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INTERNAL COMBUSTION ENGINES

New Age International **Salient Features * The New Edition Is A Thoroughly Revised Version Of The Earlier Edition And Presents A Detailed Exposition Of The Basic Principles Of Design, Operation And Characteristics Of Reciprocating I.C. Engines And Gas Turbines. * Chemistry Of Combustion, Engine Cooling And Lubrication Requirements, Liquid And Gaseous Fuels For Ic Engines, Compressors, Supercharging And Exhaust Emission - Its Standards And Control Thoroughly Explained. * Jet And Rocket Propulsion, Alternate Potential Engines Including Hybrid Electric And Fuel Cell Vehicles Are Discussed In Detail. * Chapter On Ignition System Includes Electronic Injection Systems For Si And Ci Engines. * 150 Worked Out Examples Illustrate The Basic Concepts And Self Explanatory Diagrams Are Provided Throughout The Text. * More Than 200 Multiple Choice Questions With Answers, A Good Number Of Review Questions, Numerical With Answers For Practice Will Help Users In Preparing For Different Competitive Examinations.With These Features, The Present Text Is Going To Be An Invaluable One For Undergraduate Mechanical Engineering Students And Amie Candidates.**

FUNDAMENTALS OF INTERNAL COMBUSTION ENGINES

PHI Learning Pvt. Ltd. **Providing a comprehensive introduction to the basics of Internal Combustion Engines, this book is suitable for: Undergraduate-level courses in mechanical engineering, aeronautical engineering, and automobile engineering. Postgraduate-level courses (Thermal Engineering) in mechanical engineering. A.M.I.E. (Section B) courses in mechanical engineering. Competitive examinations, such as Civil Services, Engineering Services, GATE, etc. In addition, the book can be used for refresher courses for professionals in auto-mobile industries. Coverage Includes Analysis of processes (thermodynamic, combustion, fluid flow, heat transfer, friction and lubrication) relevant to design, performance, efficiency, fuel and emission requirements of internal combustion engines. Special topics such as reactive systems, unburned and burned mixture charts, fuel-line hydraulics, side thrust on the cylinder walls, etc. Modern developments such as electronic fuel injection systems, electronic ignition systems, electronic indicators, exhaust emission requirements, etc. The Second Edition includes new sections on geometry of reciprocating engine, engine performance parameters, alternative fuels for IC engines, Carnot cycle, Stirling cycle, Ericsson cycle, Lenoir cycle, Miller cycle, crankcase ventilation, supercharger controls and homogeneous charge compression ignition engines. Besides, air-standard cycles, latest advances in fuel-injection system in SI engine and gasoline direct injection are discussed in detail. New problems and examples have been added to several chapters. Key Features Explains basic principles and applications in a clear, concise, and easy-to-read manner Richly illustrated to promote a fuller understanding of the subject SI units are used throughout Example problems illustrate applications of theory End-of-chapter review questions and problems help students reinforce and apply key concepts Provides answers to all numerical problems**

COMBUSTION SYSTEMS OF HIGH-SPEED PISTON I.C. ENGINES

Elsevier Publishing Company

INTERNAL COMBUSTION ENGINE FUNDAMENTALS

McGraw-Hill Science Engineering **This text, by a leading authority in the field, presents a fundamental and factual development of the science and engineering underlying the design of combustion engines and turbines. An extensive illustration program supports the concepts and theories discussed.**

IGNITION SYSTEMS FOR GASOLINE ENGINES

3RD INTERNATIONAL CONFERENCE, NOVEMBER 3-4, 2016, BERLIN, GERMANY

Springer **The volume includes selected and reviewed papers from the 3rd Conference on Ignition Systems for Gasoline Engines in Berlin in November 2016. Experts from industry and universities discuss in their papers the challenges to ignition systems in providing reliable, precise ignition in the light of a wide spread in mixture quality, high exhaust gas recirculation rates and high cylinder pressures. Classic spark plug ignition as well as alternative ignition systems are assessed, the ignition system being one of the key technologies to further optimizing the gasoline engine.**

MIXTURE FORMATION IN INTERNAL COMBUSTION ENGINES

Springer Science & Business Media **A systematic control of mixture formation with modern high-pressure injection systems enables us to achieve considerable improvements of the combustion pr- ess in terms of reduced fuel consumption and engine-out raw emissions. However, because of the growing number of free parameters due to more flexible injection systems, variable valve trains, the application of different combustion concepts within different regions of the engine map, etc., the prediction of spray and m- ture formation becomes increasingly complex. For this reason, the optimization of the in-cylinder processes using 3D computational fluid dynamics (CFD) becomes increasingly important. In these CFD codes, the detailed modeling of spray and mixture formation is a prerequisite for the correct calculation of the subsequent processes like ignition, combustion and formation of emissions. Although such simulation tools can be viewed as standard tools today, the predictive quality of the sub-models is c- stantly enhanced by a more accurate and detailed modeling of the relevant pr- esses, and by the inclusion of new important mechanisms and effects that come along with the development of new injection systems and have not been cons- ered so far. In this book the most widely used mathematical models for the simulation of spray and mixture formation in 3D CFD calculations are described and discussed. In order to give the reader an introduction into the complex processes, the book starts with a description of the fundamental mechanisms and categories of fuel - jection, spray break-up, and mixture formation in internal combustion engines.**

DYNAMIC MODELING OF WASTE ENERGY HARVESTING SYSTEM FOR SPARK IGNITION ENGINE INTERNAL COMBUSTION ENGINE

Several methods for waste thermal energy recovery from IC engine have been studied by using supercharger or turbocharger or combined. This study presents an innovative approach on power generation from waste of IC engine based on coolant and exhaust. The waste energy harvesting system of coolant (weHSc) is used to supply hot air at temperatures in the range of 60-70°C directly into the engine cylinder, which would be useful to vaporize the fuel droplets into the cylinder. Increase in fuel vaporization helps to improve the engine thermal efficiency by 1% to be 29% at 4000 rpm due to reduction in fuel consumption. The waste energy harvesting system of exhaust (weHSex) has been developed with integrating fuzzy intelligent controlled micro-faucet emission gas recirculation (MiF-EGR). In this study the MiF-EGR has been used to maintain the intake air temperature at 70°C and reduce higher intake temperature by allowing exhaust gas flow to the engine cylinder chamber thus increase the engine volumetric efficiency. The performance of weHSc and weHSex equipped engine has been investigated by using GT Suite software for optimum engine speed at 4000 rpm. The result shows that specific fuel consumption of engine has improved by 2% due to vaporization of fuel droplets. Reduction of hydrocarbon (HC) formation inside the engine combustion chamber has been reduced by 9% at 4000 rpm thus control the emission level. Volumetric efficiency also has been improved in overall by 2.2%. Lastly, the brake power has increased by 8% due to the fuel atomization and vaporization at engine intake temperature of 70°C.

INTRODUCTION TO INTERNAL COMBUSTION ENGINES

Bloomsbury Publishing **Now in its fourth edition, this textbook remains the indispensable text to guide readers through automotive or mechanical engineering, both at university and beyond. Thoroughly updated, clear, comprehensive and well-illustrated, with a wealth of worked examples and problems, its combination of theory and applied practice aids in the understanding of internal combustion engines, from thermodynamics and combustion to fluid mechanics and materials science. This textbook is aimed at third year undergraduate or postgraduate students on mechanical or automotive engineering degrees. New to this Edition: - Fully updated for changes in technology in this fast-moving area - New material on direct injection spark engines, supercharging and renewable fuels - Solutions manual online for lecturers**

CHEMICAL KINETICS IN COMBUSTION AND REACTIVE FLOWS: MODELING TOOLS AND APPLICATIONS

Cambridge University Press **Introduces advanced mathematical tools for the modeling, simulation, and analysis of chemical non-equilibrium phenomena in combustion and flows, following a detailed explanation of the basics of thermodynamics and chemical kinetics of reactive mixtures. Researchers, practitioners, lecturers, and graduate students will find this work valuable.**

INTERNAL COMBUSTION ENGINES AND POWERTRAIN SYSTEMS FOR FUTURE TRANSPORT 2019

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON INTERNAL COMBUSTION ENGINES AND POWERTRAIN SYSTEMS FOR FUTURE TRANSPORT, (ICEPSFT 2019), DECEMBER 11-12, 2019, BIRMINGHAM, UK

CRC Press **With the changing landscape of the transport sector, there are also alternative powertrain systems on offer that can run independently of or in conjunction with the internal combustion (IC) engine. This shift has actually helped the industry gain traction with the IC Engine market projected to grow at 4.67% CAGR during the forecast period 2019-2025. It continues to meet both requirements and challenges through continual technology advancement and innovation from the latest research. With this in mind, the contributions in Internal Combustion Engines and Powertrain Systems for Future Transport 2019 not only cover the particular issues for the IC engine market but also reflect the impact of alternative powertrains on the propulsion industry. The main topics include: - Engines for hybrid powertrains and electrification - IC engines - Fuel cells - E-machines - Air-path and other technologies achieving**

performance and fuel economy benefits - Advances and improvements in combustion and ignition systems - Emissions regulation and their control by engine and after-treatment - Developments in real-world driving cycles - Advanced boosting systems - Connected powertrains (AI) - Electrification opportunities - Energy conversion and recovery systems - Modified or novel engine cycles - IC engines for heavy duty and off highway Internal Combustion Engines and Powertrain Systems for Future Transport 2019 provides a forum for IC engine, fuels and powertrain experts, and looks closely at developments in powertrain technology required to meet the demands of the low carbon economy and global competition in all sectors of the transportation, off-highway and stationary power industries.

INTERNAL COMBUSTION ENGINE HANDBOOK

BASICS, COMPONENTS, SYSTEMS, AND PERSPECTIVES

More than 120 authors from science and industry have documented this essential resource for students, practitioners, and professionals. Comprehensively covering the development of the internal combustion engine (ICE), the information presented captures expert knowledge and serves as an essential resource that illustrates the latest level of knowledge about engine development. Particular attention is paid toward the most up-to-date theory and practice addressing thermodynamic principles, engine components, fuels, and emissions. Details and data cover classification and characteristics of reciprocating engines, along with fundamentals about diesel and spark ignition internal combustion engines, including insightful perspectives about the history, components, and complexities of the present-day and future IC engines. Chapter highlights include: Classification of reciprocating engines Friction and Lubrication Power, efficiency, fuel consumption Sensors, actuators, and electronics Cooling and emissions Hybrid drive systems Nearly 1,800 illustrations and more than 1,300 bibliographic references provide added value to this extensive study.

INTRODUCTION TO MODELING AND CONTROL OF INTERNAL COMBUSTION ENGINE SYSTEMS

Springer Science & Business Media **Internal combustion engines still have a potential for substantial improvements, particularly with regard to fuel efficiency and environmental compatibility. These goals can be achieved with help of control systems. Modeling and Control of Internal Combustion Engines (ICE) addresses these issues by offering an introduction to cost-effective model-based control system design for ICE. The primary emphasis is put on the ICE and its auxiliary devices. Mathematical models for these processes are developed in the text and selected feedforward and feedback control problems are discussed. The appendix contains a summary of the most important controller analysis and design methods, and a case study that analyzes a simplified idle-speed control problem. The book is written for students interested in the design of classical and novel ICE control systems.**

LASER IGNITION OF INTERNAL COMBUSTION ENGINES

GRIN Verlag **Doctoral Thesis / Dissertation from the year 2006 in the subject Electrotechnology, grade: 1, mit Ausgezeichnung bestanden, Vienna University of Technology (Insitut fur Photonik), language: English, abstract: In this PhD thesis different fundamental aspects and the practical usability of a laser ignition system as a new, innovative and alternative ignition approach for internal combustion engines were investigated in great detail mainly experimentally. Ignition experiments in combustion chambers under high pressures and elevated temperatures have been conducted. Different fuels were investigated. Also the minimum breakdown energy in dependence of the initial temperature and pressure with the help of an aspheric lens with a high numerical aperture was studied. High-speed Schlieren diagnostics have been conducted in the combustion chamber. The different stages like the ignition plasma within the first nanoseconds via the shock wave generation to the expanding flame kernel were investigated. With the help of multi-point ignition the combustion duration could be reduced significantly. The controlled start of auto-ignition of n-heptane-air mixtures by resonant absorption of Er, Cr: YSGG laser radiation at 2.78 um by additionally introduced water has been proven in combustion chamber experiments as a completely new idea. Beside experiments in the combustion chambers and long term tests under atmospheric conditions, various tests in SI engines up to 200 h, have been made. Different sources of contamination of the window surface have been identified. First experiments with a longitudinally diode-pumped, fiber-coupled and passively Q-switched solid-state laser -prototype system with maximum pulse energy of 1.5 mJ at about 1.5 ns pulse duration were performed which allowed to ignite the engine successfully over a test period of 100 h. In cooperation with Lund University in Sweden, experiments have been performed on another engine test bed running in HCCI mode revealing the la**

INTERNAL COMBUSTION ENGINES

Laxmi Publications

FUEL ECONOMY

IN ROAD VEHICLES POWERED BY SPARK IGNITION ENGINES

Springer Science & Business Media **Concern about the reduced availability and the increased cost of petroleum fuels prompted great efforts in recent years to reduce the fuel consumption of auto mobiles. The ongoing efforts to reduce fuel consumption have addressed many relevant factors, including increased engine performance, reduced friction, use of lightweight materials, and reduced aerodynamic drag. The results of the investigations assessing the various factors affecting fuel economy have been published in journals, conference proceedings, and in company and government reports. This proliferation of technical information makes it difficult for workers to keep abreast of aU developments.**

The material presented in this book brings together in a single volume much of the relevant materials, summarizes many of the state-of-the-art theories and data, and provides extensive lists of references. Thus, it is hoped that this book will be a useful reference for specialists and practicing engineers interested in the fuel economy of automobiles. J. C. HILLIARD o. S. SPRINGER vii CONTENTS 1. AUTOMOTIVE FUEL ECONOMY David Cole I. Introduction and Background. . . . . 1 . . . . . n. Fuel Economy Factors . . . . . 9 A. Engine..... 11 B. Drive Train. . . . . 20 . . . . . C. Vehicle Factors. . . . . 22 . . . . . D. Operating Factors. . . . . 28 . . . . . E. Test Cycles . . . . . 32 . . . . . References . . . . . 33 . . . . . 2. FUEL ECONOMY AND EMISSIONS J. T. Kummer I. Introduction ..... . 35 n. Emission Regulations ..... .

ADVANCES IN INTERNAL COMBUSTION ENGINE RESEARCH

Springer **This book discusses all aspects of advanced engine technologies, and describes the role of alternative fuels and solution-based modeling studies in meeting the increasingly higher standards of the automotive industry. By promoting research into more efficient and environment-friendly combustion technologies, it helps enable researchers to develop higher-power engines with lower fuel consumption, emissions, and noise levels. Over the course of 12 chapters, it covers research in areas such as homogeneous charge compression ignition (HCCI) combustion and control strategies, the use of alternative fuels and additives in combination with new combustion technology and novel approaches to recover the pumping loss in the spark ignition engine. The book will serve as a valuable resource for academic researchers and professional automotive engineers alike.**

ENGINE MODELING AND SIMULATION

Springer Nature

A TEXTBOOK OF THERMAL ENGINEERING

S. Chand Publishing **Two new chapters on eneral Themodynamic Relations and Variable Specific Heat have been Added.The mistake which had crept in have been elinimated.we wish to express our sincere thanks to numerous professors and students,both at home and abroad,for sending their valuable suggestions and also for recommending the book to their students and friends.**

INTERNAL COMBUSTION ENGINES

Elsevier **Internal Combustion Engines covers the trends in passenger car engine design and technology. This book is organized into seven chapters that focus on the importance of the in-cylinder fluid mechanics as the controlling parameter of combustion. After briefly dealing with a historical overview of the various phases of automotive industry, the book goes on discussing the underlying principles of operation of the gasoline, diesel, and turbocharged engines; the consequences in terms of performance, economy, and pollutant emission; and of the means available for further development and improvement. A chapter focuses on the automotive fuels of the various types of engines. Recent developments in both the experimental and computational fronts and the application of available research methods on engine design, as well as the trends in engine technology, are presented in the concluding chapters. This book is an ideal compact reference for automotive researchers and engineers and graduate engineering students.**

SPECIFICATIONS AND DRAWINGS OF PATENTS RELATING TO ELECTRICITY ISSUED BY THE U. S.

CONTROL AND ROBUSTNESS ANALYSIS OF HOMOGENEOUS CHARGE COMPRESSION IGNITION USING EXHAUST RECOMPRESSION

Stanford University **There has been an enormous global research effort to alleviate the current and projected environmental consequences incurred by internal combustion (IC) engines, the dominant propulsion systems in ground vehicles. Two technologies have the potential to improve the efficiency and emissions of IC engines in the near future: variable valve actuation (VVA) and homogeneous charge compression ignition (HCCI). IC engines equipped with VVA systems are proven to show better performance by adjusting the valve lift and timing appropriately. An electro-hydraulic valve system (EHVS) is a type of VVA system that possesses full flexibility, i.e., the ability to change the valve lift and timing independently and continuously, making it an ideal rapid prototyping tool in a research environment. Unfortunately, an EHVS typically shows a significant response time delay that limits the achievable closed-loop bandwidth and, as a result, shows poor tracking performance. In this thesis, a control framework that includes system identification, feedback control design, and repetitive control design is presented. The combined control law shows excellent performance with a root-mean-square tracking error below 40 µm over a maximum valve lift of 4 mm. A stability analysis is also provided to show that the mean tracking error converges to zero asymptotically with the combined control law. HCCI, the other technology presented in this thesis, is a combustion strategy initiated by compressing a homogeneous air-fuel mixture to auto-ignition, therefore, ignition occurs at multiple points inside the cylinder without noticeable flame propagation. The result is rapid combustion with low peak in-cylinder temperature, which gives HCCI improved efficiency and reduces NOx formation. To initiate HCCI with a typical compression ratio, the sensible energy of the mixture needs to be high compared to a spark ignited (SI) strategy. One approach to achieve this, called recompression HCCI, is by closing the exhaust valve early to trap a portion of the**

exhaust gas in the cylinder. Unlike a SI or Diesel strategy, HCCI lacks an explicit combustion trigger, as autoignition is governed by chemical kinetics. Therefore, the thermo-chemical conditions of the air-fuel mixture need to be carefully controlled for HCCI to occur at the desired timing. Compounding this challenge in recompression HCCI is the re-utilization of the exhaust gas which creates cycle-to-cycle coupling. Furthermore, the coupling characteristics can change drastically around different operating points, making combustion timing control difficult across a wide range of conditions. In this thesis, a graphical analysis examines the in-cylinder temperature dynamics of recompression HCCI and reveals three qualitative types of temperature dynamics. With this insight, a switching linear model is formulated by combining three linear models: one for each of the three types of temperature dynamics. A switching controller that is composed of three local linear feedback controllers can then be designed based on the switching model. This switching model/control formulation is tested on an experimental HCCI testbed and shows good performance in controlling the combustion timing across a wide range. A semi-definite program is formulated to find a Lyapunov function for the switching model/control framework and shows that it is stable. As HCCI is dictated by the in-cylinder thermo-chemical conditions, there are further concerns about the robustness of HCCI, i.e., the boundedness of the thermo-chemical conditions with uncertainty existing in the ambient conditions and in the engine's own characteristics due to aging. To assess HCCI's robustness, this thesis presents a linear parameter varying (LPV) model that captures the dynamics of recompression HCCI and possesses an elegant model structure that is more amenable to analysis. Based on this model, a recursive algorithm using convex optimization is formulated to generate analytical

ASSESSMENT OF FUEL ECONOMY TECHNOLOGIES FOR LIGHT-DUTY VEHICLES

National Academies Press **Various combinations of commercially available technologies could greatly reduce fuel consumption in passenger cars, sport-utility vehicles, minivans, and other light-duty vehicles without compromising vehicle performance or safety. Assessment of Technologies for Improving Light Duty Vehicle Fuel Economy estimates the potential fuel savings and costs to consumers of available technology combinations for three types of engines: spark-ignition gasoline, compression-ignition diesel, and hybrid. According to its estimates, adopting the full combination of improved technologies in medium and large cars and pickup trucks with spark-ignition engines could reduce fuel consumption by 29 percent at an additional cost of $2,200 to the consumer. Replacing spark-ignition engines with diesel engines and components would yield fuel savings of about 37 percent at an added cost of approximately $5,900 per vehicle, and replacing spark-ignition engines with hybrid engines and components would reduce fuel consumption by 43 percent at an increase of $6,000 per vehicle. The book focuses on fuel consumption--the amount of fuel consumed in a given driving distance--because energy savings are directly related to the amount of fuel used. In contrast, fuel economy measures how far a vehicle will travel with a gallon of fuel. Because fuel consumption data indicate money saved on fuel purchases and reductions in carbon dioxide emissions, the book finds that vehicle stickers should provide consumers with fuel consumption data in addition to fuel economy information.**

ENERGY RESEARCH ABSTRACTS

ERDA ENERGY RESEARCH ABSTRACTS

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LASER IGNITION SYSTEM ON CNG ENGINE

Master's Thesis from the year 2013 in the subject Engineering - Automotive Engineering, course: M.tech IC Engine, language: English, abstract: The CNG Engines play a dominant role in transportation and energy production. The CNG engine is an environment-friendly engine, which causes drastic reduction in emission to the environment by using CNG as a fuel in IC engine. The total Hydrocarbon (HC), carbon monoxide (CO) and nitrogen oxide (NOx) emission are reduced. The lean air-fuel mixture enters the cylinder of the engine where it is ignited by a spark plug. Spark plugs work by sending small; high-voltage electrical sparks across a gap between two metal electrodes Spark plugs can ignite leaner fuel mixtures, but only by increasing spark energy. Unfortunately spark plug cannot ignite leaner air-fuel mixture for long time it produce exhaust emission as well as reduce the efficiency of engine. ON the other hand, Laser ignition system of engines represents a more and more realistic alternative to traditional spark plug or high-frequency ignition approaches. Its ability to ignite extremely lean mixtures of fuel and air allows one to efficiently reduce the NOX concentrations in the exhaust gases, which are associated with potential long-lived ignition components. In this project, an overview of the laser parameters necessary to ignite the most common lean burn air-fuel mixtures for CNG engines is presented. Furthermore, a novel approach for multipoint laser ignition is discussed as a viable path for speeding up the long combustion durations of lean mixtures. Finally, an innovative approach to compact, robust, and relatively cheap laser ignition is described, which involves miniature laser systems. The passively Q-switched laser head is ideally mounted on each cylinder, while the optical pump should be located far away. Ignition energies in the range of slightly more than 1mj per pulse are realized with the involvement of perfect optical focusing.

EXPERIMENTS AND MODEL DEVELOPMENT OF A DUAL MODE, TURBULENT JET IGNITION ENGINE

The number of vehicles powered by a source of energy other than traditional petroleum fuels will increase as time passes. However, based on current predictions, vehicles run on liquid fuels will be the major source of transportation for decades to come. Advanced combustion technologies can improve fuel economy of internal combustion (IC) engines and reduce exhaust emissions. The Dual Mode, Turbulent Jet Ignition (DM-TJI) system is an advanced, distributed combustion technology which can achieve high diesel-like thermal efficiencies at medium to high loads and potentially

exceed diesel efficiencies at low-load operating conditions. The DM-TJI strategy extends the mixture flammability limits by igniting lean and/or highly dilute mixtures, leading to low-temperature combustion (LTC) modes in spark ignition (SI) engines. A novel, reduced order, and physics-based model was developed to predict the behavior of a DM-TJI engine with a pre-chamber air valve assembly. The engine model developed was calibrated based on experimental data from a Prototype II DM-TJI engine. This engine was designed, built, and tested at the MSU Energy and Automotive Research Laboratory (EARL). A predictive, generalized model was introduced to obtain a complete engine fuel map for the DM-TJI engine. The engine fuel map was generated in a four-cylinder boosted configuration under highly dilute conditions, up to 40% external exhaust gas recirculation (EGR). A vehicle simulation was then performed to further explore fuel economy gains using the fuel map generated for the DM-TJI engine. The DM-TJI engine was embodied in an industry-based vehicle to examine the behavior of the engine over the U.S. Environmental Protection Agency (EPA) driving schedules. The results obtained from the drive cycle analysis of the DM-TJI engine in an industry-based vehicle were compared to the results of the same vehicle with its original engine. The vehicle equipped with the DM-TJI system was observed to benefit from ~13% improvement in fuel economy and ~11% reduction in CO2 emission over the EPA combined city/high driving schedules. Potential improvements were discussed, as these results of the drive cycle analysis are the first-ever reported results for a DM-TJI engine embodied in an industry-based vehicle. The resulting fuel economy and CO2 emission were used to conduct a cost-benefit analysis of a DM-TJI engine. The cost-benefit analysis followed the economic and key inputs used by the U.S. EPA in a Proposed Determination prepared by that agency. The outcomes of the cost-benefit analysis for the vehicle equipped with the DM-TJI system were reported in comparison with the same vehicle with its base engine. The extra costs of a DM-TJI engine were observed to be compensated over the first three years of the vehicle's life time. The results projected maximum savings of approximately 2400 in 2019 dollars. This includes the lifetime-discounted present value of the net benefits of the DM-TJI technology, compared to the base engine examined. In this dollar saving estimate, the societal effects of CO2 emission were calculated based on values by the interagency working group (IWG) at 3% discount rate.

PISTON ENGINE-BASED POWER PLANTS

Academic Press **Piston Engine-Based Power Plants presents Breeze's most up-to-date discussion and clear and concise analysis of this resource, aimed at those working and researching in the area. Various engine types including Diesel and Stirling are discussed, with consideration of economic factors and important planning considerations, such as the size and speed of the plant. Breeze also evaluates the emissions which piston engines can create and considers ways of planning for and controlling those. Explores various types of engines used to power automotive power plants such as internal combustion, spark-ignition and dual-fuel Discusses the engine cycles, size and speed Evaluates emissions and considers the various economic factors involved**

ALTERNATIVE FUELS AND ADVANCED COMBUSTION TECHNIQUES AS SUSTAINABLE SOLUTIONS FOR INTERNAL COMBUSTION ENGINES

Springer Nature **This monograph covers different aspects related to utilization of alternative fuels in internal combustion (IC) engines with a focus on biodiesel, dimethyl ether, alcohols, biogas, etc. The focal point of this book is to present engine combustion, performance and emission characteristics of IC engines fueled by these alternative fuels. A section of this book also covers the potential strategies of utilization of these alternative fuels in an energy efficient manner to reduce the harmful pollutants emitted from IC engines. It presents the comparative analysis of different alternative fuels in a variety of engines to show the appropriate alternative fuel for specific types of engines. This book will prove useful for both researchers as well as energy experts and policy makers.**

ERDA ENERGY RESEARCH ABSTRACTS

ERDA ENERGY RESEARCH ABSTRACTS

ERDA RESEARCH ABSTRACTS

BASICS OF CIVIL AND MECHANICAL ENGINEERING

Jyothis Publishers

ALTERNATIVES TO THE INTERNAL COMBUSTION ENGINE

IMPACTS ON ENVIRONMENTAL QUALITY

Johns Hopkins University Press

ENGINE MODELING AND CONTROL

MODELING AND ELECTRONIC MANAGEMENT OF INTERNAL COMBUSTION ENGINES

Springer **The increasing demands for internal combustion engines with regard to fuel consumption, emissions and driveability lead to more actuators, sensors and complex control functions. A systematic implementation of the electronic control systems requires mathematical models from basic design through simulation to calibration. The book treats physically-based as well as models based experimentally on test benches for gasoline (spark ignition) and diesel (compression ignition) engines and uses them for the design of the different control functions. The main topics are: -**

Development steps for engine control - Stationary and dynamic experimental modeling - Physical models of intake, combustion, mechanical system, turbocharger, exhaust, cooling, lubrication, drive train - Engine control structures, hardware, software, actuators, sensors, fuel supply, injection system, camshaft - Engine control methods, static and dynamic feedforward and feedback control, calibration and optimization, HiL, RCP, control software development - Control of gasoline engines, control of air/fuel, ignition, knock, idle, coolant, adaptive control functions - Control of diesel engines, combustion models, air flow and exhaust recirculation control, combustion-pressure-based control (HCCI), optimization of feedforward and feedback control, smoke limitation and emission control This book is an introduction to electronic engine management with many practical examples, measurements and research results. It is aimed at advanced students of electrical, mechanical, mechatronic and control engineering and at practicing engineers in the field of combustion engine and automotive engineering.

BASIC MECHANICAL ENGINEERING

KHANNA PUBLISHING HOUSE **This book 'Basic Mechanical Engineering' has been written to provide knowledge and insight into various aspects of Mechanical Engineering. This book is intended as text book to be used by the students in the technical institutions i.e. Engineering Colleges and Polytechnics. The book covers Syllabi of various Universities on 'Basic Mechanical Engineering', 'Elements of Mechanical Engineering', 'Mechanical Engineering', 'Introduction to Mechanical Engineering' and 'Fundamentals of Mechanical Engineering' for the students of all the disciplines of Engineering. Adequate attention has been paid to emphasize on basic principles involved in the subject matter. The explanation in the text has been supported with line diagrams, along with numerous solved problems. The readers will find the book highly useful as a comprehensive text covering basic principles in simple language and easy to grasp formatting.**

BASICS OF MECHANICAL ENGINEERING

Jyothis Publishers

ADVANCED COMBUSTION TECHNIQUES AND ENGINE TECHNOLOGIES FOR THE AUTOMOTIVE SECTOR

Springer Nature **This book discusses the recent advances in combustion strategies and engine technologies, with specific reference to the automotive sector. Chapters discuss the advanced combustion technologies, such as gasoline direct ignition (GDI), spark assisted compression ignition (SACI), gasoline compression ignition (GCI), etc., which are the future of the automotive sector. Emphasis is given to technologies which have the potential for utilization of alternative fuels as well as emission reduction. One special section includes a few chapters for methanol utilization in two-wheelers and four wheelers. The book will serve as a valuable resource for academic researchers and professional automotive engineers alike.**

ENGINEERING FUNDAMENTALS OF THE INTERNAL COMBUSTION ENGINE

PEARSON NEW INTERNATIONAL EDITION

Pearson Higher Ed **For a one-semester, undergraduate-level course in Internal Combustion Engines. This applied thermoscience text explores the basic principles and applications of various types of internal combustion engines, with a major emphasis on reciprocating engines. It covers both spark ignition and compression ignition engines—as well as those operating on four-stroke cycles and on two stroke cycles—ranging in size from small model airplane engines to the larger stationary engines. The full text downloaded to your computer With eBooks you can: search for key concepts, words and phrases make highlights and notes as you study share your notes with friends eBooks are downloaded to your computer and accessible either offline through the Bookshelf (available as a free download), available online and also via the iPad and Android apps. Upon purchase, you'll gain instant access to this eBook. Time limit The eBooks products do not have an expiry date. You will continue to access your digital ebook products whilst you have your Bookshelf installed.**

INTRODUCTION TO MECHANICAL ENGINEERING SCIENCES

Jyothis Publishers **Introduction to Mechanical Engineering Sciences addresses various fields such as Thermodynamics, IC Engines, Power plant engineering,etc.**

THERMAL ENGINEERING

Firewall Media