the state of the art in process mining. It is intended for business process analysts, business consultants, process managers, graduate students, and BPM researchers.

The continual explosion of information technology and the need for better data collection and management methods has made data mining an even more relevant topic of study. Books on data mining tend to be either broad and introductory or focus on some very specific technical aspect of the field. This book is a series of seventeen edited OC student-authored lecturesOCO which

explore in depth the core of data mining (classification, clustering and association rules) by offering overviews that include both analysis and insight. The initial chapters lay a framework of data mining techniques by explaining some of the basics such as applications of Bayes Theorem, similarity measures, and decision trees. Before focusing on the pillars of classification, clustering and association rules, the book also considers alternative candidates such as point estimation and genetic algorithms. The book's discussion of classification includes an introduction to decision tree algorithms, rule-based algorithms (a popular alternative to decision trees) and distance-based algorithms. Five of the lecture-chapters are devoted to the concept of clustering or unsupervised classification. The functionality of hierarchical and partitional clustering algorithms is also covered as well as the efficient and scalable clustering algorithms used in large databases. The concept of association rules in terms of basic algorithms, parallel and distributive algorithms and advanced measures that help determine the value of association rules are discussed. The final chapter discusses algorithms for spatial data mining. Sample Chapter(s). Chapter 1: Point Estimation Algorithms (397 KB). Contents: Point Estimation Algorithms; Applications of Bayes Theorem; Similarity Measures; Decision Trees; Genetic Algorithms; Classification: Distance Based Algorithms; Decision Tree-Based Algorithms; Covering (Rule-Based) Algorithms; Clustering: An Overview; Clustering Hierarchical Algorithms; Clustering Partitional Algorithms; Clustering: Large Databases; Clustering Categorical Attributes; Association Rules: An Overview; Association Rules: Parallel and Distributed Algorithms; Association Rules: Advanced Techniques and Measures; Spatial Mining: Techniques and Algorithms. Readership: An introductory data mining textbook or a technical data mining book for an upper level undergraduate or graduate level course."

The mining industry has experienced important improvements with regard to its safety record and work environment. But there is still room for further improvement and the mining industry now faces the challenge of securing a future workforce: The current workforce is aging, and mining work increasingly requires a more qualified workforce. *Designing Ergonomic, Safe, and Attractive Mining Workplaces* seeks to give an understanding of what must be considered in the design of mining workplaces. By reviewing and discussing the historic and current development of the mining industry as well as problems related to the safety, ergonomics, and attractiveness of mining workplaces, it demonstrates that the challenges facing the mining industry often need to be solved on a case-to-case basis. The processes through which these issues are managed are of significant importance. To facilitate a proactive approach, the book covers the principles of systematic work environment management, together with examples of methods for risk management and work environment monitoring. It introduces a systematic and iterative design and planning method for the mining industry. This method acknowledges that all relevant stakeholders must be able to influence the design of ergonomic, safe, and attractive mining workplaces. Features Takes a holistic and sociotechnical approach to current and future problems of the mining industry, which normally are dealt with in isolation or through technology Reviews historic, current, and future issues in the mining industry with regards to workplace attractiveness, health, safety, mechanization, automation, and work organization Provides several examples of these issues and attempts to address them (successfully and unsuccessfully) Covers the principles of systematic work environment management together with examples of methods for risk management and work environment monitoring for pro-actively dealing with work environment issues Introduces a systematic and iterative design and planning method for the mining industry that aims to avoid problems of traditional planning approaches and increase stakeholder and employee participation

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