Pro forma for submission of proposal under the scheme

MODERNISATION & REMOVAL OF OBSOLESCENCE

The scheme aims to modernize and remove obsolescence in the Laboratories / Workshops/ Computing facilities (Libraries are excluded), so as to enhance the functional efficiency of Technical Institutions for Teaching, Training and experimenting purposes.

It also supports new innovations in Class Room and Laboratory / Teaching Technology, development of Lab Instructional Material and appropriate Technology to ensure that the practical work and project work to be carried out by students is contemporary and suited to the needs of the Industry.

The equipment financed under the scheme up to a limit of Rs 20 lakhs /- could be ideally used for up gradation of equipment in existing laboratories, enhancement of performance parameter specification of existing equipment, incorporation of latest development in the field and replacement of old depreciated equipment by modern equipment.

In addition to above major objectives, the equipment installed through MODROBS can be used for indirect benefit to Faculty / Students through Continuing Education programmes, Training programmes for local industry and consultancy work.

Name of the Institute	Mar Baselios Christian College of Engineering & Technology		
Address	Mar Baselios Christian College of Engineering & Technology Pallikkunnu P.O, Kuttikanam Peermade, Idukki Dist, Kerala - 685531		
Contact details	principal@mbcpeermade.com	04869-233571	
Permanent Id of the Institute	1-5798929		
Application Id	1-93512226670		

Department	Department of Mechanical Engineering
Lab to be funded	Design and Analysis Lab
Current lab utilization	•6 hours a week for 16 weeks (96 hours per year) 8 batches (5 students per batch)

Strength & Weakness of lab	**Strengths** • Started in 2001, Mar Baselios Christian College of Engineering & Technology, Peermade is one of the best institution in Idukki district Kerala. • Sprawling Campus in a serene environment with excellent infrastructure. • Periodic research orientations like National Conferences, Workshops/Seminars. • Effective mentoring system providing constant guidance to the student and feedback to the parent **Weakness** • Lack of sophisticated tools for research • As a result students are not getting exposure to state of the art equipments and hence the level of competency demanded by modern day industries and research is not attained. • Equipments available are very old and outdated. • Paucity of consultancy activity
Total cost of equipment in lab	

Major equipment available in the lab

Name of equipment	Cost in Rs.
CNC Lathe Machine	8,78,651
METALLURGICAL MICROSCOPE.	2,43,660
JUNKERS GAS CALORIMETER.	1,49,000
UNIVERSAL VIBRATION APPARATUS.`	1,13,202
TOOLMAKER MICROSCOPE.	79,634
PROFILE PROJECTOR.	65,160
KAPLAN TURBANE.	3,78,000/-

Technical Field of proposal

Vibration testing

Title of proposal

Modernization of Design and Analysis Lab

Summary

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Project Impact -Expected outcome

In the recent decades because of the global demand to control the pollution and climatic change, energy conversion from nonpolluting renewable energy resources became predominant. In India there is a significant scope in converting wind energy to useful rotary motion or electrical energy. Though the use of wind turbine is not a new innovation there are a lot of new recent developments in this field. Generally, there are two main categories of wind turbine system namely horizontal and vertical wind turbines and both has its own characteristic turbine blade designs. A new novel method in this field is vortex induced vibration wind power generator (VIVWPG). Here there are no blades, instead a mast (or a cylindrical body) vibrates with wind flow (or velocity). These vibration guides the rotor coils to move backward and forward in a permanent magnet to produce the power. The vibration is caused due to the vortex shedding phenomenon which if fine-tuned to the natural frequency of mast it vibrates in its resonance. This enhances the vibration and produce increased power output. One of the main challenges is fine tuning the natural frequency of mast according to the variation in wind velocity and need a novel mechanism to control it.

MBC College of Engineering and Technology Peermade, Idukki, Kerala is situated in a mountain and hilly region in the Western Ghats. The college is at a height of 1100m from sea level. Because of this geography the region has wind velocity ranging from 2 to 6 m/s. Hence this novel VIVWPG can be easily analyzed and implemented here and can contribute a nonpolluting renewable energy source to wherever possible.

Three groups of undergraduate students are currently (2020-21) working on this project on the following three related fields respectively, a) Ansys simulation study on the effect of vortex shedding on different cylindrical bodies, b) Magnetic confinement method to tune the body/mast vibration in resonance with wind velocity and c) Method to visualize and analyze the displacement, forces and

moments of vibrating body using LabVIEW graphic coding software. The future work includes model making of VIVWPG based on the results of earlier studies and using NI modules and DAQ system for acquiring the signals from sensors from the vibrating body and analysis through already built LabVIEW code to study and improve further and finally implement it.

In order to develop this new novel wind power generator and increase the knowledge of the students and make them an employable engineer there is a need of instruments to measure the vibration, sensors to capture the physical parameters, digital and analogue signal acquiring instruments (National Instruments -cRIO bus module), Ansys simulation software, DAQ system, High speed computer with respect to the above theme. Thus, for this rurally situating institution and for the development of students and faculty, the institution is requesting for a fund release for the development of a new design and analysis lab which will help all department students to acquire new knowledge and for enhanced project work output.

Abstract

In the recent decades because of the global demand to control the pollution and climatic change, energy conversion from nonpolluting renewable energy resources became predominant like from wind and solar energy. In India there is a significant scope in converting wind energy to useful rotary motion or electrical energy apart from the solar energy conversion. Though the use of wind turbine is not a new innovation there are a lot of new recent developments in this field. Generally, there are two main categories of wind turbine system namely horizontal and vertical wind turbines and both has its own characteristic turbine blade designs. A new novel method in this field is vortex induced vibration wind power generator (VIVWPG). Here there are no blades, instead a mast (or a cylindrical body) vibrates with wind flow (or velocity). These vibration guides the rotor coils to move backward and forward in a permanent magnet to produce the power. The vibration is caused due to the vortex shedding phenomenon which if fine-tuned to the natural frequency of mast it vibrates in its resonance. This enhances the vibration and produce increased power output. One of the main challenges is fine tuning the natural frequency of mast according to the variation in wind velocity and need a novel mechanism to control it. The bladeless technology is highly ecofriendly as its effects on birds is negligible

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In order to develop this new novel wind power generator, solar energy conversion equipment and increase the knowledge of the students and make them an employable enginee,r there is a need of instruments to measure the vibration, sensors to capture the physical parameters, digital and analogue signal acquiring instruments (national instruments -cRIO integrated controller), ANSYS simulation software, DAQ system, high speed computer with respect to the above theme. Thus, for this rurally situating institution and for the development of students and faculty, the institution is requesting for a fund release for the development of a new design and analysis lab which will help all department students to acquire new knowledge and for enhanced project work output apart from the revenue this can bring to the college through consultancy and training programs.

Objectives

1. To establish a new state of art laboratory for design and analysis for vibration, sensor, solar irradiation studies with data logging and analysis.
2. To familiarize students with key concepts in condition monitoring of gears, bearings and general machinery that forms the backbone of any industry.
3. To bring out exceptional projects work from the laboratory.
4. To develop non-polluting renewable energy sources mainly from wind and solar which suits the college hilly and windy geographical region and contribute to the rural under developed district.
5. To train the students on how to acquire the signals from sensors and analyze it using sophisticated hardware and software and visualize it using graphical programming code like LabView.
6. To train the students for innovative creativity and simulation skills

Summary

The Lab once deployed can cater to the needs of academia, students, and allied research community, as well as industry, both public and private. The Center, through its expertise and facilities, will be an enabler for all these groups by engaging in sponsored and consultancy projects, offering appropriate training and educational programs, developing new technologies and product ideas, and making state of the art equipment and computational facilities available to its user community

Project Impact -Expected Outcome

Following are the immediate expected outcome from this facility

1. Implementation of novel vortex induced vibration wind power generator (VIVWPG) on which the three students' groups are currently working on as their final year projects (1. Ansys simulation study on the effect of vortex shedding, 2. Method to fine tune the vibrating body natural frequency, 3. Method to visualize and analyze the displacement, forces and moments of vibrating body using LabVIEW graphical programming software)
2. Futuristic and continuous study possibilities on the vibration characteristics of the vibrating body of this VIVWPG using vibrating instruments and improve the performance of wind power generator.

Within five years the following benefits are also expected

1. Structural dynamic modification of existing structures to ensure good vibration suppression and comfort.
2. Multiple Input Multiple Output testing which is now a standard in world class vibration test facility becomes a reality by replacing the existing SISO (Single Input/ Output) technique.
3. Noise and vibration control and condition monitoring in modern day automobiles, aircrafts and buildings.

Only very few engineering colleges provides high quality engineering education in Idukki district, Kerala and being our college a private institution and since we have a financial limitation (student fees is the only significant revenue), students are not able to do get hands on experience on recent new knowledges and they are not able to conduct high end researches. Currently the college is only providing the financial assistance to the student to do their UG projects, but it is limited. The financial support will not only help to improve the knowledge and hands-on experience, this new design and analysis laboratory will bring revenue to the college for further improvements through the following ways.

Technical Consultancy / Revenue Generation

Activity / Event	Proposed (2021-22)
Continuing Research	Nearby college students and others can do research work **1 lakh**
Continuing Education Programmes/ Addon courses	Training and short-term courses for students and others in the fields of: 1. Vibration testing 2. Vibration control 3. Digital signal processing 4. Hardware and software integration with sensors 5. Ansys Simulation 6. LabView Graphical Programming 7. MATLAB/Simulink **3 lakhs**
Training for Industrial Worker	Training and short-term courses for engineers from industry in the fields of aerospace/ defense/ automobile/production etc.: 1. Vibration control 2. Hardware and software integration with sensors 3. ANSYS simulation 4. LabView graphical programming 5. MATLAB/Simulink **1 lakh**

Consultancy	Consultancy may be provided in the above-mentioned fields. **1.5 lakhs**

Proposed	Specifications	Cost in Rs.	No of	Justification
ANSYS WORKBENCH ANSYS MULTIPHYSICS	**Design Modeler** – Parametric based modeling software **Meshing** – Physics based meshing Tool **Resources (Engineering Data)** – ANSYS Workbench materials database. **DesignXplorer** – Optimize design parameters using DOE, VT & Six Sigma **DesignSpace** – Conceptualize, design and validate your ideas using knowledge based simulation **ANSYS Fatigue Module**- Simulates Structural Performance under cyclic loading conditions. **Rigid Body Dynamics** - rigid body and mixed flexible/rigid body structural dynamics **ANSYS User Programmable Features (USER300,ect)** - user-programmable elements available when using the traditional (PREP7) interface **Finite Element Modeler** – Convert any FE model into ANSYS FE Model **MCAD Connections**-Allows Direct imports from other CAD packages. **ANSYS Academic CFD Turbo** Tools: Consists of Blade Modeler and TuboGrid: Specialized blade/turbo machinery pre-processing products intended for use with ANSYS CFX	550,000	1	The lab already has sold edge software for design analysis This module is an addon to the existing software. It helps to perform fluid flow analysis, heat transfer characteristics, analysis on vorticity

DAQ AND ANALYSIS SOFTWARE BNC-2120 DAQ	8 simultaneous channels DAQ hardware * Excitation motor control fully integrated with DAQ, capable of sine sweeping. * Time waveform, spectrum, and frequency response signal analysis. *BNC connectors for input output (I/O) connections *E/M/S/X and NI 671x Series devices (Interface) Protection (DC max V) (Digital I/O) Powered off: ±5.5 V Powered on: +10/-5 V Power Requirement+5 VDC (±5%) Operating temperature 0 to 50°C NI PCI-6070E (MIO 16E 1) (Legacy) NI DAQ system timing controller (DAQ-STC) is used by devices in E Series for time -connected functions. 16 Ch, 1.25 MS/s, 12-Bit, 2 AO, 8 DIO, 2 24-Bit Counters	300000/-		Pre-defined experimental and data collection for easy setup or fully customizable data collection
INTEGRATED CONTROLLER **CalView software** ANALOGUE INPUT MODULE	**CRIO – 9022** 8 slot Chassis Voltage Range: 9-35 V (DC) Required Power: 35 W (max) **NI – 9215** Channel to Common- Input volt ±30 V (max) (DC)	150000/- 150000/-	1 1	Complete analysis and control of electronic instruments

LOW SIDE (LS) CHANNELS	**NI – 9758** Battery input: 12 V or 24 V Acceptable power range: 7 to 32 V External power supply: 100 mA PWM controlled 0-100% duty cycle operation Frequency: 2-10 kHz One LS channel - 1.5 A	150000/	1	
Digital Input Output (DIO)	**NI – 9411** Channel to Common- Input voltage: ±30 V (max) (DC)	150000/	1	

VIBRATION EXCITER AND CONTROL	A set of equipment capable of producing vibration, of required amplitude and frequency. The setup consists of vibration exciter, Power Amplifier and vibration exciter control. Maximum force: 10kgf Frequency range: 10-10kHz Utility: 1. Vibration testing. 2. Natural frequency identification. 3. Vibration modes shape assessment.	438000/-	1	Useful for vibration studies, endurance testing and modal testing
PIEZO AMPLIFIER	Maximum Voltage- ± 200 volts peak Maximum Current- ± 200 mA peak Output Power- 40 watts Frequency Range- DC to 250 KHz Bandwidth- Into 1 K ohm resistive load: Flat, DC to 300 KHz; 3db roll-off, 400 KHz Phase Shift--.083° per KHz	36500/-	1	Ultraprecise positioning Generation of very high acceleration rates, fast mechanical switching Generation of high frequency motions Generation of very high static and dynamic forces * No electrical energy required under static conditions

PYRANOMETER	Classified as Secondary Standard Sensor Type- Circular Multi-junction wire wound thermopile Type of the Dome- Double Dome Type High Quality Glass- WG295 Glass or Equivalent Sensitivity 7-10 μV/Wm-2 Spectral Range-300 -2800 nm Response Time-One second ±1% from normalization 0-70° Zenith angle ±3% 70-80° Zenith angle or better Temperature range: -20° C to 60° C Relative humidity range: 0-100%	150000/-	1	High quality precision Pyrometer for measuring Global Solar Radion. measure the heat flux

VIBRO METER	Material-Fiber Display-Digital Frequency range-0.1Hz-10Kz Velocity range-0.1-400mm/s Acceleration rage-20-400m/s2 Displacement-0.001-4mm RPM-5-100,000r/min Power source -Battery	21000/-	1	Used for measuring periodic motion, to check the imbalance and deflecting of the moving machinery. Specifically designed for measuring various mechanical vibration.
ANEMOMETER	Type- Digital Cup Anemometer Display Type-Digital Air velocity-3-60m/s Output: 4-20 mA Accuracy: Better than +/- 2% Housing: Aluminum Connector: 4 way Power: 230 VAC With 20 Mtr Wire Speed Indicator Input : 4-20 mA Supply: 230 v ac	29000/-	1	

By signing this certificate, I/We undertake to

- ☑ Abide by all the rules / regulations regarding utilization of amount that may be granted to the Institute.
- ☑ Submit timely progress reports about grant utilization.
- ☑ Submit utilization certificate duly authenticated by CA on/before project period is over.
- ☑ Return full/partial unutilized grant amount to the Council.

19/01/2021

Project forwarded to AICTE

Date :

CHRISTIAN COLLEGE OF ENGINEERING & TECHNOLOGY MAR BASELIOS PEERMADE 685 531

Signature of Head of the Institution

PRINCIPAL
Mar Baselios Christian
College of Engineering & Technology
P. O. Pallikkunnu, Peermade-685531

Institute Seal

Important : You need to apply on web portal using your Institute login and password. Select tab "RID application". Press "New" to create new application. Your application is assigned **unique application Id**. Fill all the details over there. **Prepare application in this proforma also**. Attach PDF of it to the application on web portal. Now press "submit" on web portal to submit application. Pay processing fees on web portal using appropriate payment option.

office use only :

	NR	R	R	R	R	R	R
	Equip purchase	AMC	Consumables	Salary	Fellowship	Travel, Stay & DA	Ptg& Stationery / office Exp
MODROB	Y	-	Y	-	-	-	-