MIRPUR UNIVERSITY OF SCINECE & TECHNOLOGY (MUST)

Mirpur Azad Jammu & Kashmir

INTERNAL RESEARCH FUNIDNG
OFFICES OF RESEARCH, INNOVATION AND COMMERCIALIZATION (ORIC)

COVER SHEET FOR PROPOSAL

A1. TITLE OF PROPOSED PROJECT:

B1. RESEARCH DOMAIN

☐ Product Development/ Improvement ☐ Process Development/ Improvement

B2. STATE FIELD OF RESEARCH AND SPECIALIZATION (For example; PREVIOUS EXPERIENCE WITH INDUSTRIAL RESEARCH)

Major: _____ Specialization: _____

C1. PROJECT DIGEST. Describe the proposed PROJECT (about 200 Words).

C2. Patent/ Intellectual Property Search:

1. What is status of your idea regarding similar patents?
2. Have you already filed a patent application?
3. If a patent already exists on your idea/concept, then what is your strategy and rationale in making the proposed research?

D. PRINCIPAL INVESTIGATOR

D1. PRINCIPAL INVESTIGATOR NAME (full with no initials)		D2. HIGHEST DEGREE	D3. POSITION
D4. DEPARTMENT	D5. UNIVERSITY/INSTITUTION Mirpur University of Science and Technology (MUST), Mirpur AJK	D6. MAILING ADDRESS	
D7. Telephone:(area code, number and extension)		Email:	

E: INDUSTRIAL PARTNER (from Collaborating Industry if any)

E1. Industrial PartnerNAME (full with no initials)	E2. HIGHEST DEGREE	E3. POSITION
E4. SECTION / UNIT	E5. FACTORY / INDUSTRY	E6. OFFICIAL MAILING ADDRESS

E7. Telephone:(area code, number and extension)	Fax: (Area code, number)	Email:

F1. PROPOSED DURATION OF PROJECT: (*inmonths*)	F2. PROPOSED STARTING DATE

F3. TOTAL FUNDS REQUESTED RS.	F3.A COMPONENT RS.	F3-B INUDSTRY COMPONENT RS.

SIGNATURE OF PRINCIPAL INVESTIGATOR	SIGNATURE OF PARTNER INDUSTRY
Date	Date

ENDORSEMENT OF THE HEAD OF INSTITUTION (Vice-chancellor/Rector of University, Director of Degree-awarding Institutions)	ENDORSEMENT OF THE HEAD OF INDUSTRIAL ORGANIZATION
Signature & Date	Signature & Date
Name: Title:	Name: Title:
Address: Mirpur University of Science and Technology (MUST)	Address:
Phone: FAX: E-mail:	Phone: E-mail:

PROJECT DETAILS

1. PROJECT SUMMARY

Describe the proposed prototype and any research required using (about 250) words. Attach sketch/diagrams/photo, if needed, to illustrate your concept.

2. PROPOSED GOALS/OBJECTIVES(please identify quantifiable goals)

Please clearly identify the output in the form of a **product or process, need or relationship to industry** and also identify other end-users of your output/product. **GOALS/OBJECTIVES**

3. INTRODUCTION(not to exceed one page)

The introduction should consist of three paragraphs; the first paragraph should indicate the scientific and/or commercial basis on which the project is based. The second paragraph should introduce the precise nature of the project, and the final paragraph should indicate the proposed objectives in the light of the first two paragraphs and explain clearly what the reader will see in the main body of the proposal.

4A. BACKGROUND AND METHODOLOGY OF THE PROPOSED RESEARCH(Not to exceed two pages)

A comprehensive and up to-date justification for the proposed program for technology development, industrial growth, national economyand contribution to society.

4B. RESEARCH PLAN: SCHEDULE/PHASING(Preferably with a time-chart not to exceed one page, follow the sample as given below)

This project is proposed for a period of 24 months starting from April 2017 and closing on March 2019.

Month	Study	Procurement	Development	Experiment	Report
April-2017					
May-2017					
June-2017					
July-2017					
August-2017					
September-2017					
October-2017					
November-2017					
December-2017					
January-2018					
February-2018					
Mach-2018					
April-2018					
May-2018					
June-2018					
July-2018					
August-2018					
September-2018					
October-2018					
November-2018					
December-2018					
January-2019					
February-2019					
Mach-2019					

4C. REFERENCES(cited in 3, 4A & 4B; not to exceed two pages, follow the reference style as given below)

[1] "Fan Industry of Pakistan" by Trade Development Authority of Pakistan, Government of Pakistan

[2] D G Dorrel, "A Review of the Design Issues and Techniques for Radial-Flux Brushless Surface and Internal Rare-Earth Permanent-Magnet Motors" IEEE TIE vol. 58 issue 9, 2011

[3] Chuang, Huang, and Li Daijin. "The performance analysis and optimal design of multi-blade centrifugal fan with fluent." *Information Science, Electronics and Electrical Engineering (ISEEE), 2014 International Conference on*. Vol. 2. IEEE, 2014.

[4] Y. Kumon "Development of Electric Fan Propeller Featuring Chestnut Tiger Butterfly Wing Characteristics." Journal of Aero Aqua Bio-mechanisms, vol 3, 2013.

[5] Adachi, Tsutomu, Naohiro Sugita, and Yousuke Yamada. "Study on the performance of a sirocco fan (optimum design of blade shape)." *International Journal of Rotating Machinery* 7.6 (2001): 405-414.

[6] Brundu, Francesco Gavino, et al. "IoT Software Infrastructure for Energy Management and Simulation in Smart Cities." *IEEE Transactions on Industrial Informatics* (2016).

[7] Nashimoto et.at. "Visualization of Aerodynamic Noise Source around a Rotating Fan Blade",Journal of visualization, vol. 11, 2008

5. IMPACT

Impact of proposed prototype/research on aspects such astransfers of research results into the economy in order to implement innovation, effects on import substitution and/or export enhancement, and on technology-oriented human-resource development.

6. Sustainable Development Goals (SDG's) (How and which of the SDG's will be addressed in this study? Justify how the proposed research will contribute to achieve SDG's of Pakistan. Follow the sample below related to fan industry project)

The proposed project is directly aligned with SDG-9 "Industry, Innovation & Infrastructure". As proposed through this project the product innovation will be brought in fan industry through introduction of a fully smart IoT based automated fan with better motor and the blade designs for energy efficiency and lower cost of production. This innovation will excel the technology induced fan production in the country thus making it more competitive and export oriented in international market. The project will build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation in Pakistani fan industry. Indirectly the proposed project touch upon key other SDGs mainly related to poverty alleviation, economic empowerment and better provision of business opportunities and social services. Following are some of the key highlights:

1. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
2. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
3. Ensure sustainable consumption and production patterns
4. Strengthen the means of implementation and revitalize the global partnership for sustainable development

7. PROJECT PARTNERS(information on collaborating Industry if any)

8. PROJECT Work plan(Attach the Work Plan for your proposed project, follow the sample below)

Please provide an overview of your work plan to include activities taking place.

The scheme of plan is elaborated through the following chain relationship:

The proposed project is academia-industry joint initiative which will be focused on product innovation and improvement leading to competitive electric fan production for international market. The project will work on three fronts: (i) conducting research on improved and efficient design options of electric fan (induction motor design, Internet of Things (IoT) based automation, optimized aero-dynamical design solution, solar panel based DC fan designs) (ii) developing a facility for industrial testing of various fan parameters; and (iii) fostering industry-academia collaboration mainly between PEFMA and the Department of Electrical (Power) Engineering of Mirpur University of Science and Technology (MUST), Mirpur AJK.

The scheme of implementation strategy of the proposed project is based on the following five key component which are elaborated below:

1. ***Study:*** The project will start with conducting research on improvement & innovation of fan design with modern technology based specification. The PI along with his team will conduct various reviews and studies in collaboration with HEC, MUST and PEFMA. PI will also consult international avenues for taking

guidance and support. As a result of the research on fan design and production, the researches will be able to bring out a smart electric fan design.

2. ***Procurement:*** During the first year of the project, after initial research, the project team will procure the required tools and equipment for product improvement and innovation for electric fan production. The key proposed tools & equipment include: (i) JMAG, (ii) IoT Module, (iii) Relays, (iv) Sensors, (v) 3d printer, (vi) 3d printer material. Along with this the material and equipment for establishing fan testing facility will also be procured.
3. ***Development:*** This is the important phase of the proposed project where actual and practical product innovation will be carried out. PI and his team will develop products according to the scheme of planned activities and interventions. As proposed the following key innovation aspects will bring about under the proposed project: (i) induction motor design, (ii) Internet of Things (IoT) based automation, (iii) optimized aero-dynamical design solution and (iv) solar panel based DC fan designs. The development and innovation of various aspects of fan production will be collaborated through PEFMA.
4. ***Experiment:*** Further to the development of design innovations in electric fan, the project team will do extensive experimentation in order to test and verify the product innovation outcomes. The experimentation will be largely conducted in collaboration with PEFMA member industries. By the closing of the experimentation all the proposed design innovation will be ready for adoption for the fan industry.
5. ***Report:***The reporting will remain an ongoing activity of the project and the PI and his team will develop and submit various periodic reports reflecting on key progress and achievement. As a final reporting deliverable the team will develop a final project report at the close of the project. This report document will cover all the details of the project right from the start to the end. This report will also document the details of products developed and innovation introduced. This report will also give a detailed account of key lessons learned and challenges faced. The same report will also comment on a way forward for further innovation and improvements in fan industry.

9. PROJECT OUTPUT

Please give a brief account of expected output (Follow the sample below)

The key expected output of this project is that we will be able to develop improved electric fan design with energy efficient features with reduced production cost. Following are the key expected outputs of this project:

1. Improved product innovation in fan industry of Pakistan for becoming more competitive in international market.
2. Improved fan motor design to enhance the efficiency of electric fan thus making the size compact and reduce the cost.
3. Increased inclusion of smart and Internet of Things (IoT) based automation, remote sensing and control in electric fan in order to make it suitable for digital economy of 21st century.
4. Better provision of an optimized aero-dynamical design solution for electric fan propeller.
5. Enhanced introduce and adoption of the solar panel based DC fan designs in order to utilize the indigenous abundant solar potential.
6. Enhanced availability of fan testing facilities for industrial testing of various fan parameters including efficiency, losses, air delivery, automation, energy consumption and energy star ratings.

10. FACILITIES AND FUNDING

10A. Facilities: equipment available for the research project IN THE HOST UNIVERSITY/INSTITUTION & THE COLLABORATING OGRANIZATION

10B. Scientific Personnel (at the PI institution)

a. Available

b. Required

*Involvement of research students is encouraged.

10C. Other funding available for the proposed studies (if any)

11A. PRINCIPAL INVESTIGATOR

A brief resume of research accomplished in the last 05 years. Please specify title of the research proposal(s), duration, funding source(s) and award amount(s).(Follow the sample below)

Dr. AnzarMahmood
Associate Professor
Department of Electrical (Power) Engineering MUST, Mirpur AJ&K.
Email Address:anzarmahmood@gmail.com, anzar.pe@must.edu.pk
Contact No.: +92-331-5079549

Qualification:

Year	Degree Program	Board/ University
2011-2016	PhD Electrical Engineering (Power)	CIIT Islamabad.
2005-2007	MS Nuclear Power	NED University Karachi.
1999-2005	B.E. Electrical Engineering	UCET, AJKU
1994- 1997	Pre- Engineering	BISE Mirpur, AJ&K.
1993-1994	Matric (Science)	BISE Mirpur, AJ&K.

Experience:

S.#	Date	Title	Institution
1.	6th May, 2016 to date	Associate Professor	MUST, Mirpur AJ&K.
2.	August 2013-May, 2016	Assistant Professor	CIIT Islamabad
3.	Nov, 2007 to July 2013	Senior Engineer	PAEC Islamabad
4.	Dec. 2005- Nov. 2007	Research Fellow	KANUPP KARCHI

Achievements:

- Pakistan Atomic Energy Commission MS Fellowship
- Merit Certificate Holder in M. Engg. (NED University Karachi)
- Top Position Holder in Power Plant Systems Training Course
- ISI Impact Factor of **43.7**

PUBLICATIONS:

Total Publications/Proceedings = 43; Total Impact Factor = 43.7
Total journal Publication = 19
Impact Factor Journal publication = 10
Conference Proceedings = 24
Submitted Impact Factor journal publications = 03
In progress journal publication = 05
NOTE: Details in attached CV

1.	Please attach C.V.	
2.	Number of Publications during the last five years & page numbers on the C.V. where these publications are listed	National: _____ Please see pages_____ of CV International: ___43____ Please see pages : ___2-5_____ of CV
3.	Number of research projects completed & page number where this information appears	Basic: _____ Please see pages _____ of CV Applied: _____ Please see pages_____ of CV

11B. CO-PRINCIPAL INVESTIGATOR

A brief resume highlighting achievement / experience, specially concerned with the present proposal(Follow the sample below)

Dr. SajjadManzoor
Department of Electrical (Power) Engineering MUST, Mirpur AJ&K.
Email Address:sajjadm266@hotmail.com&sajjad.pe@must.edu.pk
Contact No.: +92-317-5527331

Qualification:

Year	Degree Program	Board/ University
2012-2016	PhD Electronic Systems Engineering (Control)	Hanyang Uni. S. Korea
2008-2010	MS Electronics, Electrical, Control & Instrumentation Engineering (Control)	Hanyang Uni. S. Korea
2003-2007	B.Sc. Electrical Engineering	UET, Lahore
1999-2001	Pre- Engineering	BISE Mirpur, AJ&K.
1997-1999	Matric (Science)	FBISE, Islamabad

Experience:

S.#	Date	Title	Institution
1.	Oct, 2011 to date	Lecturer	MUST, Mirpur AJ&K.
2.	Feb, 2011-Oct, 2011	Lecturer	COMSAT, Abbotabad
3.	April, 2007-Aug, 2008	Assistant Engr. E&I	Pakarab Fertilizers Ltd., Multan

Achievements:

- HEC HERI-UESTPs/UETs Scholarship for PhD, from Sep, 2012-Aug, 2016.
- HEC Scholarship in MS (Engineering) in South Korean Universities, from Sep, 2008-Aug, 2010.
- 3rd position in pre-engineering among boys (BISE Mirpur, AJ&K)

Publications:

Journal Publications:

1. SajjadManzoor and Youngjin Choi, "A Unified Neural Oscillator Model for Various Rhythmic Locomotions of Snake-like Robot", Neurocomputing, vol. 173, Part 3, pp. 1112-1123, Jan., 2016.
2. SajjadManzoor and Youngjin Choi, "A Coordinated Navigation Strategy for Multi-Robots to Capture a Target Moving with Unknown Speed", Journal of Intelligent and Robotic Systems, revised and resubmitted, 2016. (Accepted)

Conference Publications:

1. Muhammad Bilal Khan, SajjadManzoor, and Youngjin Choi,, "Passageway Modeling between Neural Signal and Muscle Activation", International Conference on Control, Automation and Systems [ICCAS], pp. 1164-1166, Oct., 2010.
2. SajjadManzoor, Seonghan Lee and Youngjin Choi, "Synchronized Coordination for Omni-directional Mobile Robot with Hemi-circular Wheels using Neural Oscillator", International Conference on Control, Automation and Systems [ICCAS], pp. 1534-1536, 2013.
3. SajjadManzoor, Mi Jung Kim, and Youngjin Choi, "Robotic Leg-Lengthening Fixator using Hybrid Position/Force Control", IEEE International Conference on Cyber Technology in Automation, Control and Intelligent Systems [CYBER], pp. 579-584, June, 2014.
4. SajjadManzoor and Youngjin Choi, "Central Pattern Generator Based Locomotion in Inchworm Robot", The 11th International Conference on Ubiquitous Robots and Ambient Intelligence [URAI], pp. 419-422, Nov., 2014.
5. SajjadManzoor and Youngjin Choi, "Neural Oscillator-based Multi-Robot Coordination Algorithm to Catch-Observe-Protect a Target", IEEE International Conference on Mechatronics and Automation [ICMA], pp. 1418-1423, Aug., 2015. (Best Paper Finalist)
6. SajjadManzoor and Youngjin Choi, "Modular Design of Snake Robot for Serpentine and Rectilinear Motions", 13th International Conference on Ubiquitous Robots and Ambient Intelligence [URAI], 2016.

7. SajjadManzoor and Youngjin Choi, “Multi-Agent Coordination Using Limit Cycles in Dynamic Environment”, 2016 IEEE International Conference on Control Automation & Information Sciences [ICCAIS], pp. 156-161, Oct., 2016.
8. SajjadManzoor and Youngjin Choi, “Neural Oscillator-based Algorithm for Side-winding Motion Generation of Modular Snake Robot”, IEEE ICRA, submitted, 2017.

12. ESTIMATED BUDGET FOR THE PROPOSED RESEARCH PERIOD(Follow the sample below)

DESCRIPTION	YEAR 1		YEAR 2		Total Amount	
	ORIC	Industry	ORIC	Industry	ORIC	Industry
A						
B	57,410		57,410		114,820	
C	44,000				44,000	
Subtotal:					***158,820***	

Prototype Development Cost

B. Permanent Equipment (Please attach invoice/quotation and expected delivery date for items costing over Rs 0.1 Million)						
JMAG	1100,000				1100000	
IoT Module	45000		45000		90000	
Relays	20000				20000	
Sensors	35000		40000		75000	
3d printer	1600000				1600000	
3d printer material	200000		200000		4,00,000	
Fan testing System development	3070340		3070340		6140680	
Subtotal:					***9425680***	

13. JUSTIFICATION(Please justify your request in a background of the existing facilities available at the host Institute.

Signature Principal Applicant