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Synthetics, Mineral Oils, and Bio-Based Lubricants - Leslie R. Rudnick 2020-01-29 Highlighting the major economic and industrial changes in the lubrication industry since the first edition, Synthetics, Mineral Oils, and Bio-Based Lubricants: Chemistry and Technology, Third Edition highlights the major economic and industrial changes in the lubrication industry and outlines the state of the art in each major lubricant application area. Chapters cover the use of lubricant fluids, growth or decline of market areas and applications, potential new applications, production capacities, and regulatory issues, including biodegradability, toxicity, and food production equipment lubrication. The highly-anticipated third edition features new and updated chapters including those on automatic and continuously variable transmission fluids, fluids for food-grade applications, oil-soluble polyalkylene glycols, functional

bio-based lubricant base stocks, farnesene-derived polyolefins, estolides, bio-based lubricants from soybean oil, and trends in construction equipment lubrication. Features include: Contains an index of terms, acronyms, and analytical testing methods. Presents the latest conventions for describing upgraded mineral oil base fluids. Considers all the major lubrication areas: engine oils, industrial lubricants, food-grade applications, greases, and space-age applications Includes individual chapters on lubricant applications—such as environmentally friendly, disk drive, and magnetizable fluids—for major market areas around the globe. In a single, unique volume, Synthetics, Mineral Oils, and Bio-Based Lubricants: Chemistry and Technology, Third Edition offers property and performance information of fluids, theoretical and practical background to their current applications, and strong indicators for global market trends that will influence the industry for years to come.

An Introduction to Microelectromechanical Systems Engineering - Nadim Maluf 2004

Bringing you up-to-date with the latest developments in MEMS technology, this major revision of the best-selling An Introduction to Microelectromechanical Systems Engineering offers you a current understanding of this cutting-edge technology. You gain practical knowledge of MEMS materials, design, and manufacturing, and learn how it is being applied in industrial, optical, medical and electronic markets. The second edition features brand new sections on RF MEMS, photo MEMS, micromachining on materials other than silicon, reliability analysis, plus an expanded reference list. With an emphasis on commercialized products, this unique resource helps you determine whether your application can benefit from a MEMS solution, understand how other applications and companies have benefited from MEMS,

and select and define a manufacturable MEMS process for your application. You discover how to use MEMS technology to enable new functionality, improve performance, and reduce size and cost. The book teaches you the capabilities and limitations of MEMS devices and processes, and helps you communicate the relative merits of MEMS to your company's management. From critical discussions on design operation and process fabrication of devices and systems, to a thorough explanation of MEMS packaging, this easy-to-understand book clearly explains the basics of MEMS engineering, making it an invaluable reference for your work in the field.

2013 Passenger Car Yearbook - Automotive Engineering International 2013-10-07

Each year car manufacturers release new production models that are unique and innovative. The production model is the result of a lengthy process of testing aerodynamics, safety, engine components, and vehicle styling. The new technologies introduced in these vehicles reflect changing standards as well as trends of the market. From Acura to Volvo, this book provides a snapshot of the key engineering concepts and trends of the passenger vehicle industry over the course of a year. For each of the 43 new production models, articles from Automotive Engineering International (AEI) magazine detail technology developments as well as a comprehensive look at the 2013 passenger car models. This book provides those with an interest in new vehicles with all the information on the key automotive engineering and technology advancements of the year. AEI’s association with SAE International guarantees that these articles come from a trusted and reliable source with a reputation 100-plus years in the making. The 2013 Passenger Car Yearbook features articles covering a wide variety of topics from

styling, safety, testing, hybrid systems, powertrain designs, lightweighting, and materials. Interviews with key designers and engineers offer the reader an in-depth look at the strategies behind the year's technology advancements. This yearbook is a must-read to any vehicle enthusiast or engineer. The 2013 Passenger Car Yearbook explores where automotive engineering and styling is heading in years to come, and where it has come from in the past.

Energy Research Abstracts - 1985

Automotive Engineering International - 2005

Let Me Sell You a Ferrari - Robert E. Guarino 2021-05-14

The moment in 1958 when a sports car-crazed youth in Massachusetts saw his first Ferrari changed his life. The black 250 GT coupe's seductive lines, purposeful air and already hallowed name seized Robert E. Guarino's imagination; just a few years later, he would be selling such cars. And in 1967, with two partners and an investment of just $6,000 apiece, he would open a Ferrari-Porsche-Datsun dealership. This memoir follows his lifelong journey with Ferraris and other remarkable automobiles, as an enthusiast and dealer. Highlights include a nonstop drive from Chicago to Boston in a 308 GTB; rides with important figures like Piero Ferrari at Fiorano and Dario Benuzzi at Mugello; visits to the Ferrari, Maserati and Lamborghini factories; the horror of watching a delivery truck crash onto a row of new cars; and time at the wheel of such icons as the 365 GTB/4 "Daytona," 250 GTO, 288 GTO and F40.

Automotive Engineering - 1997

Federal Register - 1983-03-09

Index of Patents Issued from the United States Patent and Trademark Office - United States. Patent and Trademark Office 1984

Proceedings of the 21st

International Conference on Industrial Engineering and Engineering Management 2014 - Ershi Qi 2015-01-06
Being the premier forum for the presentation of new advances and research results in the fields of Industrial Engineering, IEEM 2014 aims to provide a high-level international forum for experts, scholars and entrepreneurs at home and abroad to present the recent advances, new techniques and applications face and face, to promote discussion and interaction among academics, researchers and professionals to promote the developments and applications of the related theories and technologies in universities and enterprises and to establish business or research relations to find global partners for future collaboration in the field of Industrial Engineering. All the goals of the international conference are to fulfill the mission of the series conference which is to review, exchange, summarize and promote the latest achievements in the field of industrial engineering and engineering management over the past year and to propose prospects and vision for the further development.

List of BETC Publications - Bartlesville Energy Technology Center 1977

Hydrogen in Automotive Engineering - Manfred Klell 2022-09-21
„Wasserstoff in der Fahrzeugtechnik“ bietet einen allgemeinen Überblick über die verschiedenen Aspekte von Eigenschaften, Erzeugung, Speicherung und Anwendung von Wasserstoff. Schwerpunkte liegen auf der Thermodynamik der Speicherung von Wasserstoff sowie auf der Anwendung in der Fahrzeugtechnik und in der Energietechnik. Mit Bezug zu Forschungsvorhaben an der TU Graz und dem HyCentA wird der aktuelle Stand der Technik fundiert dargestellt. Als eigener Abschnitt wurde in dieser Auflage die Brennstoffzelle zur Stromerzeugung für

Elektroantriebe ergänzt. Ein Verfahren zur Wasserstoffproduktion durch Pyrolyse aus Glycerin wurde neu aufgenommen. Ergänzt wurden Abschnitte über aktuelle Anwendungen, über Verbrennungsmotoren für Gemische aus Wasserstoff und Methan, über Werkstoffe sowie Fragen von Wirkungsgrad und CO2-Emissionen.

Scientific and Technical Aerospace Reports - 1995
Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database.

Advances in Cryogenic Engineering Materials - Richard P. Reed 2013-11-11
Proceedings of the Tenth International Cryogenic Materials Conference (ICMC) held in Albuquerque, New Mexico, July 12-16, 1993.

2014 Passenger Car Yearbook - Automotive Engineering International 2013-12-10
Each year car manufacturers release new production models that are unique and innovative. These cars begin as concepts then go through the process of prototyping. The process of creating a new model can take years, involving extensive testing and refining of aerodynamics, safety, engine components, and vehicle styling. The production model is the result of this lengthy process, and its new technologies reflect the latest engineering standards as well as market trends. The 2014 Passenger Car Yearbook details the key engineering developments in the passenger vehicle industry of the year. Each new car model is profiled in its own chapter with one or more articles that were previously published and written by the award-winning editors of Automotive Engineering International. The novel engineering aspects of each new model are explored in depth. Interviews with key developers and engineers are included for some of the models, providing inside details about how initial ideas evolved

in the cars that consumers drive. Published for enthusiasts who are interested in new car models and their technologies, as well as practicing automotive engineers who are interested in new engineering trends such as hybrid systems, powertrain designs, automotive design, lightweighting, and materials, and new engineers who want an overview of current trends, the 2014 Passenger Car Yearbook also: • Provides a single source for information on the key engineering trends of one year. • Allows the reader to skip to chapters that cover specific car models that interest them, or read about all models from beginning to end. • Makes for dynamic reading, with its large number of big, full-color images and easy-reading magazine format.

Popular Mechanics - 1980-07

Popular Mechanics inspires, instructs and influences readers to help them master the modern world. Whether it's practical DIY home-improvement tips, gadgets and digital technology, information on the newest cars or the latest breakthroughs in science -- PM is the ultimate guide to our high-tech lifestyle.

Proceedings of the Institution of Mechanical Engineers - 1979

Sound System Engineering 4e - Don Davis 2013-06-26

Long considered the only book an audio engineer needs on their shelf, Sound System Engineering provides an accurate, complete and concise tool for all those involved in sound system engineering. Fully updated on the design, implementation and testing of sound reinforcement systems this great reference is a necessary addition to any audio engineering library. Packed with revised material, numerous illustrations and useful appendices, this is a concentrated capsule of knowledge and industry standard that runs the complete range of sound system design from the simplest all-analog paging systems to the largest multipurpose digital systems.

Snow Country - 1989-12
In the 87 issues of Snow Country published between 1988 and 1999, the reader can find the defining coverage of mountain resorts, ski technique and equipment, racing, cross-country touring, and the growing sport of snowboarding during a period of radical change. The award-winning magazine of mountain sports and living tracks the environmental impact of ski area development, and people moving to the mountains to work and live.

Der Antrieb von morgen 2017 - Johannes Liebl 2017-09-19
Der inhaltliche Schwerpunkt des Tagungsbands zur ATZlive-Veranstaltung "Der Antrieb von morgen" liegt beim Paradigmenwechsel durch künftig immer strengere Gesetze zu CO2-Emissionen sowie neu gestaltete, anspruchsvollere Prüfzyklen in Labors und realen Fahrsituationen. Die Elektrifizierung schreitet weiter voran. Antriebsstränge müssen noch stärker im Systemverbund Verbrennungsmotor, Getriebe und Elektrifizierung ausgelegt werden. Thematisch wird der Fokus auf die Antriebssynthese gelegt, während Komponenten und deren Fahrzeugintegration die Basis bilden.

Popular Mechanics - 1983-04
Popular Mechanics inspires, instructs and influences readers to help them master the modern world. Whether it's practical DIY home-improvement tips, gadgets and digital technology, information on the newest cars or the latest breakthroughs in science -- PM is the ultimate guide to our high-tech lifestyle.

Report summaries - United States. Environmental Protection Agency 1983

Particulate Emissions from Vehicles - Peter Eastwood 2008-04-15
The public health risks posed by automotive particulate emissions are well known. Such particles are sufficiently small to reach the deepest regions of the lungs; and moreover act as carriers for many potentially toxic

substances. Historically, diesel engines have been singled out in this regard, but recent research shows the need to consider particulate emissions from gasoline engines as well. Already implicated in more than one respiratory disease, the strongest evidence in recent times points to particle-mediated cardiovascular disorders (strokes and heart attacks). Accordingly, legislation limiting particulate emissions is becoming increasingly stringent, placing great pressure on the automotive industry to produce cleaner vehicles - pressure only heightened by the ever-increasing number of cars on our roads. Particulate Emissions from Vehicles addresses a field of increased international interest and research activity; discusses the impact of new legislation globally on the automotive industry; and explains new ways of measuring particle size, number and composition that are currently under development. The expert analysis and summary of the state-of-the-art, which encompasses the key areas of combustion performance, measurement techniques and toxicology, will appeal to R&D practitioners and engineers working in the automotive industry and related mechanical fields, as well as postgraduate students and researchers of engine technology, air pollution and life/ environmental science. The public health aspects will also appeal to the biomedical research community.

4th European Conference of the International Federation for Medical and Biological Engineering 23 - 27 November 2008, Antwerp, Belgium - Jos van der Sloten 2009-02-04

The 4th European Congress of the International Federation for Medical and Biological Federation was held in Antwerp, November 2008. The scientific discussion on the conference and in this conference proceedings include the following issues: Signal & Image Processing ICT Clinical Engineering and Applications Biomechanics and

Fluid Biomechanics Biomaterials and Tissue Repair Innovations and Nanotechnology Modeling and Simulation Education and Professional

Popular Mechanics - 1998-01

Popular Mechanics inspires, instructs and influences readers to help them master the modern world. Whether it's practical DIY home-improvement tips, gadgets and digital technology, information on the newest cars or the latest breakthroughs in science -- PM is the ultimate guide to our high-tech lifestyle.

Encyclopedia of Automotive Engineering - David Crolla 2015-03-23

A Choice Oustanding Academic Title The Encyclopedia of Automotive Engineering provides for the first time a large, unified knowledge base laying the foundation for advanced study and in-depth research. Through extensive cross-referencing and search functionality it provides a gateway to detailed but scattered information on best industry practice, engendering a better understanding of interrelated concepts and techniques that cut across specialized areas of engineering. Beyond traditional automotive subjects the Encyclopedia addresses green technologies, the shift from mechanics to electronics, and the means to produce safer, more efficient vehicles within varying economic restraints worldwide. The work comprises nine main parts: (1) Engines: Fundamentals (2) Engines: Design (3) Hybrid and Electric Powertrains (4) Transmission and Driveline (5) Chassis Systems (6) Electrical and Electronic Systems (7) Body Design (8) Materials and Manufacturing (9) Telematics. Offers authoritative coverage of the wide-ranging specialist topics encompassed by automotive engineering An accessible point of reference for entry level engineers and students who require an understanding of the fundamentals of technologies outside of their own expertise or training Provides invaluable guidance to more detailed texts

and research findings in the technical literature Developed in conjunction with FISITA, the umbrella organisation for the national automotive societies in 37 countries around the world and representing more than 185,000 automotive engineers 6 Volumes www.automotive-reference.com An essential resource for libraries and information centres in industry, research and training organizations, professional societies, government departments, and all relevant engineering departments in the academic sector.

Model Validation and Uncertainty Quantification, Volume 3 - Zhu Mao 2022

Model Validation and Uncertainty Quantification, Volume 3: Proceedings of the 39th IMAC, A Conference and Exposition on Structural Dynamics, 2021, the third volume of nine from the Conference brings together contributions to this important area of research and engineering. The collection presents early findings and case studies on fundamental and applied aspects of Model Validation and Uncertainty Quantification, including papers on: Inverse Problems and Uncertainty Quantification Controlling Uncertainty Validation of Models for Operating Environments Model Validation & Uncertainty Quantification: Decision Making Uncertainty Quantification in Structural Dynamics Uncertainty in Early Stage Design Computational and Uncertainty Quantification Tools.

Electric Motorcycles and Bicycles - Kevin Desmond 2018-12-17

Beginning in 1881, isolated prototypes of electric tricycles and bicycles were patented and sometimes tested. Limited editions followed in the 1940s, but it was not until the lithium-ion battery became available in the first decade of this century that urban pedelecs and more powerful open-road motorcycles--sometimes with speeds of over 200 mph--became possible and increasingly popular. Today's

ever-growing fleets of one-wheel, two-wheel and three-wheel light electric vehicles can now be counted in the hundreds of millions. In this third installment of his electric transport history series, the author covers the lives of the innovative engineers who have developed these e-wheelers.

Popular Science - 1989-11

Popular Science gives our readers the information and tools to improve their technology and their world. The core belief that Popular Science and our readers share: The future is going to be better, and science and technology are the driving forces that will help make it better.

Automotive Engineering Fundamentals - Richard Stone 2004-04-30

In the introduction of Automotive Engineering Fundamentals, Richard Stone and Jeffrey K. Ball provide a fascinating and often amusing history of the passenger vehicle, showcasing the various highs and lows of this now-indispensable component of civilized societies. The authors then provide an overview of the publication, which is designed to give the student of automotive engineering a basic understanding of the principles involved with designing a vehicle. From engines and transmissions to vehicle aerodynamics and computer modeling, the intelligent, interesting presentation of core concepts in Automotive Engineering Fundamentals is sure to make this an indispensable resource for engineering students and professionals alike.

INNOVATION, ECONOMIC DEVELOPMENT, AND INTELLECTUAL PROPERTY IN INDIA AND - Kung-Chung Liu 2019-01-01

This open access book analyses intellectual property and innovation governance in the development of six key industries in India and China. These industries are reflective of the innovation and economic development of the two economies, or of vital importance to them: the IT Industry, the film industry, the

pharmaceutical industry, plant varieties and food security, the automobile industry, and the sharing economy. The analysis extends beyond the domain of IP law, and includes economics and policy analysis. The overarching concerns of the book are how the examined industries have developed in the two countries, what role state innovation policy and/or IP policy has played in such development, what the nature of the state innovation policy/IP policy is, whether such policy has been causal, facilitating, crippling, co-relational, or simply irrelevant, and whether there is a possibility of synergy between the two economies. The book also inquires as to why and how one specific industry has developed in one country and not in the other, and what India and China can learn from each other. The book provides a real-life understanding of how IP laws interact with innovation and economic development in the six selected economic sectors in China and India. The reader can also draw lessons from the success or failure of these sectors. --

Reliability in Automotive and Mechanical Engineering - Bernd Bertsche 2008-04-30

Defects generate a great economic problem for suppliers who are faced with increased duties. Customers expect increased efficiency and dependability of technical product of - also growing - complexity. The authors give an introduction to a theory of dependability for engineers. The book may serve as a reference book as well, enhancing the knowledge of the specialists and giving a lot of theoretical background and information, especially on the dependability analysis of whole systems.

Official Gazette of the United States Patent and Trademark Office - 1997

Hybridization of MNE Subsidiaries - F. Becker-Ritterspach 2008-12-03

MNEs setting up subsidiaries in emerging markets face the ongoing question to what extent they can transfer their

home-grown or global organizational models. This book looks at how the cross-border transfer of production models in MNEs is related to strategic choices of firms and different kinds of contextual differences between countries.

2016 Passenger Car and 2015 Concept Car Yearbook - Automotive Engineering International 2015-12-15 Carmakers release new models every year with advanced technology to attract consumer interest and to satisfy increasingly stringent government regulations. Some of these technologies are firsts or leading-edge, and they start trends that more companies will soon follow. Snapshots of the direction of the automotive industry, along with OEM and supplier perspectives, are presented in these articles that have been collected by the Editors of Automotive Engineering whose aim is to provide the reader with a complete overview of the key advances that took place over the course of one model year. • Provides a single source for information on the key engineering trends of one year. • Allows the reader to skip to chapters that cover specific car models that interest them, or read about all models from beginning to end. • Includes plenty of big, full-color images and the facts about the most recent technology and engineering innovations. Each car manufacturer has its own chapter exploring new models in-depth. The yearly trends and innovations that make the automotive industry fascinating to both the engineer and the customer are all captured in the imagery and easy-reading of this full-color book.

Popular Mechanics - 2004-05 Popular Mechanics inspires, instructs and influences readers to help them master the modern world. Whether it’s practical DIY home-improvement tips, gadgets and digital technology, information on the newest cars or the latest breakthroughs in science -- PM is the ultimate guide to our high-tech lifestyle.

Popular Science - 1985-03 Popular Science gives our

readers the information and tools to improve their technology and their world. The core belief that Popular Science and our readers share: The future is going to be better, and science and technology are the driving forces that will help make it better.

Semiconductor Laser Engineering, Reliability and Diagnostics - Peter W. Epperlein 2013-03-18

This reference book provides a fully integrated novel approach to the development of high-power, single-transverse mode, edge-emitting diode lasers by addressing the complementary topics of device engineering, reliability engineering and device diagnostics in the same book, and thus closes the gap in the current book literature. Diode laser fundamentals are discussed, followed by an elaborate discussion of problem-oriented design guidelines and techniques, and by a systematic treatment of the origins of laser degradation and a thorough exploration of the engineering means to enhance the optical strength of the laser. Stability criteria of critical laser characteristics and key laser robustness factors are discussed along with clear design considerations in the context of reliability engineering approaches and models, and typical programs for reliability tests and laser product qualifications. Novel, advanced diagnostic methods are reviewed to discuss, for the first time in detail in book literature, performance- and reliability-impacting factors such as temperature, stress and material instabilities. Further key features include: practical design guidelines that consider also reliability related effects, key laser robustness factors, basic laser fabrication and packaging issues; detailed discussion of diagnostic investigations of diode lasers, the fundamentals of the applied approaches and techniques, many of them pioneered by the author to be fit-for-purpose and novel in the application; systematic insight into laser degradation modes such as

catastrophic optical damage, and a wide range of technologies to increase the optical strength of diode lasers; coverage of basic concepts and techniques of laser reliability engineering with details on a standard commercial high power laser reliability test program. Semiconductor Laser Engineering, Reliability and Diagnostics reflects the extensive expertise of the author in the diode laser field both as a top scientific researcher as well as a key developer of high-power highly reliable devices. With invaluable practical advice, this new reference book is suited to practising researchers in diode laser technologies, and to postgraduate engineering students. Dr. Peter W. Epperlein is Technology Consultant with his own semiconductor technology consulting business Pwe-PhotonicsElectronics-IssueResolution in the UK. He looks back at a thirty years career in cutting edge photonics and electronics industries with focus on emerging technologies, both in global and start-up companies, including IBM, Hewlett-Packard, Agilent Technologies, Philips/NXP, Essient Photonics and IBM/JDSU Laser Enterprise. He holds Pre-Dipl. (B.Sc.), Dipl. Phys. (M.Sc.) and Dr. rer. nat. (Ph.D.) degrees in physics, magna cum laude, from the University of Stuttgart, Germany. Dr. Epperlein is an internationally recognized expert in compound semiconductor and diode laser technologies. He has accomplished R&D in many device areas such as semiconductor lasers, LEDs, optical modulators, quantum well devices, resonant tunneling devices, FETs, and superconducting tunnel junctions and integrated circuits. His pioneering work on sophisticated diagnostic research has led to many world’s first reports and has been adopted by other researchers in academia and industry. He authored more than seventy peer-reviewed journal papers, published more than ten invention disclosures

in the IBM Technical Disclosure Bulletin, has served as reviewer of numerous proposals for publication in technical journals, and has won five IBM Research Division Awards. His key achievements include the design and fabrication of high-power, highly reliable, single mode diode lasers. Book Reviews “Semiconductor Laser Engineering, Reliability and Diagnostics: A Practical Approach to High Power and Single Mode Devices”. By Peter W. Epperlein Prof. em. Dr. Heinz Jäckel, High Speed Electronics and Photonics, Swiss Federal Institute of Technology ETH Zürich, Switzerland The book “Semiconductor Laser Engineering, Reliability and Diagnostics” by Dr. P.W. Epperlein is a landmark in the recent literature on semiconductor lasers because it fills a longstanding gap between many excellent books on laser theory and the complex and challenging endeavor to fabricate these devices reproducibly and reliably in an industrial, real world environment. Having worked myself in the early research and development of high power semiconductor lasers, I appreciate the competent, complete and skillful presentation of these three highly interrelated topics, where small effects have dramatic consequences on the success of a final product, on the ultimate performance and on the stringent reliability requirements, which are the name of the game. As the title suggests the author addresses three tightly interwoven and critical topics of state-of-the-art power laser research. The three parts are: device and mode stability engineering (chapter 1, 2), reliability mechanisms and reliability assessment strategies (chapter 3, 4, 5, 6) and finally material and device diagnostics (chapter 7, 8, 9) all treated with a strong focus on the implementation. This emphasis on the complex practical aspects for a large-scale power laser fabrication is a true

highlight of the book. The subtle interplay between laser design, reliability strategies, advanced failure analysis and characterization techniques are elaborated in a very rigorous and scientific way using a very clear and easy to read representation of the complex interrelation of the three major topics. I will abstain from trying to provide a complete account of all the topics but mainly concentrate on the numerous highlights. The first part 1 “Laser Engineering” is divided in two chapters on basic electronic-optical, structural, material and resonator laser engineering on the one side, and on single mode control and stability at very high, still reliable power-levels with the trade-off between mirror damage, single mode stability on the other side. To round up the picture less well-known concepts and the state-of-the-art of large-area lasers, which can be forced into single-mode operation, are reviewed carefully. The subtle and complex interplay, which is challenging to optimize for a design for reliability and low stress as a major boundary condition is crucial for the design. The section gives a rather complete and well-referenced account of all relevant aspects, relations and trade-offs for understanding the rest of the book. The completeness of the presentation on power laser diode design based on basic physical and plausible arguments is mainly based on analytic mathematical relations as well as experiments providing a new and well-balanced addition for the power diode laser literature in particular. Modern 2D self-consistent electro-optical laser modeling including carrier hole burning and thermal effects – this is important because the weak optical guiding and gain-discrimination depend critically on rather small quantities and effects, which are difficult to optimize experimentally – is used in the book for simulation results, but is not treated separately. The novel and really original, “gap-filling”

bulk of the book is elaborated by the author in a very clear way in the following four chapters in the part 2 “Laser Reliability” on laser degradation physics and mirror design and passivation at high power, followed then by two very application oriented chapters on reliability design engineering and practical reliability strategies and implementation procedures. This original combination of integral design and reliability aspects – which are mostly neglected in standard literature – is certainly a major plus of this book. I liked this second section as a whole, because it provides excellent insights in degradation physics on a high level and combines it in an interesting and skillful way with the less “glamorous” (unfortunately) but highly relevant reliability science and testing strategies, which is particularly important for devices operating at extreme optical stresses with challenging lifetime requirements in a real word environment. Finally, the last part 3 “Laser Diagnostics” comprising three chapters, is devoted mainly to advanced experimental diagnostics techniques for material integrity, mechanical stress, deep level defects, various dynamic laser degradation effects, surface- and interface quality, and most importantly heating and disordering of mirrors and mirror coatings. The topics of characterization techniques comprising micro-Raman- and micro-thermoreflectance-probing, 2K photoluminescence spectroscopy, micro-electroluminescence and photoluminescence scanning, and deep-level-transient spectroscopy have been pioneered by the author for the specific applications over many years guaranteeing many competent and well represented insights. These techniques are brilliantly discussed and the information distributed in many articles by the author has been successfully unified in a book form. In my personal judgment and liking, I consider the parts

2 and 3 on reliability and diagnostics as the most valuable and true novel contribution of the book, which in combination with the extremely well-covered laser design of part 1 clearly fill the gap in the current diode laser literature, which in this detail has certainly been neglected in the past. In summary, I can highly recommend this excellent, well-organized and clearly written book to readers who are already familiar with basic diode laser theory and who are active in the academic and industrial fabrication and characterization of semiconductor lasers. Due to its completeness, it also serves as an excellent reference of the current state-of-the-art in reliability engineering and device and material diagnostics. Needless to mention that the quality of the book, its representations and methodical structure meet the highest expectation and are certainly a tribute from the long and broad experience of the author in academic laser science and the industrial commercialization of high power diode lasers. In my opinion, this book was a pleasure to read and due to its quality and relevance deserves a large audience in the power diode laser community! Prof. em. Dr. Heinz Jäckel, High Speed Electronics and Photonics, Swiss Federal Institute of Technology ETH Zürich, Switzerland June 16, 2013

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==== “Semiconductor Laser Engineering, Reliability and Diagnostics: A Practical Approach to High Power and Single Mode Devices”. By Peter W. Epperlein Dr. Chung-en Zah, Research Director, Semiconductor Technologies Research, S&T Division, Corning Incorporate, Corning NY, USA This book covers for the first time the three closely interrelated key laser areas of engineering (design), reliability and diagnostics in one book, written by the well-known practitioner in cutting-edge optoelectronics industries, Dr. Peter W. Epperlein. The book

closes the gap in the current book literature and is thus a unique and excellent example of how to merge design, reliability and diagnostics aspects in a very professional, profound and complete manner. All physical and technological principles, concepts and practical aspects required for developing and fabricating highly-reliable high-power single-mode laser products are precisely specified and skilfully formulated along with all the necessary equations, figures, tables and worked-out examples making it easy to follow through the nine chapters. Hence, this unique book is a milestone in the diode laser literature and is an excellent reference book not only for diode laser researchers and engineers, but also diode laser users. The engineering part starts with a very informative and clear, well-presented account of all necessary basic diode laser types, principles, parameters and characteristics for an easy and quick understanding of laser functionality within the context of the book. Along with an elaborate and broad discussion of relevant laser material systems, applications, typical output powers, power-limiting factors and reliability tradeoffs, basic fabrication and packaging technologies, this excellent introductory section is well suited to become quickly and easily familiar with practical aspects and issues of diode laser technologies. Of special importance and high usefulness is the first analytic and quantitative discussion in a book on issues of coupling laser power into optical single mode fibers. The second section discusses in a well-balanced, competent and skilful way waveguide topics such as basic high-power design approaches, transverse vertical and lateral waveguide concepts, stability of the fundamental transverse lateral mode and fundamental mode waveguide optimization techniques by considering detrimental effects such as heating, carrier injection, spatial hole burning, lateral

current spreading and gain profile variations. Less well-known approaches to force large-area lasers into a single mode operation are well-identified and carefully discussed in depth and breadth. All these topics are elaborated in a very complete, rigorous and scientific way and are clearly articulated and easy to read. In particular, the book works out the complex interaction between the many different effects to optimize high-power single-mode performance at ultimate reliability and thus is of great benefit to every researcher and engineer engaged in this diode laser field. Another novelty and highlight is, for the first time ever in book form, a comprehensive yet concise discussion of diode laser reliability related issues. These are elaborated in four distinct chapters comprising laser degradation physics and modes, optical strength enhancement approaches including mirror passivation/coating and non-absorbing mirror technologies, followed by two highly relevant product-oriented chapters on reliability design engineering concepts and techniques and an elaborate reliability test plan for laser chip and module product qualification. This original and novel approach to link laser design to reliability aspects and requirements provides both, most useful insight into degradation processes such as catastrophic optical mirror damage on a microscopic scale, and a wide selection of effective remedial actions. These accounts, which are of highest significance for lasers operating at the optical stress limit due to extremely high output power densities and most demanding lifetime requirements are very professionally prepared and discussed in an interesting, coherent and skilful manner. The diagnostics part, consisting of three very elaborate chapters, is most unique and novel with respect to other diode laser books. It discusses for the first time ever on a very high level and in a competent way studies on

material integrity, impurity trapping effects, mirror and cavity temperatures, surface- and interface quality, mirror facet disorder effects, mechanical stress and facet coating instability, and diverse laser temperature effects, dynamic laser degradation effects and mirror temperature maps. Of highest significance to design, performance and reliability are the various correlations established between laser device and material parameters. The most different and sophisticated experiments, carried out by the author at micrometer spatial resolutions and at temperatures as low as 2K, provide highly valuable insights into laser and material quality parameters, and reveal for the first time the origins of high power limitations on an atomic scale due to local heating effects and deep level defects. It is of great benefit, that the experimental techniques such as Raman spectroscopy, various luminescence techniques, thermoreflectance and deep-level transient spectroscopy, pioneered by the author for the specific experiments on lasers, are discussed with great expertise in depth and breadth, and the numerous paper articles published by the author are now represented in this book. The book has an elaborate table of contents and index, which are very useful, over 200 illustrative figures and tables, and extensive lists of references to all technical topics at the end of each of the nine chapters, which make it easy to follow from cover to cover or by jumping in at random areas of special interest. Moreover, experimental and theoretical concepts are always illustrated by practical examples and data. I can highly recommend this extremely relevant, well-structured and well-formulated book to all practising researchers in industrial and academic diode laser R&D environments and to post-graduate engineering students interested in the actual problems of designing, manufacturing, testing,

characterising and qualifying diode lasers. Due to its completeness and novel approach to combine design, reliability and diagnostics in the same book, it can serve as an ideal reference book as well, and it deserves to be welcomed wordwide by the addressed audience. Dr. Chung-en Zah, Research Director, Semiconductor Technologies Research, S&T Division, Corning Incorporate, Corning NY, USA

========== ========== ===== “Semiconductor Laser Engineering, Reliability and Diagnostics: A Practical Approach to High Power and Single Mode Devices”. By Peter W. Epperlein Cordinatore Prof. Lorenzo Pavesi, UNIVERSITÀ DEGLI STUDI DI TRENTO, Dipartimento di Fisica / Laboratorio di Nanoscienze This book represents a well thought description of three fundamental aspects of laser technology: the functioning principles, the reliability and the diagnostics. From this point of view, and, as far as I know, this is a unique example of a book where all these aspects are merged together resulting in a well-balanced presentation. This helps the reader to move with ease between different concepts since they are presented in a coherent manner and with the same terminology, symbols and definitions. The book reads well. Despite the subtitle indicates that it is a practical approach, the book is also correct from a formal point of view and presents the necessary equations and derivations to understand both the physical mechanisms and the practicalities via a set of useful formulas. In addition, there is the more important aspect of many real-life examples of how a laser is actually manufactured and which the relevant parameters that determine its behaviour are. It impresses the amounts of information that are given in the book: this would be more typical of a thick handbook on semiconductor laser than of an agile book. Dr. Epperlein was able to identify the most

important concepts and to present them in a clear though concise way. I am teaching a course on Optoelectronics and I'm going to advise students to refer to this book, because it has all the necessary concepts and derivations for a systematic understanding of semiconductor lasers with many worked-out examples, which will help the student to grasp the actual problems of designing, manufacturing, testing and using semiconductor lasers. All the various concepts are joined to very useful figures, which, if provided to instructors as files, can be a useful add-on for the use of the book as text for teaching. Concepts are always detailed with numbers to give a feeling of their practical use. In conclusion, I do find the book suitable for my teaching duties and will refer it to my students. Prof. Dr. Lorenzo Pavesi, Head of the Department of Physics, Head of the Nanoscience Laboratory, University of Trento, Italy 31 May 2013 ========== ==========

===== “Semiconductor Laser Engineering, Reliability and Diagnostics: A Practical Approach to High Power and Single Mode Devices”. By Peter W. Epperlein Robert W. Herrick, Ph.D., Senior Component Reliability Engineer, Intel Corp., Santa Clara, California, USA Dr. Epperlein has done the semiconductor laser community a great service, by releasing the most complete book on the market on the practical issues of how to make reliable semiconductor lasers. While dozens of books have been written over the past couple of decades on semiconductor laser design, only a handful have been written on semiconductor laser reliability. Prior to the release of this book, perhaps 40% of the material could be obtained elsewhere by combining five books: one on laser design, one on laser reliability, one on reliability calculations, and a couple of laser review books. Another 40% could be pieced together by collecting 50 -100 papers on the subjects of laser

design, laser fabrication, characterization, and reliability. The remaining 20% have not previously been covered in any comprehensive way. Only the introductory material in the first half of the first chapter has good coverage elsewhere. The large majority of the knowledge in this book is generally held as “trade secret” by those with the expertise in the field, and most of those in the know are not free to discuss. The author was fortunate enough to work for the first half of his career in the IBM research labs, with access to unparalleled resources, and the ability to publish his work without trade secret restrictions. The results are still at the cutting edge of our understanding of semiconductor laser reliability today, and go well beyond the empirical “black box” approach many use of “try everything, and see what works.” The author did a fine job of pulling together material from many disparate fields. Dr. Epperlein has particular expertise in high power single mode semiconductor lasers, and those working on those type of lasers will be especially interested in this book, as there has never been a book published on the fabrication and qualification of such lasers before. But those in almost any field of semiconductor lasers will learn items of interest about device design, fabrication, reliability, and characterization. Unlike most other books, which intend to convey the scientific findings or past work of the author, this one is written more as a “how to” manual, which should make it more accessible and useful to development engineers and researchers in the field. It also has over 200 figures, which make it easier to follow. As with many books of this type, it is not necessary to read it from cover-to-cover; it is best skimmed, with deep diving into any areas of special interest to the reader. The book is remarkable also for how comprehensive it is – even experts will discover something new and useful. Dr. Epperlein’s book is an essential read for

anyone looking to develop semiconductor lasers for anything other than pure research use, and I give it my highest recommendation. Robert W. Herrick, Ph.D., Senior Component Reliability Engineer, Intel Corp., Santa Clara, California, USA

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The Player Volume 5 Issue 12.....in this issue..... Powabyke - The electric bike. Porsche GT3 - The latest supercar from the famous German manufacturer. Home James - A personal interview with James Hewitt.

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