

**DESIGN AND FABRICATION OF HYBRID DIFFERENTIAL
SYSTEM**

A PROJECT REPORT

Submitted by

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112818114022

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

In

MECHANICAL ENGINEERING



T.J.S. ENGINEERING COLLEGE



ANNA UNIVERSITY: CHENNAI 600 025

JUNE 2022

A handwritten signature in green ink, appearing to read 'J. Krishna', written over the printed name of the Principal.

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BONAFIDE CERTIFICATE

Certified that this project report "DESIGN AND FABRICATION OF HYBRID DIFERENTIAL SYSTEM" is the bonafide work of "H.KRISHNA BHARATHI(12818114022)", who carried out the project work under my supervision.


22/6/22

SIGNATURE

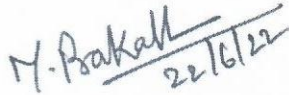
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Submitted for project viva - voce examination held on 22/6/22


INTERNAL EXAMINER

22/06/22




EXTERNAL EXAMINER


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ABSTRACT

Differential is the large scale mechanical energy transmission system. The hybrid differential is semi automatic electric controlled system. This update differential is use to improve the efficiency of the engine., Differential Drive Assisted Steering (DDAS) technology for the independent-wheel-drive electric vehicle has gradually appeared to researcher's attention.

However, the previous experimental results show that its assistance quality cannot be fully accepted due to its caused sensitive steering wheel torque fluctuation in actual work environment.

According to the working principle of the DDAS system, it is founded that the road roughness, the front wheel alignment parameters and sensor noise are the main factors that influence the quality of assisted steering and driver's road feel.

Hence the three factors are added as interference into the ideal vehicle model. The simulation results and its comparison with the previous real vehicle tests confirm this causality between these factors considered and the steering wheel torque fluctuation of the DDAS system.

Then a robust H_1 loop-shaping controller is designed to solve the issue caused by these inner interferences and outer noises. Simulations results validate the propose controller and show better steering wheel torque performance than the traditional anti-windup PID controller. It can be use also in the off-road vehicles



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OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 Explain the influence of steady and variable stresses in machine component design.
- CO2 Apply the concepts of design to shafts, keys and couplings.
- CO3 Apply the concepts of design to temporary and permanent joints.
- CO4 Apply the concepts of design to energy absorbing members, connecting rod and crank shaft.
- CO5 Apply the concepts of design to bearings.


TEXT BOOKS:

1. Bhandari V, "Design of Machine Elements", 4th Edition, Tata McGraw-Hill Book Co, 2016.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 5th Edition, Tata McGraw-Hill, 2011.

REFERENCES:

1. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum's Outline), 2010
2. Ansel Ugural, "Mechanical Design – An Integral Approach", 1st Edition, Tata McGraw-Hill Book Co, 2003.
3. P.C. Gope, "Machine Design – Fundamental and Application", PHI learning private ltd, New Delhi, 2012.
4. R.B. Patel, "Design of Machine Elements", MacMillan Publishers India P Ltd., Tech-Max Educational resources, 2011.
5. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4th Edition, Wiley, 2005
6. Sundararajamoorthy T. V. Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2015.




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OBJECTIVES:

- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching.
- To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming

UNIT I THEORY OF METAL CUTTING

9

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.




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UNIT II TURNING MACHINES

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multi spindle:

UNIT III SHAPER, MILLING AND GEAR CUTTING MACHINES

Shaper - Types of operations. Drilling ,reaming, boring, Tapping. Milling operations-types of milling cutter. Gear cutting – forming and generation principle and construction of gear milling ,hobbing and gear shaping processes –finishing of gears.

UNIT IV ABRASIVE PROCESS AND BROACHING

~~Grinding process - specifications and selection, types of grinding process-~~ cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

UNIT V CNC MACHINING

Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 Explain the mechanism of material removal processes.
- CO2 Describe the constructional and operational features of centre lathe and other special purpose lathes.
- CO3 Describe the constructional and operational features of shaper, planner, milling, drilling, sawing and broaching machines.
- CO4 Explain the types of grinding and other super finishing processes apart from gear manufacturing processes.
- CO5 Summarize numerical control of machine tools and write a part program.

TEXT BOOKS:

1. Hajra Choudhury, "Elements of Workshop Technology", Vol.II., Media Promoters 2014
2. Rao. P.N "Manufacturing Technology - Metal Cutting and Machine Tools", 3rd Edition, Tata McGraw-Hill, New Delhi, 2013.

REFERENCES:

1. Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White "Machine Tool Practices", Prentice Hall of India, 1998
2. Geoffrey Boothroyd, "Fundamentals of Metal Machining and Machine Tools", Mc Graw Hill, 1984
3. HMT, "Production Technology", Tata McGraw Hill, 1998.
4. Roy. A.Lindberg, "Process and Materials of Manufacture," Fourth Edition, PHI/Pearson Education 2006.




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