Aashi Shah

Mr. Green

Independent Study & Mentorship

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Annotated Bibliography: Mechanical Engineering

"CAD/CAM/CIM." The Gale Encyclopedia of Science, edited by Katherine H. Nemeh and Jacqueline L. Longe, 6th ed., vol. 2, Gale, 2021, pp. 740-741. Gale In Context: Science, link.gale.com/apps/doc/CX8124400417/SCIC?u=j043905001&sid=bookmark-SCIC&xid=994f9871. Accessed 19 Sept. 2023.

Editors of the Gale Encyclopedia of Science delve into the historical evolution and practical applications of Computer-Aided Technologies (CAx). These encompass Computer-Aided Design (CAD), enabling precise product visualization and design; Computer-Aided Manufacturing (CAM), streamlining production processes; and Computer-Integrated Manufacturing (CIM), facilitating seamless integration of manufacturing systems. The article traces the origins of CAx, dating back to the 1950s, shedding light on its developmental journey. It underscores the indispensable role of these systems in engineering, providing engineers with versatile platforms for project execution. The convenience of translating measurements and data across various documents through computer-based design is also emphasized, enhancing efficiency in intricate calculations and design tasks.

“Airplane Parts and Function.” *NASA*, NASA, 4 Oct. 2022, www1.grc.nasa.gov/beginners-guide-to-aeronautics/airplane-parts-function/.

The United States government agency responsible for science and technology related to air and space, NASA, highlights airplane research done at their Glenn Research Center looking at the many parts of an airplane and their functions accompanied by a model. These parts include the wings, fuselage, vertical and horizontal stabilizers, flaps, and spoilers. The text deeply demonstrates the specific components' use but, more specifically, how these parts help the aircraft fly through the air and maintain flight. To elaborate, the wings "generate most of the lift to keep the plane in the air"; the stabilizers help "control and maneuver" the aeroplane; flaps and spoilers are used to "increase the amount of force produced by the wing"; and lastly the "fuselage holds all the pieces together". The unique structure of the article and use of vocabulary truly help with readability, especially for beginners or novices.

"Aircraft Components & Structure." *CFI Notebook: "Higher" Education*, www.cfinotebook.net/notebook/aerodynamics-and-performance/aircraft-components-and-structure. Accessed 21 Sept. 2023.

Designed for both aspiring and experienced pilots, the CFI notebook delves into aircraft intricacies with a level of depth surpassing the previous source from NASA. It offers a thorough and proficient explanation of every facet of an airplane, accompanied by the extensive use of new vocabulary. It begins with principal airplane structures and then leads to the flight control surfaces. Additionally, throughout the writing, there are detailed descriptions of variations of each of the components along with many models and images. This notebook will serve as a valuable reference guide when looking at aircraft designs and enhance my understanding of fundamental mechanical engineering principles in aviation.

Edkins, Alex Ingram, and Jamie. “Different Types of Car Engines Explained.” Carwow.Co.Uk, Carwow, 4 July 2023, www.carwow.co.uk/guides/choosing/car-engine-types-explained-0522#gref.

This informative piece written by Alex Ingram and Jamie Edkins evaluates various car engine types. It is tailored to cater to those in the market for a new vehicle but struggle to understand the terminology used to characterize these cars. With a focus on illustrating the concepts for novices with limited prior knowledge, the article discusses car engine layouts, cylinder configurations, air intake methods, and the fundamental functioning of an engine. Similar to the previous articles revolved around aviation terminology, this article encompasses vocabulary describing a car’s engine. However, unlike those articles, this one is oriented towards everyday people looking to learn the bare minimum so this would be less in-depth than one targeted for experts though it will still be useful. Overall this article is a good introduction to automotive manufacturing ideas and terms.

Samani, Niti. “A Detailed Guide on Automotive Manufacturing Process.” Deskera Blog, Deskera Blog, 5 Jan. 2023, www.deskera.com/blog/automotive-manufacturing-process/.

In this article, Samani guides the readers on the exact steps of an automobile’s manufacturing process. The line of reasoning begins with defining automotive manufacturing and then leads to the history of automotive manufacturing processes. This historical perspective offers valuable insights into how the industry has evolved, adapting to technological advancements, changing consumer preferences, and environmental considerations. She ends the piece with specific materials and production lines used in automotive production facilities. As I read through this, it seemed as though mechanical engineering emerged as a central theme. They play a pivotal role in the automotive

manufacturing industry being responsible for the design, planning, and execution of new vehicle designs and technologies. Their expertise in mechanics, materials science, and manufacturing processes drives innovation and ensures that vehicles meet ever-increasing demands for performance, efficiency, and safety. This article highlights the significant and intriguing direct contributions of mechanical engineers to the field of automotive manufacturing.

"Mechanical engineering." Britannica School, Encyclopædia Britannica, 24 Feb. 2017. school.eb.com/levels/high/article/mechanical-engineering/105845. Accessed 21 Sep. 2023.

This informative article written by professors at the University of Cambridge aims to provide readers with a comprehensive understanding of the field of mechanical engineering, its historical development, key functions, and various branches. Additionally, the article highlights the significant contributions of mechanical engineering to the Industrial Revolutionary Era and the technological advancements that followed. A specific detail that was new to me was the review of branches within this engineering branch. This would include the development of machines for production, machines for power generation, military applications, and environmental control. Each of these branches is discussed in terms of their significance and impact. By presenting a thorough overview, the article intends to foster an appreciation for the field's importance and its wide-ranging impact on society and technology.

"SALARIES FOR ENGINEERS ON THE RISE." States News Service, 23 July 2012. Gale In Context: Biography,

link.gale.com/apps/doc/A297319370/GPS?u=j043905001&sid=bookmark-GPS&xid=9b4cdbaf. Accessed 22 Sept. 2023.

Being written in 2012, this article discusses the job outlook and rises and falls in salaries among engineers based on data collected from the American Society of Mechanical Engineers. It presents a series of statistics and facts that help understand the scope of engineering. Some of these include that, ocean-based engineers are paid the highest full-time salaried median income of $169,000. Additionally, an interesting statistic mentioned is that median annual income is highest in California, Nevada, and Hawaii, and lowest in the Upper Mountain states. This article takes a unique standpoint assessing the jobs of engineering rather than what the engineers are involved in.

Ufer, Tim. “How Mechanical Engineers Lead Advances in Renewable Energy.” Online Engineering Master’s Programs, 3 Mar. 2023, online.egr.msu.edu/articles/how-mechanical-engineers-lead-advances-renewable-energy/.

Written at Michigan State University, this piece intends to educate the reader on the significant contributions of an engineer in the field of renewable energy but also to indirectly encourage the reader to consider pursuing a career in mechanical engineering with a focus on renewable energy by showcasing the growing demand for engineers in this field and the opportunities it offers.

“Mechanical Engineering in Robotics: Challenges and Opportunities: Redline Group Recruitment News and Blogs.” Redline Group, www.redlinegroup.com/insights/mechanical-engineering-in-robotics-challenges-and-opportunities-31565141642. Accessed 22 Sept. 2023.

This article, written by a technology consultant, looks over the outlook of mechanical engineering and the jobs within that field as they intertwine with robotics and manufacturing. It indicates the future of engineering as it moves towards a more advanced industry of hardware. The author mentions potential obstacles in the robotics manufacturing process including material selection, human-robot interaction, and motion control. Identifying these is useful to the audience to determine focus areas of this field for the best outcomes in a long-term project. Another helpful section was a listing of opportunities related to the robotics field which includes research and automation. Overall, this article provides a viewpoint specific to seeing the future of mechanical engineering in the field of automated technology much unlike the types of topics previous articles covered.

Pastor, Robert, et al. "Knowledge-Based Automated Mechanical Design of a Robot Manipulator." MDPI, Multidisciplinary Digital Publishing Institute, 9 June 2022, www.mdpi.com/2076-3417/12/12/5897 .

A group of students from the Department of Robotics at the Faculty of Mechanical Engineering in the Czech Republic researched and described the design process of what is called a robotic manipulator in an automated workflow. This described method is split into two parts: a genetic optimization of the kinematic structure and an iterative CAD design. We are familiar with the abbreviation CAD from the first article but the first term related to genetic optimization generally means finding the best configuration of joints and links in a mechanical system or robot. With this information among others, this article indicates all the uses of mechanical engineering in this robotics field at the utmost detail. The use of this specific example is unique to this article because no other had

discussed the projects mechanical engineers may associate with. It will be most useful when designing a method of my own and paralleling the two to see the way projects were going about.