



Department of Mechanical Engineering  
A. G. PATIL POLYTECHNIC INSTITUTE, SOLAPUR

SUMMER  
2019



## Design and Development of Chairless Chair Exoskeleton System for Better Ergonomics at Workplace

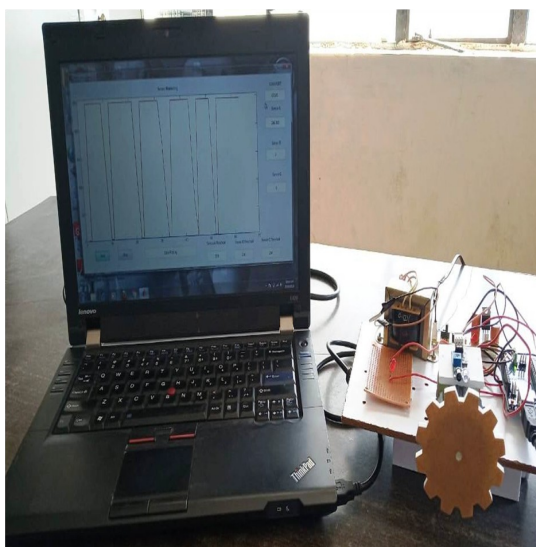


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Fuel in tank  
400 ml

## Digital Fuel Level Indicator

## Design and Development of Gear Conditioning and Monitoring Instruments



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## Find us....

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It gives me immense pleasure to introduce you to this next edition of newsletter of department for the academic year 2018-19.

The objective of department is to prepare students for successful career in Industry, Research and Academics to meet the needs of growing technology. To fulfill this we arranged different activities for students to enhance their skills and performances in academic, sports and

co curricular activities.

This year we have achieved success worth mentioning, we received a **BMW engine and transmission** approx. worth Rs.14 lakh. BMW-India Chennai Plant has donated this engine to our institute under its CSR policy. Also faculties will be benefited through training on it. The MoU is under process with BMW-India Chennai Plant. We are the only recipient of such engine-transmission in Solapur. We also received various electronics components and kits for the application in automotive field & research which are donated by various industries around the globe, including U.S.A., Norway, Sweden, Philippines, Malaysia, U.K. In this way, we are always striving for continuous improvement.

Best wishes !

Mr. S. K. Mohite  
Head of Department

## Vision

To provide technical education and values in areas of Mechanical Engineering to create professionals to meet the needs of industry, business and society

## Mission

- 1.To provide skilled manpower to the industry
- 2.To educate students to be Entrepreneurs and Team leaders with ethics
- 3.To motivate students for research and innovation for humanity

## Program Educational Objective (PEOs)

- 1.To develop ability to work as Supervisor, Manager and Entrepreneur
- 2.To present themselves as responsible Mechanical Engineering professionals with ethics
- 3.To inculcate ability to develop mechanical product and processes by considering social and environmental aspects

# Academic Performance

## Third Year -

- Mr. Palankar Guruprasad Ulhas Stood 1<sup>st</sup> with 91.41 %
- Mr. Khasnis Omkar Suresh Stood 2<sup>nd</sup> with 91.24 %
- Mr. Sayyad Mohsin Salim Stood 3<sup>rd</sup> with 89.59 %

## Second Year -

- Mr. Gavali Rutuja Balaji Stood 1<sup>st</sup> with 83.44 %
- Mr. Hulgeri Shubham Sharnappa Stood 2<sup>nd</sup> with 82.44 %
- Mr. Koli Akash Revappa Stood 3<sup>rd</sup> with 80.89 %

## First Year -

- Mr. Dombale Aditya Niranjan Stood 1<sup>st</sup> with 83.44 %
- Mr. Sarvade Pavankumar Stood 2<sup>nd</sup> with 82.44 %
- Mr. Walke Shubham Dnyaneshwar Stood 3<sup>rd</sup> with 80.89 %



## Co curricular and Extra Curricular Activities

1. Mr. Thombare Prajwal got First Prize in National Level Technical Paper Presentation program "Annum 2K19".
2. Mr. Bewoor Jitesh got Second Prize in State Level Technical Paper Presentation program "Techno Wave 2019". at S.P.M. Polytechnic, Kumthe, Solapur.
3. Mr. Jinde Ashutosh won First Prize in State Level Technical Event CAD Expert in "Accretion 2019" at A. G. Patil Polytechnic, Solapur.
4. Mr. Hodlure Prashant won First Prize in State Level Technical Event Lathe Mania in "Accretion 2K 19" at A. G. Patil Polytechnic, Solapur.
5. Mr. Pise Prashant got First Prize in 'Group Discussion' and Second Prize in 'Interview Mania' in AGTECH FEST 2019 at A. G. Patil Institute of Technology, Solapur.
6. Mr. Adhatrao Kedar got First Prize in Cad event in AGTECH FEST 2019 at A. G. Patil Institute of Technology, Solapur also he got Third Prize in CAD expert event in Accretion 2019 at A. G. Patil Polytechnic, Solapur.
7. Mr. Awate Gururaj got Second Prize in Cad event in AGTECH FEST 2019 at A. G. Patil Institute of Technology, Solapur.





## Expert Lectures:

1. "Piping Technology" by Mr. Pramod Deshmukh for second year students
2. "Basics of CAD" by Mr. Vinaykumar Revankar for second year students
3. "Basics of Boiler" by Mr. Nanavare A. A. for second year students
4. "Opportunities for diploma students in Merchant Navy" by Mr. More A. K. for third year students.

## Industrial Visits:

**Third Year students visited the following industries.**

1. Precision Camshaft Ltd. , Chincholi MIDC, Solapur
2. Srujan Foods Pvt. Ltd., Chincholi MID, Solapur
3. Leena Engineering Works, Hotgi Road MIDC, Solapur
4. Chavan Motors, Akkalkot Road, Solapur
5. Shree Tools, Satara MIDC, Satara
6. Baba Ice Factory, Industrial Area, Hotgi Road, Solapur
7. Super Bright Electroplates, Solapur
8. Shree Industries, Hotgi Road MIDC, Solapur

**Visits for second year students were carried out to following industry**

Shri Siddheshwar sugar factory, Hotgi Road, Solapur



**Precision Camshaft Ltd.**

## Faculty Achievements:

### Workshops/ Training Attended

1. Mr. Mohite S. K. and Mr. Motgi R. S. attended 3 days industrial training programme at SAJ Test Plants Pvt. Ltd., Pune. Also attended 6 days "Process of Accreditation" at A. G. Patil Polytechnic, Solapur.
2. Mr. Dhalait J. G. and Mr. Kulkarni G. M. attended 2 days programme on "Total Quality Management and Six Sigma" at S.E.S Polytechnic, Solapur.
3. Mr. Mulla J. G. and Mr. Narote B. E. attended 3 days VLCI residential Faculty training Program at Government Polytechnic, Pune
4. Mr. Pinjar J. P., Mr. Patil N. P., Mr. Dhalait J. G. and Mr. Kulkarni G. M. attended 6 days "Process of Accreditation" at A. G. Patil Polytechnic, Solapur.

### Other Achievements

Our faculties are always motivated to achieve the landmarks in order to do their up gradation along with their academic achievements.

### Patents

1. Mr. R. S. Motgi filed 2 patents named as design of bolt and spanner and it is accepted and published in the Patent Office Journal No. 07/2019 dated 15/02/2019
2. Mr. N. R. Patil filed a patent named compass.
3. Dr. M. A. Chougule, Mr. N. R. Patil and Mr. N. P. Patil filed a patent named Divider and compass.

1. Mr. Patil N. P. and Mr. Dawankar S. R. completed their post graduation in Mechanical—Manufacturing Processes.
2. Mr. Mohite S. K. published 4 different papers in International Journals.
3. Mr. Motgi R. S. published 2 papers in international journals.
4. Mr. Upadhe S. N. published 5 papers in well known journal like Springer and IEEE
5. Mr. Khajurgikar S. K. published a paper on "Development of conventional milling machine to automated milling machine using electro-pneumatic system " in international journal.
6. Mrs. Chavan R. D. Published paper in well known journal IEEE.

# DESIGN AND DEVELOPMENT OF CHAIRLESS CHAIR EXOSKELETON SYSTEM FOR BETTER ERGONOMICS AT WORKPLACE

**Abstract-** Chairless chair is a portable contraption that looks nothing like a chair and allows you to sit on it whenever you want and wherever you want. This flexible, ergonomic device looks more like an exoskeleton and extends from the hip to the backs of the feet and adapts to different body sizes and safety shoes. This device, we call as chairless chair possess minimum weight as compared to a normal chair and is mobile and portable. A virtual chair, which can be imagined as an exoskeleton can be worn on a person's lower body part. With the help of this he/she can move anywhere and sit anywhere and anytime he/she wishes to.

Its intended use is for employees at manufacturing firms who have to stand for long periods of time at work and sometimes bend into unnatural positions to assemble a product. For the user's quality of work life is improved while for the factory, there will be reduction of the work-related pain of the workers. With the chairless Chair the users walk together with the sitting support while wearing it, without obstructing the workspace, at the same time avoiding strenuous postures such as bending, squatting or crouching. It is meant to reduce worker fatigue and work-related accidents while improving productivity. It can be customized to fit all sizes and outfits.

For an Industry, space management is an important factor. Unnecessary chairs and resting places can be avoided by maximizing the use of chairless chair. Such spaces can be utilized for several other purposes.



## WORKING PRINCIPLE

In this project the movement of system is controlled manually for changing angle in knee locking system and changing height of system by means of height adjuster suitable to user. Knuckle pin used for adjusting three different angles provided in knee locking system.

## ADVANTAGES

The main advantage of this chairless is that it is portable. It can be carried anywhere easily by keeping in a bag. The user can even walk to some distance chairless chair attached to their legs. So that the user doesn't need to detach the exoskeleton every time he moves from one place to another. Next, it is proven to be suitable with a range of height up to 183cm. In addition, our prototype offer user to comfort themselves with three levels of degree depends on their comfort level. This can help the user to do their work with high serenity compare to chair with constant degree because some work not required the user to be seated but if its longing for a long time, it might be a problem to their muscle or having leg cramp, therefore, this is where chairless chair play an important role.

## APPLICATIONS

1. Medical /Rehabilitation purposes where the devices are aimed to support physically weak, injured, or disabled people to perform a wide range of motions.
2. A small number of exoskeletons have also been designed for military applications for soldiers.
3. For Industrial applications to lift or carry heavy loads.
4. In civilian areas, exoskeletons could be used to help fire fighters and other rescue workers survive dangerous environments.
5. It is useful for old people who have back pain, knee pain.
6. It is used for industrial worker for doing work for long time.
7. It is used for house wife for doing work in kitchen for long time.

## CONCLUSION

The chairless chair is successfully fabricated, assembled and analyzed. The aim of this project was to develop an exoskeleton with simple link mechanism to support human walking, sitting and standing motions synchronously with human. It also helps to take significant portion of external load carrying by the user. Once this is achieved, exoskeletons can be made as a part of everyday life to reduce down the cases of MSD (Musculoskeletal Disorders). Since the cost of fabrication is comparably less, so this can be made affordable to the workers in small scale industries also.



A group of five students, three men and two women, are standing behind a wooden table. On the table is a digital fuel level indicator project setup, which includes a white plastic fuel tank, a white funnel, a small electronic circuit board, and some wires. The students are wearing white shirts and lanyards with ID cards. The background is a plain wall with a whiteboard.

# Digital Fuel Level Indicator

*Today in this digitized world, if the fuel indicator in the automobiles is also made digital it will help to know the exact amount of fuel available in the fuel tank. The above furnished fact is considered in our project and we found out a proper solution for indicating the exact availability of fuel in the tank digitally. Here, we are indicating the amount of fuel in the tank in litres. This value in litres will be in numerical digits (ex: 1.2, 1.3, 1.4). This project mainly concentrates about the indication of fuel level in two- wheeler tanks.*

*days the fuel pointer framework for the bikes are computerized yet they don't show the correct measure of fuel which is available in the tank i.e. they demonstrate the measure of fuel as far as bars and not in numbers or digits like litres or Millilitre. So this issue is contemplated for our work of building up the computerized (numeric) fuel pointer framework for bikes which indicates correct measure of fuel regarding Litres (L) or Millilitres (ml).*

The current fuel demonstrating framework in vehicle utilizes simple and computerized visuals for indicating surmised status of fuel level, not displaying the amount in numerical. This framework alluded demonstrates the fuel level in numerical by utilizing LCD. In India, mileage issue has risen to be a major issue prompting clients stalling out in obscure zone since they neglect to check the fuel level. This proposed configuration can give an approach to stop this issue and control the exorbitant utilization of the fuel to the client demonstrating mileage. This proposed configuration will be useful to control the stream of the vehicle. This is finished by controlling the fuel use with the assistance of units put in the fuel tank and when the fuel tank gets unfilled a sign is given for the driver that the fuel is void and the vehicle will kill. On the premise of PIC 16F877A advancement of this plan is done and to demonstrate the fuel that is available in the vehicle LCD show is utilized as yield unit. The Characters got from the controller unit is recently shown on LCD screen.

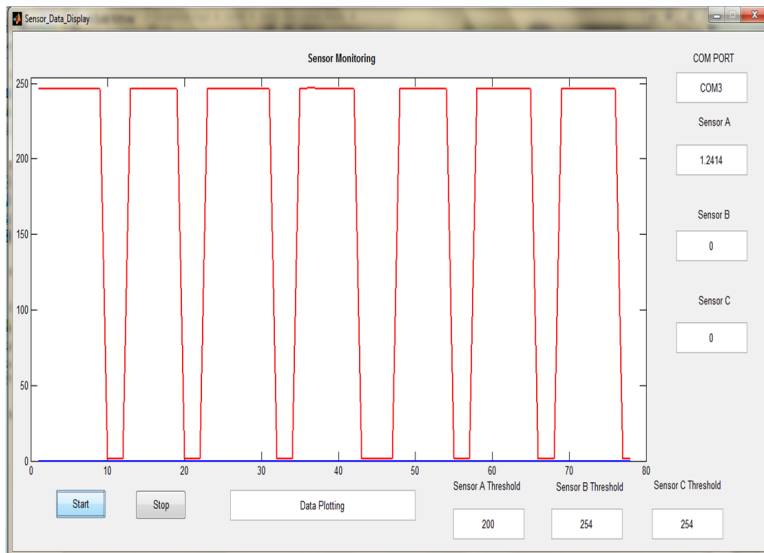
## MAIN COMPONENTS

1. LCD Screen
2. Petrol Tank with Ultrasonic Sensor
3. 12 V– 7Ah Battery

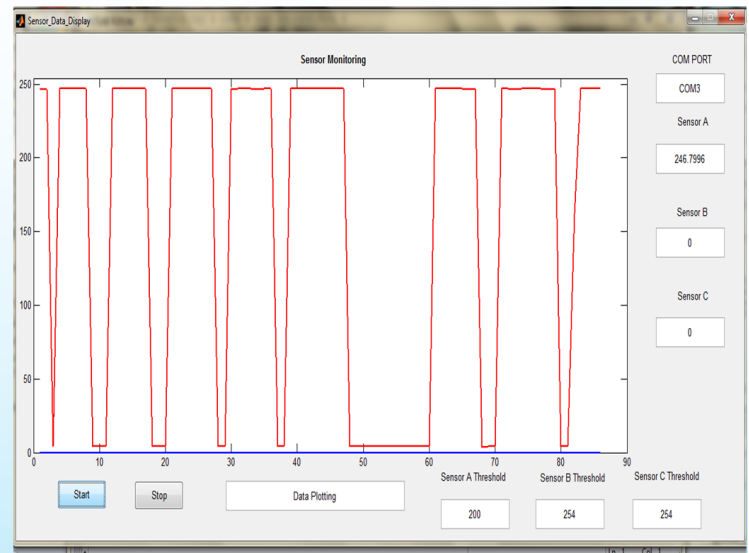
## CONCLUSION

The smart digital fuel indicator is very advance type indicating system. The main advantage of this system is that it can give accurate value of remaining fuel. The operation time taken is very less. This project is able to show that simple available hardware and technology can be used to construct a fuel level monitoring system. The system designed and tested in this project presented at the low construction cost of the system. Involving mechatronics. Such design applications can eventually solve many practical problems with ease, reliability and at low cost. It can be used and implemented in all vehicles without much increment of cost of the vehicle. This smart fuel indicator is best in its field and will be most widely used and advance system.

# DESIGN & DEVELOPMENT OF GEAR CONDITIONING AND MONITORING INSTRUMENT



Continuous graph for no damage on tooth profile.



Discontinuous graph for no damage on tooth profile.

**Abstract:** The gear is an integral part of the system and any error or misalignment in the gears may affect the system directly or indirectly. This can cause breakdown of a working system or mechanism. If a gear is misaligned it must be checked for alignment and if there are errors in the gear they must be reduced. These errors are detected by sensors. A sensor is simply a transducer or a device that senses a physical or electrical change and converts into a electrical pulse or signals. These signals or pulse are displayed on a screen. A graph of, error versus time is plotted and this graph tells us about the working of a gear is whether smooth or rough. A smooth working gear is a acceptable for complicated mechanism while a roughly working gear must be replaced. In many applications the gear must be accurate to the dimensions and must be errorless.

## OBJECTIVE

Objective of the project is to detect the error on the tooth profile of the gear for its significance in performance at the same time for its satisfactory working. Here we have designed the instrument with the help of modern electronic system which consist of the input and output based feedback control system.

### ACTUAL WORKING MODEL

1. Infrared Sensor:- The sensor is of the range of 5 cm.
2. The photo diode:- The photodiode is to receives the signal from infrared sensor for giving the response to the AURDINO software for plotting the graph.
3. Selection of motor:- We have selected the motor of 3 RPM
4. Transformer:- A transformer is a static electrical device that transfers electrical energy between two or more circuits

### EXPERIMENTAL SETUP

The experimental set up consist of simple electric circuit which is shown in figure. Which consist of ARDUINO is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online

## OBSERVATIONS

The observation is based on the monitoring the graph which is usually a combination of a Bode magnitude plot, expressing the magnitude (usually in decibels) of the frequency response, and a Bode phase plot, expressing the phase shift.

## CONCLUSION

We have conducted the experimental testing of the instrument and we have got very accurate results in the form of expected graph. The results are in the form of graph. The tests were conducted for two conditions as follows.

1. Gear with no damage on tooth profile.
2. Gear with damage on tooth profile.

For 1st condition - The first graph signifies that the wave forms are continuous in nature hence it is concluded that there is no damage on the tooth profile and its working is satisfactory.

For 2nd condition - The second graph signifies that the wave forms are not continuous in nature hence it is concluded that there is damage on the tooth profile and its working is not satisfactory.

Both the above graphs are based on phase shift method.

The basis of first conclusion is uniform distribution of waveform while the basis of second conclusion is non uniform distribution of waveform for the complete revolution.



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## COURSES OFFERED IN DIPLOMA ENGINEERING

Discipline	Intake Capacity	Duration of Course	Accreditation Status
Mechanical Engineering	120	3 years	NBA Accredited
Electronics and Telecom. Engineering	60	3 years	NBA Accredited
Civil Engineering	60	3 years	NBA Accredited
Computer Engineering	60	3 years	NBA Accredited
Total Intake	300		

