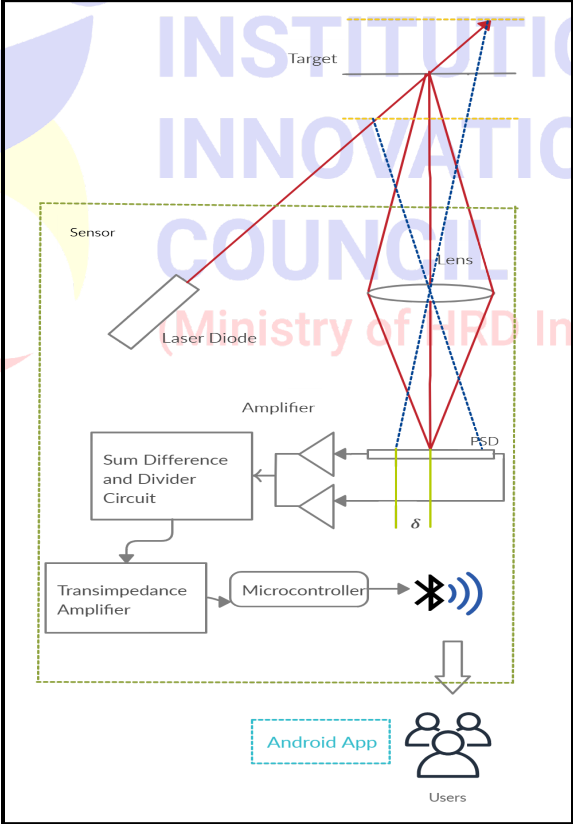


Institution's Innovation Council
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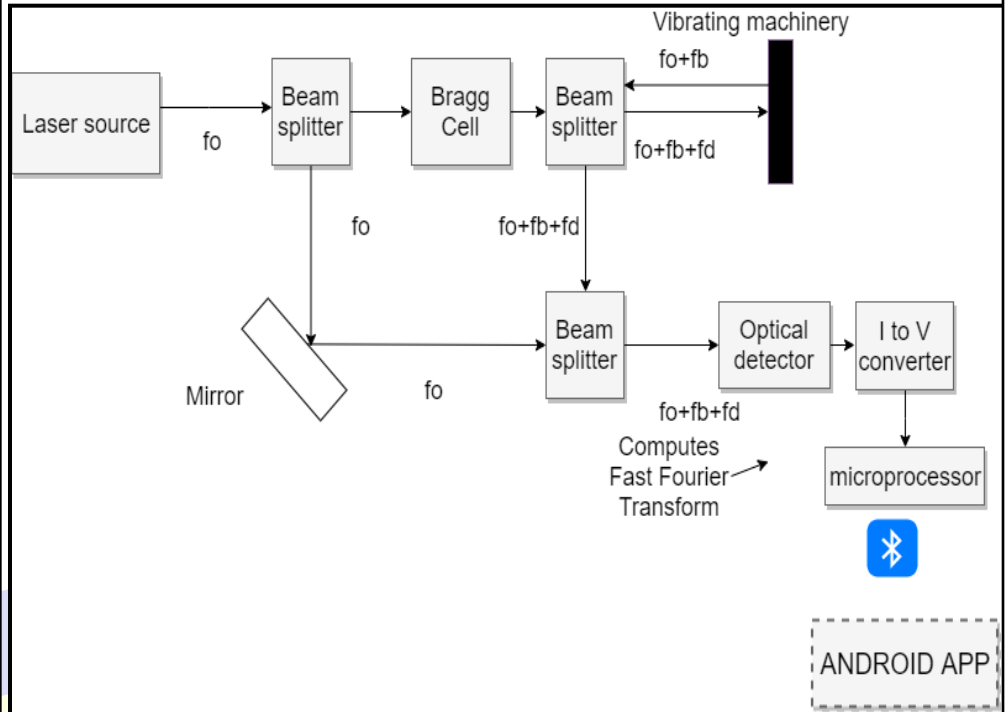
Idea Submission Form

PART A: PoC (Product)

Team Details	Team Lead:			
	Name		Email ID	Contact Number
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	4	Aditya Suryawanshi	2017.aditya.suryawanshi@ves.ac.in	8108873175
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Mentor (if Any)				
Sr. No	Name	Email ID	Contact Number	
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Institute Name and Address: Vivekanand Education Society's Institute of Technology (VESIT) Hashu Advani Memorial Complex, Collector's Colony, Chembur, Mumbai, Maharashtra				

Name of the Idea/Proof of Concept (PoC)	Laser Based Vibrometer
Theme	IoT based technologies (e.g. Security & Surveillance systems etc)
Define the problem & relevance to today's market/society/industry need (Max 100 words)	Machines have become an integral part of our lives, ranging from the refrigerator and washing machine to the industrial machinery used to manufacture nearly every product we use on a daily basis. When a machine breaks down, the consequences can range from annoyance to financial disaster, or personal injury or even loss of life. Therefore, the early detection of machinery problems is of paramount importance. Every fault in any machine starts with unusual vibrations being felt, but these usually go undetected. Hence, we are creating a prototype of a “Laser-Based Vibration Sensor” to deal with the identification of machine problems.
Propose the solution to Problem Identified (Max 100 words)	i) Variation in position based on amplitude of vibrations:  The laser source, the machine on which the laser falls, and the detection system forms three vertices of a triangle. The back-scattered light generates a bright spot on the detector. Any movement of the machine results in the movement of this spot, which is measured to calculate the vibration signal.

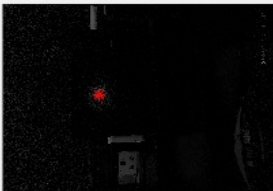
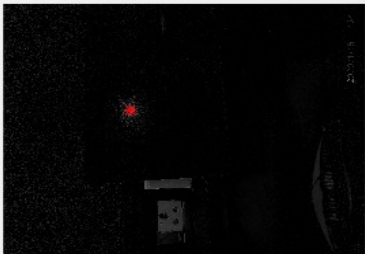
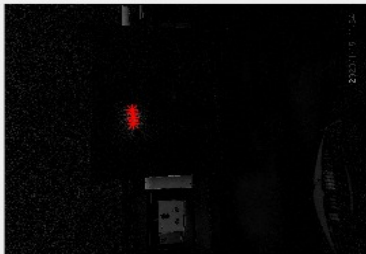
ii) Variation in frequency based on amplitude of vibrations:



Beam splitter is to split the laser in two halves. Optical detector generates current based on the frequency of the incident laser beam and passes it to the I to V converter to feed the signal to the microprocessor. After collecting the data we can forward it to the user on his android phone using bluetooth.

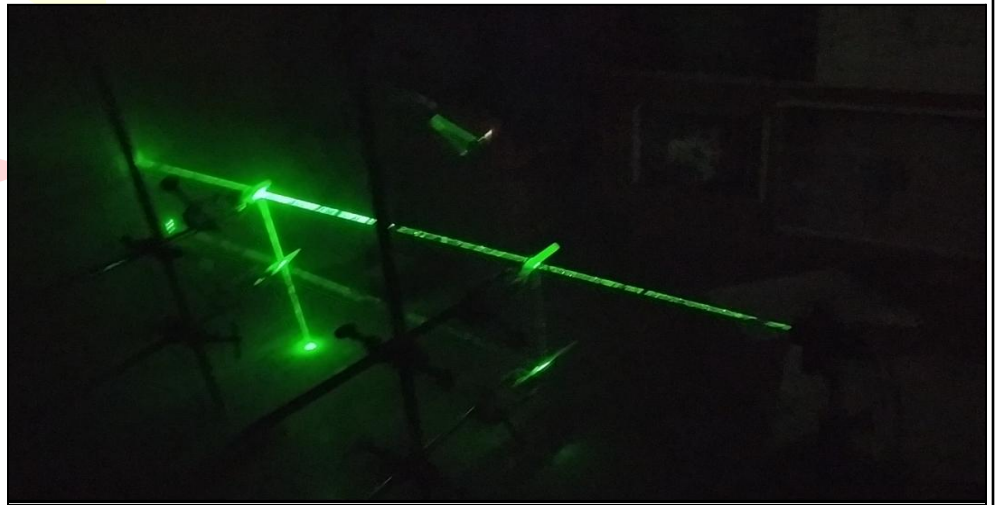
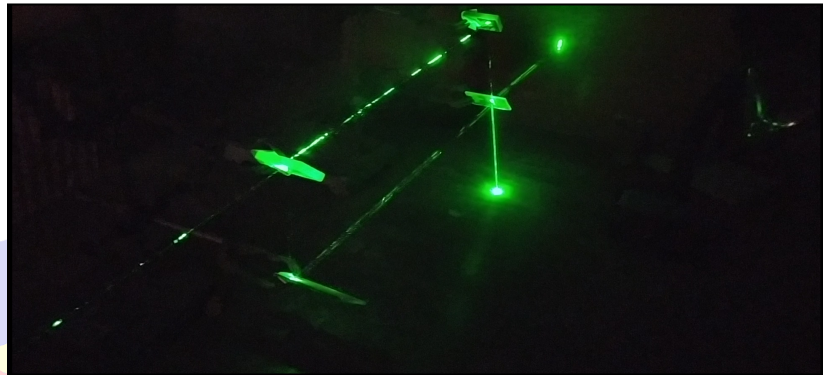
Describe the product/process/ service and write how it is innovative / unique. (Max 100 words)

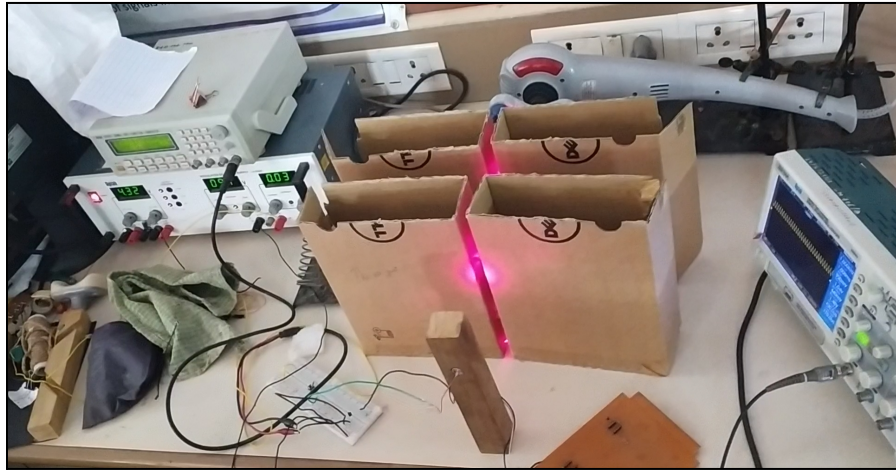
- ☐ Proposed solution helps in saving time in order to monitor vibrations of machines
- ☐ It can be used for on field testing of machineries
- ☐ With the help of product it is possible to monitor the health of machinery remotely.
- ☐ Also users can monitor the readings of the vibrations through an android app.
- ☐ The device will be contactless and will have no contact with machinery ensuring portability.
- ☐ Avoids mass loading of the test object
- ☐ More accurate results, as compared to traditional contact vibration sensors (like accelerometers)
- ☐ Maintenance cost of the device is less.

How is your proposed product/ process/service being different/ better from a similar product/ process/ service, if any, in the market (Max 100 words)	❑ In contact type vibration sensing applications where precise vibration measurement is required or in toxic and hazardous environment, addition of contact sensor becomes impractical due to inaccessibility or since this attachment adds a mass on the instrument or the machine and might alter its vibration characteristics. Hence proposed solution solves above problems by implementing contactless measurement. ❑ Size of the device will be compact and it will be portable. ❑ Proposed solution is quite cheaper. ❑ Noise sources can be eliminated. ❑ The device can measure vibration amplitude upto ± 5 mm and vibration frequency in the range of 0.1 Hz - 1 kHz from a distance of 200mm.
If your Idea is technology based, then specify the TRL Level (Technology Readiness Level) and Expecting the features of Idea/PoC. <i>Note:</i> For the Idea level, TRL 0 – 2 is expected. For the PoC level, TRL 3 is expected. (Max 100 words) Chose most appropriate TRL level from Annexure 1	<u>Results:</u> Method 1, which was Variation in position based on amplitude of vibrations was implemented by making the setup and analysis was done on Matlab, the following results were obtained. Laser dot position at 5cm behind  Laser dot position at center  Laser dot position at 5cm ahead  Psition of laser dot at all 3 cases 

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>> imgprocess1  
81.3391  
  
84.3599
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Method 2, which was Variation in frequency based on amplitude of vibrations was implemented by making the setup shown below and the readings were recorded on a Digital storage oscilloscope.





The above are the evidence of proof of concept. The demonstration was performed and desired results were obtained. This concludes that we are at "TRL 3 : Applied research. First laboratory tests completed; proof of concept."

Feasibility of Idea/PoC solution (SMART)

(Check the appropriateness of the Idea/PoC)

a) Specific – Specify the features of Innovative Idea/Poc	☐ Contactless vibrometer, discards the errors caused by use of traditional accelerometers. ☐ Extraction of vibrating frequency from the vibrating machinery using FFT Analysis. ☐ Failure alarm on operator's device when vibration exceeds safe limit. ☐ Unlike traditional vibrometers, Cost friendly in the long term as measuring instruments bears no damage if testing body damages. ☐ Wide range of applications in automobile, aircraft and medical industries.
b) Measurable – Mention the approach to convert idea/POC to prototype/innovation with milestone.	☐ Assembly of instruments in compact form factor. ☐ Testing this new compact device for rigidity and signal gathering capacity. ☐ Working on signal processing devices and testing it with various inputs(gathered with compact devices) to verify functional correctness. ☐ Combining the signal processing part with the compact device to generate the end product. ☐ Adding wireless/wired alarm systems in the device to alert operators to generate the final product.
c) Attainable – Explain how you are going to achieve the prototype development objective with the available resources at your disposal.	☐ The resources available are sufficient for the need of prototype demonstration. ☐ Additional materials required for chassis/body construction can be 3D printed using a standard 3D printer.

d) Realistic – what kind of skillset of team and resources required to achieve the goal in specific time period	☐ Hard Work in terms of testing the prototype against all gathered signals and combinations. ☐ Dedication to complete all modules in a given time line and complete working of the end product. ☐ Tenaciousness to convert the already existing proof of concept design into a working end product.
e) Timeline- Develop a timeline against the milestones for taking Idea/POC to Prototype Development and (or) Commercial level/start-up stage	
Applicability of Solution 10 Marks (Max 50 words for each from a-e)	
a) Usability – What is the usability of your innovation . (Level of acceptance of innovation and its Features among target group)	☐ For non-destructive inspection of aircraft components, infrastructure, eliminating sources of undesirable noise. ☐ In cases of destructive testing, the biological sample cannot be rescanned resulting in a costly wastage of the sample. ☐ Improves flight safety, turbine efficiency, detection of loose rivets. ☐ Sound optimization of musical instruments.
b) Scalability : how your innovation will be scalable at market level.	☐ By building an appropriate business model to interest the investors and keeping the model open ended to keep it improvising. ☐ Using the MVP(minimum value product) to validate the model. ☐ Trying to design the product in a way that automation during the manufacturing could be maximum and most materials could be locally available/ 3D printed.
c) Economic sustainability: Explain the potential of innovation to become profitable or financially viable.	☐ Sensor maintenance is less ☐ Laser light is cheap and energy is saved
d) Environment Sustainability : How your innovation is environment	☐ No hazardous substance is used during the manufacturing of the product ☐ Laser light is environment friendly

friendly or address environmental problems.	
e) Is there any Intellectual Property (IP) Component associated with the innovation? If yes, explain	We hereby declare that we are not violating any third party intellectual property rights while producing this document or while producing any document supporting this. Also, we declare that no third party copyright was violated while producing this document or while producing any documents supporting this document.
Define the potential market size (in terms of INR) and target customers. (Max 100 words)	☐ Potential Market and Target Customers: ☐ Total Addressable Market (TAM) consists of industrialists who use heavy machinery (Food processing, Aerospace Design, Medical Technology) ☐ Serviceable Addressable Market (SAM) are those of the above customers who can reach and use our product. ☐ Size: After studying market size of similar products at a global level, we have estimated that the market size of our product is 198 Billion Rupees.

Annexure 1

Themes:

1. Healthcare & Biomedical devices.
2. Agriculture & Rural Development.
3. Smart Vehicles/ Electric vehicle/ Electric vehicle motor and battery technology.
4. Food Processing.
5. Robotics and Drones.
6. Waste management.
7. Clean & Potable water.
8. Renewable and affordable Energy.
9. IoT based technologies (e.g. Security & Surveillance systems etc)
10. ICT, cyber physical systems, Block chain, Cognitive computing, Cloud computing, AI & ML.

9 stages of TRL:

- TRL 0 : Idea. Unproven concept, no testing has been performed.
- TRL 1 : Basic research. Principles postulated observed but no experimental proof available.
- TRL 2 : Technology formulation. Concept and application have been formulated.
- TRL 3 : Applied research. First laboratory tests completed; proof of concept.
- TRL 4 : Small scale prototype built in a laboratory environment ("ugly" prototype).
- TRL 5 : Large scale prototype tested in intended environment.
- TRL 6 : Prototype system tested in intended environment close to expected performance.
- TRL 7 : Demonstration system operating in operational environment at pre-commercial scale.
- TRL 8 : First of a kind commercial system. Manufacturing issues solved.



TRL 9 : Full commercial application, technology available for consumers.



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