Synthesis and characterization of nanosillimanite by high energy ball milling

Reference No. : 182021009242

Saved By : Dr. Zaheer Ahamed

Saved Date : 08-Mar-2021

PROPOSAL DETAILS

Dr. Zaheer Ahamed

zaheer.be@gmail.com

Professor (Mechanical)

Malla Reddy Engineering College

Maisammaguda, dhulapally (post via. kompally), secunderabad, rangareddy dt, Hyderabad, Telangana-500100

Technical Details :

Scheme :	Core Research Grant		
Research Area :	Material Mining and Mineral Engineering (Engineering Sciences)		
Duration :	36 Months	**Contact No :**	+90144036778
Date of Birth :	01-Jun-1981		
Nationality :	INDIAN	**Total Cost (INR) :**	28,15,000

Is PI from National Laboratory/Research Institution ? No

Project Summary :

Sillimanite is a natural available mineral in the earth's crust but unfortunately, this sillimanite is very rarely available. This mineral has most promising properties than the other minerals of the same group. So, in order to have it, this research project will synthesize nanosillimanite minerals by one of the top-down approaches in nanotechnology. The most efficient and powerful way of synthesizing nanomaterials in top-down nanotechnology is High energy ball milling. It is the process of mechanical deformation, which is a mostly used technique for producing nano metals or alloys in powder form. Co-deposition of alumina and silica and which will undergo disassociation because of severe cyclic deformation which is induced by milling with very hard ceramic balls. The reduction of grain size occurs at a rapid rate but the entire process is slow and it takes a longer time to reach the smallest size. This high-energy ball-milling method can produce 45 to 110 nm particles. An increase in ball milling time and ball ratio will lead to a decrease in the size of sillimanite materials. This project aims to reduce the size of the sillimanite material so as to enhance its properties to a greater extent. After producing nanosillimanite mineral, it is melted in high temperature muffle furnace i.e 1700 oC, where it can melt nanosillimanite mineral. Once casting of the mineral is done then mechanical properties are characterized by using Nanoindentor to find the mechanical properties.

Objectives :

• The main objective of this project proposal is to synthesis of sillimanite mineral which is rarely available in nature.
• The preparation of this sillimanite mineral is done by using combination of alumina and silica materials. The proper proportion of alumina and silica has to be maintained in order to get sillimanite mineral.
• The production of sillimanite is purely done with the aid of high energy ball mill. In this high energy ball mill, the sillimanite mineral is produced by controlling the various parameters such as ball milling time, ball size and collision of deposited material with ball mills.
• This research project aims at the usage of this mineral at very high temperatures especially in furnaces, where the temperatures are more than 1500 0C.
• Detail analysis of material composition is checked by using nanoindentor.
• The main application of this sillimanite mineral is in high temperature furnaces, IC engines, aero planes and so on.

Keywords :
Sillimanite, muffle furnace, nanoindentor, ball milling & minerals.

Expected Output and Outcome of the proposal :

The following are the expected output; The combination of 90% Alumina and 10% Silicon di-oxide will fetch tremendous properties such as; Melting Point 1700 C0 Thermal Conductivity 25 W/m.K Density Less than 3.0 gram/m3 Hardness 5000 VHN Compressive Strength 30 GPa Co-efficient of friction 0.15 Hardness 20 GPa Young's Modulus 200 GPa

Suitability of the proposed work in major national initiatives of the Government:

Innovate India

Theme of Proposed Work:

Manufacturing, Materials

Collaboration Details for last 5 Years :

Planned Collaboration for the proposed work with any foreign scientist/ institution ? No

SNo.	CO-PI Details
1	 **A Raveendra** akunururaveendra@mrec.ac.in Professor(Mechanical) **Malla Reddy Engineering College** Maisammaguda, Dhulapally (Post via. Kompally), Secunderabad, Rangareddy Dt, TELANGANA, HYDERABAD D.O.B : 17 Dec, 1970

Other Technical Details

1. **Origin of the Proposal:** *(Maximum 1 page)*
(Scientific rationale for doing this work should be elaborated)

The origin of this project proposal is the furnace lining materials which all the industries are using. The material which is used in the furnace lining will not withstand very high temperatures. If the temperature crosses more than 1000 ^{o}C then the furnace lining materials will lose all properties. At these higher temperatures the furnace lining material will not withstand and ultimately it will lose all its properties. So in order to overcome this problem with the current materials which is being used this research project proposing, the usage of sillimanite mineral for the enhancement of the properties. Even after using this mineral, if the temperature exceeds above 1700 ^{0}C, then this sillimanite mineral will be converting or transforming into mullite. This mullite mineral is stable upto 1810 ^{o}C.

2. Review of status of Research and Development in the subject

2.1 **International Status:** *(Maximum 2 pages)*
(Researchers working in the area worldwide and their contributions must be properly highlighted with recent references and reviews. A correct and faithful description of the international research status must be given)

Sayel M Fayyad, Ghazi S Al-Marahleh and Suleiman Q. abu-Einhave done work on the improvement of refractoriness under various loads of refractory bricks. In their paper, clay is used as raw material and produced chamotte bricks with a temperature of 1180 ^{0}C. By varying the percentage of alumina, they improved the possible refractoriness. After detailed chemical analysis, the clay consists of 86% Kaolinite and 14% of quartz. Once molding and drying is done then the bricks are burnt at higher temperatures. After detailed investigation, the rise in the percentage of alumina, it increases the chemical and physical properties of the brick.

Work have done on thermal length changes of some of the refractory materials by S.J. Schneider and L.E Mong. In their research paper, amorphous alumina translates into gama alumina because of loos of water and the coil. Changes in lengths are calculated. The heat treatments of various castables are initially treated at different temperatures such as 110 ^{0}C, 1050 ^{0}C and 1300 ^{0}C respectively.

***2.2* National Status:** *(Maximum 1 page)*

(Same as above to cover the contribution of Indian Scientists in the project area)

In this review paper, testing of various refractory materials and its thermal analysis is done. These refractories are made of ceramic which can withstand high heat and abrasion. These refractory materials are used in furnaces, detection of cracking of petroleum products, ceramic kilns and boilers. Testing of properties of materials and heat loss analysis can be easily done but getting solution by using a mathematical model. Along with mathematical modeling, this research project also concentrates testing of thermal as well as physical properties of different materials.

Optimization of thermal conductivity for minimal heat loss by Finite Element Analysis and wall thickness has been proposed by Mr. Dharmendra K Dodiya, Mr. Vasim G Machhar. This paper is about to study the thermal conductivity and thickness of the wall material of the induction furnace. In order to prevent heat losses silica is used. The detailed analysis is done for the optimization of wall thickness and for thermal conductivity by using FEA. In order to minimize the heat losses, the researchers have done steady state thermal analysis along with optimization. The heat flow rate will decrease with the decrease of thermal conductivity of wall material. The heat flow rate will decrease with the increase in the thickness of the furnace wall.

***2.3* Importance of the proposed project in the context of current status** *(Maximum 1 page)*

(*Highlight what is the new area or gap which will be solved in the project in relating to what is already known. This is a very important section to project the novelty content of the proposal*)

The main objective of this project proposal is to synthesis of sillimanite mineral which is rarely available in nature. The preparation of this sillimanite mineral is done by using combination of alumina and silica materials. The proper proportion of alumina and silica has to be maintained in order to get sillimanite mineral. The production of sillimanite is purely done with the aid of high energy ball mill. In this high energy ball mill, the sillimanite mineral is produced by controlling the various parameters such as ball milling time, ball size and collision of deposited material with ball mills. The main application of this sillimanite mineral is in high temperature furnaces, IC engines, aero planes and so on. This research project aims at the usage of this mineral at very high temperatures especially in furnaces, where the temperatures are more than 1500 ^{0}C. Detail analysis of material composition is checked by using nanoindentor.

3. Work Plan:

3.1 Methodology: *(Maximum of 5 pages)*

(It should contain all the details of how each of the objectives will be addressed. This section must be detailed and have clear plans, not vague and generalized statements. It should have several schemes, tables, figures, equations etc. in addition to text, explanation and justification of why the project research plan will work)

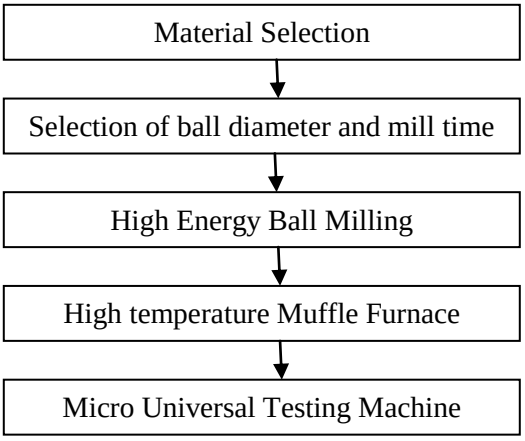

Fig 1: Work plan

Sillimanite is a natural available mineral in the earth's crust but unfortunately this sillimanite is very rarely available. This mineral has most promising properties than the other minerals of the same group. So, in order to have it, this research project will synthesize nanosillimanite mineral by one of the top down approach in nanotechnology. The most efficient and powerful way of synthesizing nanomaterials in top down nanotechnology is High energy ball milling. It is the process of mechanical deformation, which is mostly used technique for producing nano metals or alloys in a powder form. The first step in this research plan starts with a proper material selection. In order to overcome the problems which are highlighted above, this proposal will select alumina and silica in a proper proportion. This proportion will depend upon the application of this material. Then the selection of proper diameter of the balls in the high energy ball milling plays a key role in deciding the properties of the material which is to be expected. Also the milling time in high energy ball mill will decide some of the parameters such as grain size and shape. After selecting the ball diameter and mill time, then Co-deposition of alumina and silica will takes place in high energy ball mill chamber. The co-deposited material will undergo disassociation because of severe cyclic deformation which is induced by milling with very hard ceramic balls. The reduction of grain size occurs at a rapid rate but the entire process is slow and it takes longer time to reach the smallest size.

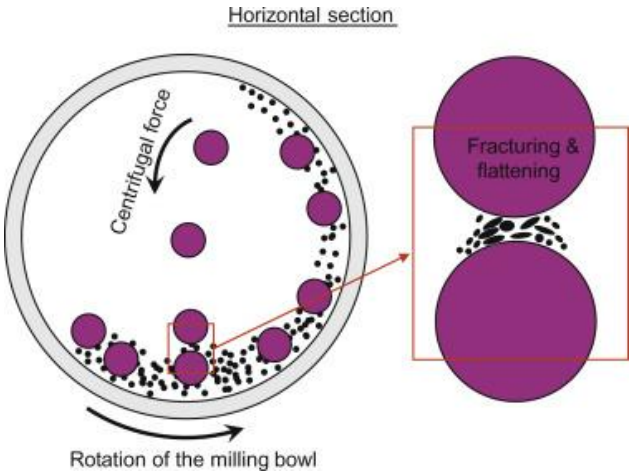

Fig 2: Ball mill mechanism

This ball milling method can produce 45 to 110 nm particles. Increase in ball milling time and ball ratio will lead to decrease in the size of sillimanite materials. This project aims to reduce the size of the sillimanite material so as to enhance its properties to a greater extent. After producing nanosillimanite mineral, it is melted in high temperature muffle furnace i.e 1700 ^{o}C, where it can melt co-deposited material and will produce nanosillimanite mineral. Once casting of the mineral is done then mechanical properties are characterized by using Micro Universal Testing Machine.

3.2 Time Schedule of activities giving milestones through BAR diagram. (Maximum 1 page)

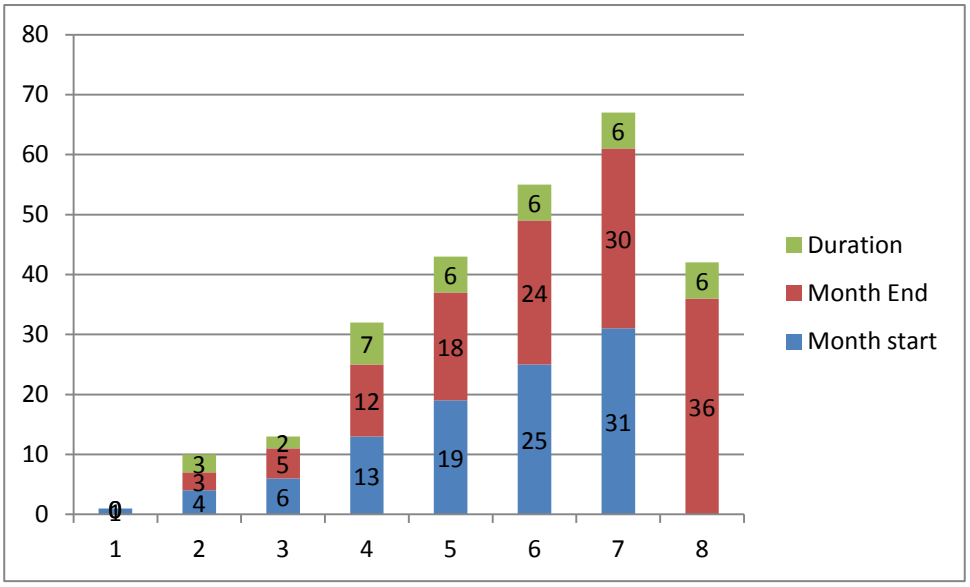

Fig 3: Time Schedule for activities

3.3 Suggested Plan of action for utilization of research outcome expected from the project. *(Maximum ½ page)*

The following are the expected output;

The combination of 90% Alumina and 10% Silicon di-oxide will fetch the tremendous properties such as;

Melting Point	: 1700 C^0
Thermal Conductivity	: 25 W/m.K
Density	: < 3.0 gram/m^3
Hardness	: 5000 VHN
Compressive Strength	: 30 GPa
Co-efficient of friction	: 0.15
Hardness	: 20 GPa
Young's Modulus	: 200 GPa

3.4 Environmental impact assessment and risk analysis. *(Maximum ½ page)*

The environmental impact assessment and risk analysis by using high energy ball milling equipment.

a. Contamination of product occurs as a result of wear and tear fro the mill balls.
b. Mill machine makes much noice if it is made of metal. Meanwhile if it is made up of rubber then the noise levels are very low.
c. It takes more time for milling.
d. It's quite challenging in order to clean after usage.

The environmental impact assessment and risk analysis by using high temperature muffle furnace.

a. Very long times are required for muffle furnaces i.e, 12-24 hrs.
b. They are very costly to maintain as well as to run due to electrical cost.

4. Expertise:

4.1 Expertise available with the investigators in executing the project: *(Maximum 1 page)*

(*Professional expertise existing with each of the investigators in terms of publications, Patents and preliminary results, to execute every component of the proposal should be highlighted)*

1. Abhay Kumar Aman, Aryabhatta Centre for Nanoscience and Nanotechnology, Aryabhatta Knowledge University Patna - 800001, Bihar, India.
2. Rakesh Kumar Singh, Aryabhatta Centre for Nanoscience and Nanotechnology, Aryabhatta Knowledge University Patna - 800001, Bihar, India.
3. Ranjit Kumar, Mahavir Cancer Research Institute 2, Patna - 801505, Bihar, India.
4. A. K. Ghosh, Mahavir Cancer Research Institute 2, Patna - 801505, Bihar, India.

4.2 Summary of roles/responsibilities for all Investigators:

(If the proposal contains more than one Investigator, it is important to clearly mention the role of each Investigator in implementing the objectives of the proposal. The Board does not encourage Investigators who do not have specific scientific role in the proposal)

S. No.	Name of the Investigators	Roles/Responsibilities
1.	Dr. Zaheer Ahamed T	Literature Review, Procurement of raw materials, Experimentation work, Characterization and Documentation
2.	Dr. A Raveendra	Selection of raw materials, Melting in muffle furnace and casting, Characterization and Documentation

4.3 Key publications published by the Investigators pertaining to the theme of the proposal during the last 5 years

1. A research journal entitled "Tribological properties of Aluminium- Kyanite Composites" has published in International Journal of Advanced Research (IJAR) on July 2016 with manuscript number IJAR-11389.
2. A research journal entitled "Evaluation of process parameters by Taguchi technique" has published in International Journal of Research and Development in Technology (IJRDT) on July 2016 with manuscript number 2349-3585.
3. A research journal entitled "Variation reduction in plate weight by using variable search for battery" has published in International Journal of Engineering Research in Mechanical and Civil Enginering (IJERMCE) on September 2017, Vol 2 Issue 9 with ISSN No: 2456- 1290, P.No 85-91.
4. A research paper entitled " Flow investigation in a Francis Turbine draft tube with a designed five hole hemi-spherical probe number 5" has been sent to Springer publication series.
5. A research paper entitled Effect of pulsed and non-pulsed current on welding characteristics of AA6061 Aluminium alloy welded joints using Tig welding, has published in IJOER, ISSN:2395-6992, Vol 2
Issue 7, July 2016.
6. A research paper entitled Improving productivity and quality by changing feeding system in an injection moulding process, has published in GJAET ISSN:2277-6370, Vol 6, Issue 1, 2017.
7. A research paper entitled Simulation in composition of cement manufacturing and comparison of mechanical properties, has published in IJSETR, ISSN:2319-8885, Vol 6 Issue 3, Feb 2017.
8. A research paper entitled Simulation in composition of cement manufacturing and comparison of mechanical properties, has published in IJSETR, ISSN:2319-8885, Vol 6 Issue 3, Feb 2017.
9. A research paper entitled Modeling and optimization of cushioning system in hydraulic cylinder to achieve performance characteristics, has published in IJIR, ISSN:2454-1362, Vol 3, Issue 1, 2017.
10. A research paper entitled CFD analysis of steam ejector with different nozzle diameter, has published in IJR ISSEN:2348-6848, Vol 4, Issue 14, Nov 2017.
11. A research paper entitled Effect of process parameters on Mrr and surface roughness in turning process of EN8, has published in IFERP, ISSN:2456-1290, Vol 2, Issue 9, Sep 2017.
12. A research paper entitled Stress Distribution around Polygonal Holes in Graphite/Epoxy Laminates Under in Plane Loading, has published in IJR, ISSN:2348-6848, VOL 05, Issue 01, Jan 2018.
13. research paper entitled Micro-Hardness and Mechanical properties of 5052 aluminium alloy

weldments using pulsed and non-pulsed current gas tungsten arc welding, has published in IJMPERD, ISSN:2249-8001, Vol.8,Issue 6, Dec2018.
14. Research paper entitled Infinitely Variable Valve Lifting, has published in IJITEE, ISSN:2249-8001, Vol.8,Issue 6, Dec2018.
15. Research paper entitled Effect of tool Overhang on turning operation using finite element model, has published in IJITEE, Vol.8, Issue-4S2, Vol.8,Issue 6, Dec2018.
16. Research paper entitled A Multivariable model of orthogonal turning operation on cutting dynamics modeled by optimum cutting Parameters using genetic algorithm, has published in IJRTE, Vol-7,Issue-5S2, Jan 2019.
17. Research paper entitled Experimental Research of wire cut EDM for SR&MRR using Taguchi Method, has published in IJEAT, Vol-9,Issue-2, Dec 2019.
18. Research paper entitled Characterization of Roselle &Kevlar hybrid Composites, has published in IJEAT, Vol-9,Issue-2, Dec 2019.
19. Research paper entitled Optimization of process parameters in Turning operation by using taguchi method Special issue-NCAETS 2019, has published in SPJMR, Vol-9,Issue-2, Dec 2019.

4.4 ibliography

1. Nano materials by Robert R McCormick school of Engineering and applied science.
2. Fabrication of nanoscale structures, Aug 09 2001.
3. Nano materials: synthesis and assembly, Thomas E Mallouk, Foresight Conference Tutorial, Nov 02 2000.
4. Nano Materials by Markus Fleck, Theoretische Physik KF Uni Graz, June 21 2007.
5. Unbounding the future: the nanotechnology revolution by Eric Drexler & Chris Peterson.
6. The Sillimanite group by Frank H Riddle, Willfrid R Foster
7. Nano materials by Brent Augustine.
8. Handbook of Microlithography, micro machining and micro fabrication, Volume 1: Microlithography, Chapter 2: Introduction to Electron Beam Lithography SPIE(1999)

5. List of Projects submitted/implemented by the Investigators

(All the Investigators should list out details of the Projects submitted, implementing and completed by them. The list should start with the Projects implemented by the Principal Investigator, followed by Co-PI1, Co-PI 2 etc.)

5.1 Details of Projects submitted to various funding agencies:

S. No	Title	Cost in Lakh	Month of submission	Role as PI/Co-PI	Agency	Status

5.2 Details of Projects under implementation

S. No	Title	Cost in Lakh	Duration	Role as PI/Co-PI	Agency

5.3 Details of Projects completed during the last 5 years

S. No	Title	Cost in Lakh	Duration	Role as PI/Co-PI	Agency

6. List of facilities being extended by parent institution(s) for the project implementation.

6.1 Infrastructural Facilities

Sr. No.	**Infrastructural Facility**	**Yes/No/ Not required Full or sharing basis**
1.	Workshop Facility	Yes
2.	Water & Electricity	Yes
3.	Laboratory Space/ Furniture	Yes
4.	Power Generator	Yes
5.	AC Room or AC	Yes
6.	Telecommunication including e-mail & fax	Yes
7.	Transportation	Yes
8.	Administrative/ Secretarial support	Yes
9.	Information facilities like Internet/Library	Yes
10.	Computational facilities	Not Required
11.	Animal/Glass House	Not Required
12.	Any other special facility being provided	Not Required

6.2 Equipment available with the Institute/ Group/ Department/Other Institutes for the project:

Equipment available with	**Generic Name of Equipment**	**Model, Make & year of purchase**	**Remarks including accessories available and current usage of equipment**
PI & his group			
PI's Department			
Other Institute(s) in the region			

7. Name and address of experts/ institution interested in the subject / outcome of the project.

1. Prof. B.S Murty,
Director,
IIT Hyderabad.

Budget Details

Institution wise Budget Breakup :

Budget Head	Malla Reddy Engineering College	Total
Manpower	7,20,000	**7,20,000**
Consumables	90,000	**90,000**
Travel	1,50,000	**1,50,000**
Equipment	15,25,000	**15,25,000**
Contingencies	1,80,000	**1,80,000**
Overhead	1,50,000	**1,50,000**
Total	**28,15,000**	**28,15,000**

Institute Name : ***Malla Reddy Engineering College***

Year Wise Budget Summary (Amount in INR) :

Budget Head	Year-1	Year-2	Year-3	Total
Manpower	2,40,000	2,40,000	2,40,000	**7,20,000**
Consumables	30,000	30,000	30,000	**90,000**
Travel	50,000	50,000	50,000	**1,50,000**
Equipments	15,25,000	0	0	**15,25,000**
Contingencies	60,000	60,000	60,000	**1,80,000**
Overhead	50,000	50,000	50,000	**1,50,000**
Grand Total	**19,55,000**	**4,30,000**	**4,30,000**	**28,15,000**

Manpower Budget Detail(Amount in INR) :

Designation	Year-1	Year-2	Year-3	Total
Junior Research Fellow *1. Carry out the research work of the collaborative research project.* *2. Keep and maintain the record of the results in the presentable form (Soft as well as hard copy).* *3. Keep a track of contingencies/consumables required for the work.* *4. Assist the PI in the preparation of various reports related to the research work.* *5. Carryout any other departmental work as directed by PI.*	2,40,000	2,40,000	2,40,000	**7,20,000**

Consumable Budget Detail (Amount in INR) :

Justification	Year-1	Year-2	Year-3	Total
Purchase of Alumina, Silica, and Sillimanite mineral.	30,000	30,000	30,000	**90,000**

Travel Budget Detail (Amount in INR) :

Justification (Inland Travel)	Year-1	Year-2	Year-3	Total
Traveling cost for purchasing the High energy Ball Mill, High temperature muffle furnace, Tabletop nanoindentor and the required raw materials.	50,000	50,000	50,000	**1,50,000**

Equipment Budget Detail (Amount in INR) :

Generic Name ,Model No. , (Make)/ Justification	Quantity	Spare time	Estimated Cost
Nano Plug and Play Indentor Nano Tec-Sol India (Tec-Sol India) *Applications:* • *Tension/Compression/3-point bend* • *Ductile and brittle fracture* • *Fatigue crack propagation* • *Threshold stress intensity* • *Low/High-cycle fatigue (LCF/HCF)* • *Elastomer properties*	1	10 %	**6,00,000**
High Energy Ball Mill (SKL Mineral Processing Equipment.) *1. By using High Energy Ball Mill, Milling, Mixing, Mechanical alloying, Size reduction, Pulverizing, Homogenizing, Colloidal milling can be done.* *2. Fineness is less than 1 micrometer and even up to 40nm powder can be prepared.* *3. Planetary Ball Mill with Control Panel and its fully automatic machine.*	1	10 %	**6,00,000**
High temperature muffle furnace HF-1700 0C (Harrier Enterprises) *Maximum Temp.: 1700º CWorking Temp.: 1600º C Temp. Accuracy: ±2º CHeating Elements: Molybdenum Discilicide (MoSi2) Inner Chamber: Ceramic Refractory / Board with heating elements placed inside walls Insulation: High Purity Alumina Door: Hinged type insulated with ceramic ber and viewing capTemperature Controlled: Microprocessor PID controller with 4 progs. X 16 segmen*	1	10 %	**3,25,000**

Contingency Budget Detail (Amount in INR) :

Justification	Year-1	Year-2	Year-3	Total
Cost for unexpected in this project proposal	60,000	60,000	60,000	**1,80,000**

Overhead Budget Detail (Amount in INR) :

Justification	Year-1	Year-2	Year-3	Total
This research project has an estimate of the overhead cost of 150000	50,000	50,000	50,000	**1,50,000**

PROFORMA FOR BIO-DATA (to be uploaded)

1.	Name and full correspondence address	Dr. Zaheer Ahamed T Professor, Department of Mechanical Engineering Malla Reddy Engineering College, Maisammaguda, Secunderabad.
2.	Email(s) and contact number(s)	zaheer.be@gmail.com & 9014403678
3.	Institution	Malla Reddy Engineering College (A)
4.	Date of Birth	01-06-1981
5.	Gender (M/F/T)	Male
6.	Category Gen/SC/ST/OBC	OBC
7.	Whether differently abled (Yes/No)	No

8. Academic Qualification (Undergraduate Onwards)

	Degree	Year	Subject	University/Institution	% of marks
1.	B.E	2003	Mechanical	KBNCE/VTU	72
2.	M.E	2005	C.I.M	CEG Anna University	6.8 CGPA
3.	Ph.D	2019	Mechanical	VTU	-
4.					

9. Ph.D thesis title, Guide's Name, Institute/Organization/University, Year of Award.

Title : Synthesis and Characterization of nanomaterials for space shuttle thermal protection system
Guide's Name : Dr. A.R. Anwar Khan, Principal, , 2019.
Institute/Organization/University : Ghousia Engineering College, VTU
Year of Award : 2019

10. Work experience (in chronological order).

S.No.	Positions held	Name of the Institute	From	To	Pay Scale
1	Associate Professor	Annamacharya Institute of Technology & Sciences	Jan 2017	Aug 2019	39000
2	Associate Professor	Al – Habeeb College of Engineering & Technology	Apr 2014	Dec 2016	35000
3	Assistant Professor	Dayanandasagar College of Engineering	July 2012	Mar 2014	32000
4	Sr. Lecturer	The Oxford College of Engineering	Jan 2011	July 2012	28000
5	Assistant Professor	Intell Engineering College	Jan 2010	Jan 2011	22000
6	Assistant Professor	Al – Habeeb College of Engineering & Technology	June 2005	Jan 2010	16000

11. Professional Recognition/ Award/ Prize/ Certificate, Fellowship received by the applicant.

S.No	Name of Award	Awarding Agency	Year

12. Publications *(List of papers published in SCI Journals, in year wise descending order).*

S.No.	Author(s)	Title	Name of Journal	Volume	Page	Year

13. Detail of patents.

S.No	Patent Title	Name of Applicant(s)	Patent No.	Award Date	Agency/Country	Status

14. Books/Reports/Chapters/General articles etc.

S.No	Title	Author's Name	Publisher	Year of Publication

15. Any other Information (maximum 500 words)

BIO-DATA

1. Name and full correspondence address : Dr. A.RAVEENDRA
   Professor,Dept of Mechanical Engg
   Mallareddy EngineeringCollege
   Maisammaguda,Secunderabad,Telangana
   500100.
2. Email(s) and contact number(s) : akunururaveendra@mrec.ac.in
   9502294258
3. Institution : MallaReddy Engineering College (**A**)
4. Date of Birth : 17-12-1970
5. Gender (M/F/T) : M
6. Category Gen/SC/ST/OBC : OBC
7. Whether differently abled (Yes/No) : No
8. Academic Qualification :

	Degree	Year	Subject	University/Institution	% of marks
1	B.Tech	1994	Mechanical Engg	REC-Warangal, AP.	58
2	M.Tech	2003	Production Engg	VTU-Belgaum	72
3	Ph.D	2017	Welding	JNTUH-Hyderabad	

9. Ph.D thesis title, Guide's Name, Institute/Organization/University, Year of Award.

   Title: Experimental Investigations on welding Characteristics of Aluminium alloy(5052) and Alloy steel(EN24) using gas tungsten arc welding(GTAW).

   Year of Award : 2017

   Guide : Dr.B.V.R Ravi kumar

   University : JNTUH-Hyderabad

10 .Work experience :

S. No.	Positions held	Name of the Organization/ Institute	From	To	Pay Scale
1.	Planning Engineer	H.H.V CO.Pvt Ltd, Bangalore	1995	2000	Rs 6000+ perks
2.	Assist.prof	Dr.SGIET- Markapur	2003	2005	Rs 8000-275-13500
3.	Assoc.prof	Malla Reddy Engg College	2005	Feb 13th 2020	37400-67000
4.	Principal	Malla Reddy Engg College	Feb14th 2020	Till date	

11.Publications (List of papers published in Journals.

S.No	Author(s)	Title	Name of Journal	Volume	Page	Year
1.	A.Raveendra, Dr.B.V.R.Ravi Kumar	Welding characteristics of Aluminium alloy (6082) and stainless steel(304) weldments, using pulsed and non-pulsed current GTAW	Technical journals(IJMEAR) ISSN:2249-6548	Vol 02, issue 03	50-59	Aug 2011
2.	B.Tularirama Rao K.Srinivas P.Rami Reddy A.Raveendra B.V.R.Ravi kumar	Effect of processing parameters on surface finish of the components processed by CNC turning machine	Technical journals(IJMEAR) ISSN:2249-6564	Vol 04,issue 01	224-228	Jan-Mar 2013
3.	A.Raveendra B.V.R.Ravi Kumar	Effect of pulsed current on welding characteristic of aluminium alloy(5052) using gas tungsten arc welding	IJSR, ISSN:2319-7064	VOL 2 Issue 5	82-86	May 2013
4.	A.Raveendra B.V.R.Ravi Kumar	Effect of pulsed current on welding characteristic of EN19alloy steel using gas tungsten arc welding	IJIRSET ISSN:2319-8753	Vol 2 Issue 5	1359-1367	May 2013
5.	A.Raveendra B.V.R.Ravi Kumar	Experimental study on pulsed and non-pulsed current TIG welding of stainless steel(SS304)	IJIRSET ISSN:2319-8753	Vol:2, Issue 6	2337-2344	June 2013
6.	A.Raveendra B.V.R.Ravi Kumar	Experimental study on pulsed and non-pulsed current tig welding of aluminium sheet(6082)	IJSER ISSN:2277-2685	Vol-3 Issue 6	4102-4108	June 2013
7.	B.Tularirama Rao Dr.K.Srinivas P.Rami Reddy A.Raveendra Dr.B.V.R.Ravi kumar	Experimental study on the effect of cutting parameters on surface finish obtained in CNC turning operation	IJIRSET ISSN:2319-8753	Vol 2 Issue 9	4547-4555	Sept 2013
8.	A.Raveendra B.V.R.Ravi Kumar	Effect of pulsed current on welding characteristic of EN24	IJAST ISSN:2229-5216	Vol 8 No 1	28-37	Jan 2014

		alloy steel using gas tungsten arc welding				
9.	A.Raveendra Dr.B.V.R.Ravi Kumar Dr.A.Siva Kumar V.Prudhvi Kumar Reddy	Influence of welding parameters on weld characteristics of 5052 aluminium alloy sheet using tig welding	IJAIEM ISSN:2319-4847	Vol 3 Issue 3	186-190	Mar 2014
10.	B.Tularirama Rao Dr.K.Srinivas P.Rami Reddy A.Raveendra Dr.B.V.R.Ravi kumar	Measuring cutting forces while cutting of different metals with different speeds	IJAIEM ISSN:2319-4847	Vol 3 Issue 9	163-169	September 2014
11.	B.Tularirama Rao Dr.K.Srinivas P.Rami Reddy A.Raveendra Dr.B.V.R.Ravi kumar	Finding cutting forces while turning operations on lathe machine at different depth of cut of different metals	IJIRSET ISSN:2319-8753	Vol 3 Issue 10	16866-16872	Oct 2014
12.	A.Raveendra B.V.R.Ravi Kumar	Micro-Hardness and mechanical properties of EN24 Alloy steel weldments using pulsed and non-pulsed current gas tungsten arc welding	IJIRSET ISSN:2319-8753	Vol 03 Issue 10	16588-16592	Oct 2014
13.	A.Raveendra .B.V.R.Ravi Kumar Dr.Siva Kumar Mr.N.Santhosh	Effect of welding parameters on 5052 aluminium alloy weldments using TIG welding	IJIRSET ISSN:2319-8753	Vol 3 Issue 3	10302-10308	Mar 2014
14.	A.Raveendra .B.V.R.Ravi Kumar Dr.Siva Kumar Mr.V.Pruthvi Kumar Reddy	Influence of welding parameters on weld characteristics of 5052 aluminium alloy sheet using TIG welding	IJAIEM ISSN:2319-4847	Vol 3 Issue 3	186-190	Mar 2014
15.	K.Vinay A.Raveendra	Effect of exhaust gas recirculation on the performance and emission characteristic of diesel engine using biodiesel	IJERT ISSN:2278-0181	Vol 4 Issue 5	1276-1281	May 2015
16.	A.Raveendra M.Satish Sagar Dr.B.V.R.Ravi Kumar	Effect of pulsed current on TIG weldments of aluminium alloy (5052) and alloy steel(EN24)	IJIRSET ISSN:2319-8753	Vol 4 Issue 5	3095-3101	May 2015
17.	J.Padmaja A.Ravindra	Design and Analysis of a Heat Sink for a High Power LED System	IJERT ISSN:2278-0181	Vol 4 Issue 7	975-982	July 2015
18.	Ch.Naveen Kumar M.V.Vara Lakshmi	Measurement of cutting forces while turning different	IJIRSET ISSN:2319-8753	Vol 4 Issue 7	6070-6076	July 2015

	A.Raveendra	materials by using lathe tool dynamometer with different cutting tool nomenclature				
19.	V.Sravanthi A.Raveendra	Experimental investigation on influence of welding parameters on welding characteristics of aluminium alloy using TIG welding	IJETTS ISSN:2348-0246	Vol 5 Issue 3	407-418	Sept 2015
20.	Korri Pradeep Kumar A.Raveendra	Thermal load effect on value by using conventional and blended fuels	IJOER ISSN:2321-7758	Vol 3 Issue 6	211-215	Nov-Dec 2015
21.	V.Lokesh Varma A.Raveendra	Structural design and FEM analysis of butterfly valve	AIJREAS ISSN:2455-6300	Vol 1 Issue 6	56-62	June 2016
22.	B.Akshay Kumar A.Raveendra	Effect of pulsed and non-pulsed current on welding characteristics of AA6061 Aluminium alloy welded joints using Tig welding	IJOER ISSN:2395-6992	Vol 2 Issue 7	93-102	July 2016
23.	K.Abhilash Korvi A.Raveendra	Improving productivity and quality by changing feeding system in an injection moulding process	GJAET ISSN:2277-6370	Vol 6 Issue 1	1-5	2017
24.	M. Ravi Teja A.Raveendra	Simulation in composition of cement manufacturing and comparison of mechanical properties	IJSETR ISSN:2319-8885	Vol 6 Issue 3	1-7	Feb 2017
25.	Ch.Prahallad A.Raveendra	Modeling and optimization of cushioning system in hydraulic cylinder to achieve performance characteristics	IJIR ISSN:2454-1362	Vol 3 Issue 1	2122-2128	2017
26.	B.Sampath A.Raveendra	CFD analysis of steam ejector with different nozzle diameter	IJR ISSEN:2348-6848	Vol 4 Issue 14	2448-2452	Nov 2017
27.	Bhiksha Gugulothu A.Raveendra M.Uma Mahesh	Effect of process parameters on Mrr and surface roughness in turning process of EN8	IFERP ISSN:2456-1290	Vol 2 Issue 9	28-34	Sep 2017
28.	A.Rohith,Dr.A.Raveendra,Dr.D.K.Nageswara rao,M.Ramesh Babu	Stress Distribution around Polygonal Holes in Graphite/Epoxy Laminates Under in Plane Loading	IJR ISSN:2348-6848	VOL 05 Issue 01	1488-1507	Jan 2018
29.	A.Raveendra, B.V.R.Ravi Kumar, S.Sudhakara Reddy	Micro-Hardness and Mechanical properties of 5052 aluminium alloy weldments using pulsed and non-pulsed current gas tungsten arc welding	International Journal of Mechanical and Production Engineering Research and Development (IJMPERD) ISSN:2249-8001 (**scopus**) Indexed Journal	Vol.8,Issue 6,	691-698	Dec2018
30.	A.Raveendra,K.Sri Noothan Reddy	Infinitely Variable Valve Lifting	International Journal of Innovative Technology and Exploring	Vol.8 Issue-2S	280-285	Dec 2018

			Engineering(IJITEE) ISSN:2278-3075 (**Scopus**) Indexed			
31.	A.Raveendra,Mohammed Abdul Mubashir	Design and Analysis of Leaf Spring for Heavy Weight Vehicles using Composite Materials	International Journal of Innovative Technology and Exploring Engineering(IJITEE) ISSN:2278-3075 (**Scopus**) Indexed	Vol.8 Issue-2S	286-291	Dec 2018
32.	B.Tulsiramarao,P.Ramreddy,K.Srinivas,A.Raveendra	Effect of tool Overhang on turning operation using finite element model	International Journal of Innovative Technology and Exploring Engineering(IJITEE) ISSN:2278-3075 (**Scopus**) Indexed	Vol.8 Issue-4S2	486-488	Dec 2018
33.	B.Tulisiramarao,P.Ramreddy,K.Srinivas,A.Raveendra	A Multivariable model of orthogonal turning operation on cutting dynamics modeled by optimum cutting Parameters using genetic algorithm	International Journal of Recent Technology and Engineering(IJRTE) ISSN:2277-3878 (**Scopus**) Indexed	Vol-7,Issue-5S2	530-535	Jan 2019
34.	A.Raveendra	Experimental Research of wire cut EDM for SR&MRR using Taguchi Method	International Journal of Engineering and Advanced Technology(IJEAT) ISSN:2249-8958 (**Scopus**) Indexed	Vol-9,Issue-2	3096-3701	Dec 2019
35.	A.Raveendra	Characterization of Roselle &Kevlar hybrid Composites	International Journal of Engineering and Advanced Technology(IJEAT) ISSN:2249-8958 (**Scopus**) Indexed	Vol-9,Issue-2	3699-3701	Dec 2019
36.	Dr.A.Raveendra	Optimization of process parameters in Turning operation by using taguchi method Special issue-NCAETS 2019	Suraj punj Journal for Multidisciplinary Research(SPJMR) UGC,approved https://app.box.com/s/b6t4n95da16g0uve3bk5shap6397odpv	Vol 9,Issue 4 ISSN:2394-2886	473-479	Dec 2019

37.	Dr.A.Raveendra	A Study on the effect of process parameter variation in TIG welding	Suraj punj Journal for Multidisciplinary Research(SPJMR) UGC,approved https://app.box.com/s/077yde65q7vyia7wdgu1i8nd191nbb4m	Vol 9,Issue 4 ISSN:2394-2886	469-472	Dec 2019
38	K.Chaitanya, Dr.A.Raveendra	Design and analysis of composite drive shaft	International Journal of Research ISSN NO:2236-6124 (UGC)	Vol 8, Issue IV	4031-4041	Dec/2019
39	S.Praveen Kumar Dr.A.Raveendra	Practical Investigation of Tool Wear Mechanism of PCBN Material by using FSP	International Journal of Advanced Science and Technology(IJAST)	ISSN:2005-4238 Vol.28, No.18,	338-348	2019
40	Dr.A.Raveendra, D.Nithis kumar	Exploration of indispensible properties of textile-grade glass fibers/white caustic treated banana fiber hybrid composite	ELSEVIER Material Today :Proceedings (**SCOPUS**)	Article in press		2020
41	Mr.K.Tarun kumar Dr.A.Raveendra	Study and Effectiveness and Reconfiguration of a Jar Tilting Mechanism of an RFC Machine	Journal of Engineering, computing and Architecture(jeca) UGC,approved	Vol:10, Issue 4,ISSN:1934-7197	159-173	2020

12. Detail of patent:

S.No	Patent Title	Name of Applicant(s)	Patent No.	Award Date	Agency/Country	Status
1	Apparatus to automatically draw two –dimensional drawing	Malla Reddy Engineering College.Department of Mechanical Engineering	Application no. 201841017390A ApplicationDate: 25/05/2018		India	published
2	An Extendable and height adjustable ceiling fan with eject abla blades.	Malla Reddy Engineering College.Department of Mechanical Engineering	Application no.202041003637A Dated27/01/2020		India	published

13. Books/Reports/Chapters/General articles etc.

S.No	Title	Author's Name	Publisher	Year of Publication
1.	An Overview of Additive manufacturing Technology	Dr. A. Raveendra Dr. N. Rishi Kanth Dr. G. Suryaprakash Rao Dr. L. Rasidhar	AkiNik Publications New Delhi	In progress
2.				

14. Any other Information (*maximum 500 words*)

a. Conferences Attended

Sl No	**Name of the Conference**	**Title of the paper**	**Organized by**	**Period**
1.	National seminar on applications of optimization in mechanical engineering	Taguchi technique as a tool to optimize the operating parameters of CNC drilling to minimize burr size	Gudlavalleru Engineering college Andhra Pradesh.	18-20 Jan 2008
2.	International conference on renewable energy and Environment for sustainable development	Transesterification process of Bio-Diesel	IIT-Delhi	11^{th}-13^{th} Dec 2008 Pp623-631
3.	NEC128-PA05MM-66NAC09	Development of mathematical models in gas metal arc welding	Dayanand sagar college of Engineering Bangalore	2009
4.	International conference on computational methods in Engg & Science-2009	Experimental investigations of Jatropa oil(preheated and blends) in a direct injection C.I Engine.	CBIT-Hyderabad	8^{th}-10^{th} Jan 2009
5.	National conference on excellence in new technologies in new mechanical Engineering(ENTIME)	Comparison of welding characteristics between TIG& MIG weldments	Malla Reddy Engineering College Secunderabad	12^{th} &13^{th} Dec 2009
6.	National conference on Aerospace Engineering (NCAE-2009)	Mechanical properties of gas metal arc weldments	Malla Reddy college of Engineering and Technology	Dec 04-05 2009
7.	ICSE 2010	Optimizing pulsed current TIG welding parameters to refine the fusion zone	Dayanand sagar Engineering college Bangalore	April 21-23 2010

8	International conference in Material processing& Characterization(ICMPC-2012)	Experimental Investigation on welding characteristics of aluminium alloy(6082) weldments using pulsed and non-pulsed current GTAW	Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad	8th-10th Mar2012
9	RITS- ICAEM-2012	Experimental Investigations on welding characteristics of stainless steel (304) weldments using pulsed and non-pulsed current GTAW.	Royal institute of Technology and management	28th and 29th Feb 2012
10	RCMS-2K13	Supersonic flow through conical nozzle with various angles of divergence	Malla Reddy Engineering College	Sept 20th &21st 2013
11	RCMS-2K13	Experimental investigations on welding characteristics of similar metal weldments and dissimilar metal weldments using arc welding	MallaReddy Engineering College	Sept 20th &21st 2013
12	RITS- ICAEM-2013	Characteristics of force feed on stability in various turning process	Royal college of management and sciences Hyderabad	Feb 28 &29 2013
13	RITS- ICAEM-2013	Comparative study on welding characteristics of EN8 &EN31 alloy steel weldments using Gas Tungsten Arc Welding	Royal college of management and sciences Hyderabad	Feb 27&28 2013
14	Emerging Trends in Science, Technology& Management (NCETSTM 2K14)	Numerical analysis of free convection with effect of surface radiation between parallel vertical heated plates with experiment data	Malla Reddy Engineering college Secunderabad	08-09 Aug 2014
15	International conference on Advanced Materials and Manufacturing Technologies(AMMT)	Micro-Hardness and Mechanical properties of 5052 aluminium alloy weldments using pulsed and non-pulsed gas tungsten arc weldments	JNTUH-Hyderabad	Dec18-20 2014
16	Inter National conference on Emerging Technologies in Mechanical Sciences(ICEMS-2014)	Microscopic study of EN24 alloy steel weldments using pulsed and non-pulsed current gas tungsten arc welding	Malla Reddy college of Engineering and Technology Secunderabad	Dec-26-27 2014
17	ICICASEMC-2016	Structural Design and FEM Analysis of Butterfly valve	Anveshana Educational and Research Foundation	18th June 2016

18	ICRCET 17	Effect of process Parameters on MRR and Surface Roughness in Turning process of EN8	Annamacharya Institute of Technology & Sciences,Ttrupathi.AP.	12th-13th Sept 2017

FDP/ Workshops Attended		
Sl.no	**Name of the work shop**	**Organization & Year**
1	**Refresher course** on Operational Research	Departments of Civil &Mechanical Engineering during 21st -22nd June 2007.
2	3 day **national seminar** on Applications of Optimization Techniques in Mechanical Engineering ,	Gudlavalleru Engineering college During 18-20 Jan 2008.
3	Two day **refresher course** in Internal Combustion Engines	Dept of Mechanical Engineering Malla Reddy Engineering on 18th &19th of June 2008.
4	**FDP** on Design Aspects of Mechanical &Aerospace Engineering	Departments of Mechanical &Aeronautical Engineering MRCET &CMEC from 2nd to 10th July 2009.
5	Two day **workshop** on Recent Developments in Mechanical Engineering	Dept of Mechanical Engineering. Malla Reddy Engineering college on12th &13th of March 2011
6	A Two day **national level work shop** under TEQIP-II on Recent Advances in CFD for industrial Applications.	Dept of Mechanical Engineering. Malla Reddy Engineering college on24th &25th of March 2012
7	One day **workshop** on Advanced trends in I.C engines and combustion	28th Feb 2013 organized by Dept of Mechanical Engineering. JNTUH college of Engineering
8	One day **workshop** on advances in welding and Surface Engineering(AWSE)	Indian Institute of Welding ,Hyderabad branch on 17th Oct17th October 2014.
9	5-day workshop(**FDP**) on principles of additive/ Generative Manufacturing	IIT-Hyderabad. Dec 1-4, 2014
10	Two-day **workshop** on Engineering Drawing	During 12th &13th Sept 2014, MallaReddy Engineering College
11	Two-day **FDP**on Finite Element Analysis	Mallareddy Engineering College during 20th and21st Feb 2015 by dept of Mechanical Enineering.
12	A **two day workshop** on Innovations in Waste Water and Energy Technologies	BITS Pilani, Hyderabad Campus during 13th &14th July 2015.
13	**One day workshop** on Outcome Based Education and Accreditation	JNT University,Hyderabad,Kukatpally on Sept 2015
14	One week **FDP** on Applications of CFD in Thermal-fluids Engineering	CMR Engineering College Kandlakola.Medchal,Hyderabad. During 29 Feb-06 Mar 2016
15	Six day **FDP** on Hyper-Works &Computational Fluid Dynamics	St.Martin's Engineering college,Dulapally,Secunderabad. 5th -10th Dec 2016

16	**FDP** on Engineering Mechanics made easy	Narasimha Reddy Engineering College during 28th June to 2nd July 2017.
17	**AICTE** sponcered two weeks **FDP** on Design for Manufacturing,Assembly,Environment for Product Innovation &Optimization	Dr.MAHALIMGAM college of Engineering and Technology-Pollachi.25th Nov 2019 to 7th Dec 2019.
18	**AICTE** sponcered one week Short Term Training Programme(STTP) on Innovations and Research Challenges in LoT Applications for Smart Manufacturing and Smart Design	Sri Ramakrishna Engineering – Vattamalaipalayam,N.G.G.O.Colony post.Coimbatore,Tamalnadu. From 09.12.2019 to 14.12.2019.
19	Five day **FDP(**online**)** on Emerging Technologies in Robotics	MallReddy Engineering College(Autonomous),Maisammaguda,Secunderabad.
20	Six day **FDP** (online) on Emerging areas in Manufacturing	Vimal jyothi Engineering College,Trivandrum,Kerala..
21	One week **FDP(**online**)** on Advanced NDT Techniques &Applications in Industry	Indian society for Non-Destructive Testing,Hyderabad Chapter in association with department of Mechanical Engineering,QISCET.Ongole from 25th to 29th May,2020.
22	One week **FDP** (online) on contemporary developments in manufacturing and industrial technologies	Dept of mechanical Engineering, Pragati Engineering College ,during 9th to 13th June, 2020
23	One week **FDP**(online) on multi objective optimization for mechanical applications	Dept of Mechanical Engineering QIS College of Engineering and Technology, Ongole,AP.During 8th to 12th June 2020.
24	One week **FDP**(online) on Disruptive Technologies in Mechanical Engineering	Dept of Mechanical Engineering Sreenidhi Institute of Science and Technology-Hyderabad during 8th to 13th June 2020.
25	Three day **FDP**(online) on "The Role of Artificial Intelligence and Machine Learning in Robotics and Automation"	During 1st-3rd June 2020 organized by Science and Technology Innovation Center, Anurag University, Hyderabad.
26	One Week **FDP** (Online) on **"**Advanced NDT Techniques & Applications in Industry	From 25th to 29th May,2020 organized **by** Indian Society for Non Destructive Testing, Hyderabad Chapter in association with Department of Mechanical Engineering, QISCET, Ongole.
27	8 weeks FDP(online) on Advanced Manufacturing Processes by IIT-Madras	From Sep-Nov 2020. Organized by IIT-M
28	AICTE approved Two weeks FDP (online) programme on Renewable Energy Intervention in industry, commercial and domestic application	From 14th Dec to26th Dec 2020 organized by Rajeev Gandhi memorial college of Engineering and Technology-Nndyal AP.

Certificate from the Investigator

Project Title: "Synthesis and characterization of nanosillimanite by high energy ball milling"

It is certified that

1. The same project proposal has not been submitted elsewhere for financial support.
2. We undertake that spare time on equipment procured in the project will be made available to other users.
3. We agree to submit a certificate from Institutional Bio safety Committee, if the project involves the utilization of genetically engineered organisms. We also declare that while conducting experiments, the Bio safety Guidelines of Department of Biotechnology, Department of Health Research, GOI would be followed in toto.
4. We agree to submit ethical clearance certificate from the concerned ethical committee, if the project involves field trails/experiments/exchange of specimens, human & animal materials etc.
5. The research work proposed in the scheme/project does not in any way duplicate the work already done or being carried out elsewhere on the subject.
6. We agree to abide by the terms and conditions of SERB grant.

Name and signature of Principal Investigator: Dr. Zaheer Ahamed T
Date: 06-03-2021
Place: Secunderabad

Name and signature of Co-PI (s) Dr. A Raveendra
Date: 06-03-2021
Place: Secunderabad

Endorsement from the Head of the Institution of PI

This is to certify that: Institute welcomes participation of Name: Dr. Zaheer Ahamed T Designation: Professor as the Principal Investigator and Dr. A Raveendra as the Co- Investigator/s for the project titled "Synthesis and characterization of nanosillimanite by high energy ball milling" and that in the unforeseen event of discontinuance by the Principal Investigator, the Co-Investigator will assume the responsibility of the fruitful completion of the project with the approval of SERB.

The PI, Dr. Zaheer Ahamed T, is a permanent or regular employee of this Institute and has 15.6 years of regular service left before superannuation

The project starts from the date on which the Institute receives the grant from SCIENCE & ENGINEERING RESEARCH BOARD (SERB), New Delhi.

The investigator will be governed by the rules and regulations of University/ Institute/Organization/College and will be under administrative control of the University/ Institute/Organization/College for the duration of the project.

The grant-in-aid by the SCIENCE & ENGINEERING RESEARCH BOARD (SERB), New Delhi will be used to meet the expenditure on the project and for the period for which the project has been sanctioned as mentioned in the sanction order.

No administrative or other liability will be attached to SCIENCE & ENGINEERING RESEARCH BOARD (SERB), New Delhi at the end of the project.

The University/Institute/Organization/College will provide basic infrastructure and other required facilities to the investigator for undertaking the research project.

The University/ Institute/Organization/College will take into its books all assets created in the above project and its disposal would be at the discretion of SCIENCE & ENGINEERING RESEARCH BOARD (SERB), New Delhi.

The University/ Institute/Organization/College assume to undertake the financial and other management responsibilities of the project.

Seal

Date: 6/3/21

Malla Reddy Engg. College (A) 500 100 Hyderabad

Signature

PRINCIPAL
Malla Reddy Engineering College
(Autonomous)
Maisammaguda, Dhulapally,
(Post Via Kompally), Sec'bad-500 100.

Endorsement from the Head of the Institution of Co-PI

This is to certify that: Institute welcomes participation of Name: Dr. Zaheer Ahamed T Designation Professor as the Principal Investigator and Dr. A Raveendra as the Co-Investigator for the project titled "Synthesis and characterization of nanosillimanite by high energy ball milling" and that in the unforeseen event of discontinuance by the Principal Investigator, the Co-Investigator will assume the responsibility of the fruitful completion of the project with the approval of SERB.

The Co-PI, Dr. A Raveendra is a permanent or regular employee of this Institute/University/Organization and has17 years of regular service left before superannuation

The Co-PI will be governed by the rules and regulations of University/ Institute/Organization/College and will be under administrative control of the University/ Institute/Organization/College for the duration of the project.

The grant-in-aid by the SCIENCE & ENGINEERING RESEARCH BOARD (SERB), New Delhi will be used to meet the expenditure on the project and for the period for which the project has been sanctioned as mentioned in the sanction order.

No administrative or other liability will be attached to SCIENCE & ENGINEERING RESEARCH BOARD (SERB), New Delhi at the end of the project.

The University/Institute/Organization/College will provide basic infrastructure and other required facilities to the investigator for undertaking the research project.

The University/ Institute/Organization/College will take into its books all assets created in the above project and its disposal would be at the discretion of SCIENCE & ENGINEERING RESEARCH BOARD (SERB), New Delhi.

The University/ Institute/Organization/College assume to undertake the financial and other management responsibilities of the project.

Seal

Date: 6/3/21

Malla Reddy Engg. College (A) 500 100 Hyderabad

Signature
PRINCIPAL
Malla Reddy Engineering College
(Autonomous)
Maisammaguda, Dhulapally,
(Post Via Kompally), Sec'bad-500 100.

Undertaking by the Principal Investigator

To

The Secretary
SERB, New Delhi

Sir

I **Dr. Zaheer Ahamed T** herby certify that the research proposal titled **Synthesis and Characterization of nanosillimanite by high energy ball milling** submitted for possible funding by SERB, New Delhi is my original idea and has not been copied/taken verbatim from anyone or from any other sources. I further certify that this proposal has been checked for plagiarism through a plagiarism detection tool i.e. **TURNITIN SOFTWARE** approved by the Institute and the contents are original and not copied/taken from any one or many other sources. I am aware of the UGC's Regulations on prevention of Plagiarism i.e. University Grant Commission (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulation, 2018. I also declare that there is no plagiarism charges established or pending against me in the last five years. If the funding agency notices any plagiarism or any other discrepancies in the above proposal of mine, I would abide by whatsoever action taken against me by SERB, as deemed necessary.

13/8/21

Signature of the PI with date
Name: **Dr. Zaheer Ahamed T**
Designation: **Professor**