# Curriculum Vitae
## Dr. RAJIV NANDAN RAI

Assistant Professor Grade-I (Ex- Wing Commander, IAF)
Subir Chowdhury School of Quality and Reliability
Indian Institute of Technology Kharagpur
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| 1. **Name in Full:** | Rajiv Nandan Rai | **Date of Birth:** | 27 December 1971 |
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## 2. Educational Qualifications:

| Degree / Examination | University / Institution | Year | Specialization | Division / Class | CGPA/% of Marks |
|---|---|---|---|---|---|
| Ph.D. | Indian Institute of Technology Delhi (IIT Delhi) | 2014 | Reliability Engineering | N/A | NA |
| M.Tech | Indian Institute of Technology Kharagpur (IIT Kharagpur) | 2010 | Reliability Engineering | N/A | 9.48/10 |
| B.Sc. Engineering | Bihar Institute of Technology Sindri (BIT Sindri) | 1993 | Mechanical Engineering | Distinction | 78/100 |
| AISSCE (CBSE) | DPS, R.K. Puram, New Delhi | 1989 | PCME | First | 88/100 |
| ISCE | St. Xavier's School, Sahibganj | 1987 | Science, Maths, English, Social Science, Hindi | First | 90.5/100 |

## 3. Work Experience (28 Years+)

| University / Organization | Designation | From | To | Total Period | Nature of Experience |
|---|---|---|---|---|---|
| Indian Institute Of Technology Kharagpur | Assistant Professor Grade-I | 05-04-2018 | Present | 5Y 23D | Academics & Research |
| Indian Institute Of Technology Kharagpur | Visiting Faculty | 15-05-2017 | 04-04-2018 | 10M 19 D | Academics & Research |
| Manav Rachna University, Faridabad | Professor And HOD(Dept. of Mech Engg) | 03-10-2016 | 30-04-2017 | 6M 29D | Academics & Research |
| Indian Air Force (IAF) | Engineering Officer, AE(M) | 29-11-1993 | 30-09-2016 | 22Y 10M | Industry |

## 4. Work Experience (Industrial)

Industrial Experience: 22 years 10 months (From 29-11-93 to 30-09-2016):

- Chief Project Engineer (CPE) at Central Servicing Development Organization (CSDO): Reliability Analysis of Aircraft Components and Aero Engines
- Chief Engineer (CE) at an MRO Facility: Repair, Overhaul and Indigenization
- Commanding Officer (CO): Aircraft Maintenance Certification Units.
- Senior Engineer (SE) at three frontline fighter flying bases: First and Second Line Maintenance
- Engineering Officer (EO) at frontline fighter flying bases: First and Second Line Maintenance

## 5. Important Certifications

- MiG-25 Aircraft Maintenance - Certified on First ("O" Level) and Second ("I" Level) lines Airframe and Aero Engine systems of MiG-25 Aircraft (November 1996 to Present)
- MiG-27 Aircraft Maintenance - Certified on First ("O" Level) and Second ("I" Level) and Fourth ("D" Level) Airframe and Aero Engine systems of MiG-27 Aircraft (June 2003 to Present)
- Quality Assurance services (QAS Aerospace) - This certification is for providing QAS for overhaul, manufacturing and Industrial Engineering Line of a Base Repair Depot. (October 2005 to Present)

- Lead Auditor IS/ISO 9001:2008 QMS - Certified by National Institute of Training for Standardization (Bureau of Indian Standards) on Quality Management Systems. (October 2011 to Present)

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**6. Teaching** (Subjects taught at IIT Kharagpur)

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|---|---|
| Reliability Analysis and Prediction | Reliability Simulation Lab |
| Repairable Systems Modelling and Analysis | Quality Engineering Lab |
| Quality Control and Analysis | Fault Diagnostics and Predictive Maintenance |
| Robust Design for Quality | NSO (H&F) |
| Introduction to Quality ( **114 UG students** registered in Spring 2023) | |

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**7. Summary of Research Activities**

- Publications: Published **33**, Under Review:**07**
- Guidance completed at Doctoral Level: **01**+**01** (Synopsis done on 06 April 23. Thesis to be submitted before 06 May 23) +**07** (In progress)
- Guidance completed at Masters Level :**20+03** ongoing
- Sponsored Research and Consultancy Projects: Completed -**10 (05 in IIT KGP+05 in IAF)**, In-Progress:**01 (at IIT KGP)**, Approved, Work to be initiated:**02**, Under Approval-**01**, Submitted Proposals (Indian air Force**,** DRDL Hyderabad, Indian Navy, DEBEL Bengaluru, Indian Railways, ADRDE Agra)**.**
- Session Chair in International Conference **(01)**, Organized National Conference **(01)**, Workshops (**03**), STC-**02**+**02**(under Approval), Webinar-**(01)** and delivered **(29)** Invited lectures for DRDO Labs, ISRO, HAL, DGQA, TVS, NSTL, L&T, Adani and in several STCs organized by SCSQR, IIT Kharagpur.
- MOU with Defence Institute of Quality Assurance (DIQA), Ministry of Defence for Research & Consultancy Projects, STCs, Executive M Tech etc.
- Empaneled as Eminent Academician by DMDE Hyderabad for design and development of Underwater Vehicles for Electrical and Mechanical Systems.
- Some of my research work got implemented in Indian Air Force.

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| **8. Publications (**Details attached as **Annexure "A")** | **Number completed** | **Number under review** |
|---|:---:|:---:|
| Publication in International refereed Journals | 22 | 06 |
| Publications in proceedings of International Conferences (Listed in Best Conferences at IIT Kharagpur) | 07 | 00 |
| Book | 01 | 01 |
| Book Chapters | 03 | 00 |
| Total | **33** | **07** |

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| **9. Research Guidance** | **Number completed** | **Number in Progress** |
|---|:---:|:---:|
| Guidance at Doctoral level | **01+01** (Synopsis done on 06 April 23. Thesis to be submitted before 06 May 23) | 07 |
| Guidance at Masters level | **20** | 03 |

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**10. Sponsored Research and Consultancy Undertaken**

- **Summary of Sponsored Research and Consultancy Projects:** Completed -**10 (05 in IIT KGP+05 in IAF)**, In-Progress:**01 (at IIT KGP)**, Approved, Work to be initiated:**02**, Under Approval-**01.**

1) Research Project (PI). "Reliability Analysis of automobile Gear Box with the help of Online Condition Monitoring Techniques" ISIRD (HOM), **INR 31 Lakhs,** (01-03-2019 to 28-08-2023). **In progress**.
2) Consultancy Project (PI). "Development of Maintenance Philosophy for Kaveri Dry Engine", GTRE Bengaluru, **INR 38,00,000** (24 months)**. Approved**. **Work to be initiated**
3) Consultancy Project (Co-PI). "FMEA/FMECA and Reliability Prediction/Estimation of Assault Rifle – Ghaatak" Rifle Factory Ishapore (FREA), **INR 25 lakhs**, (16-10-2019 to 16-08-2020). **Completed.**
4) Consultancy Project (Co-PI). "Reliability Growth Study of ASTRA Missile" (STRA), DRDL Hyderabad, **INR 7,74,700,** (01-11-2019 to 31-12-2019). **Completed**.
5) Consultancy Project (Co-PI). "Reliability Study of Rustam-II" (RSRI), ADE Bangalore, **INR 9,88,250**, (13-11-2020 to 12-05-2021). **Completed**.

6) Consultancy Project (Co-PI). "Data Collection Framework, FMEA\FMECA and Reliability Estimation of CET 65 E" (RS65), Indian Navy, **INR 8 Lakhs**, (15-09-2020 to 15-12-2021). **Completed.**
7) Consultancy Project (Co-PI). "FMEA\FMECA of RM-III Flight Vehicle)" (RMFV), RCI Hyderabad, **INR 19,71,200,** (25-06-2021 to 24-04-2022)**. Completed.**
8) Consultancy Project (Co-PI). "QRAMS Modelling and Analysis for Futuristic UAV Systems", ADE Bengaluru, **INR 50,00,000** (Oct 22-Oct 24). **Approved, Work to be initiated.**
9) Consultancy Project (Co-PI). "Reliability Study of Zirconia Amperometric Oxygen Sensor (ZAOS)", DEBEL Bengaluru, **INR 17,00,000** (12 months). **Under Approval**
10) **Proposals Submitted**: **(**DEBEL Bengaluru, Indian Railways.)**. (3 crores)**

- **Sponsored Projects Summary at IIT Kharagpur (Total Value)**

➢ Total Value Completed Projects:  **INR 71 lakhs**
➢ Total Value Projects (In- Progress): **INR 31 Lakhs**
➢ Total Value Projects (Approved. Work to be initiated): **INR 88 Lakhs**
➢ Total Value Projects (Under Approval): **INR 17 Lakhs**
➢ Proposals Submitted: **(INR 3 Crores)**

- **Research Projects (PI) undertaken at IAF (Less than INR 10 Lakhs) (2010-2013)**

1) Developed a framework for an integrated approach to the entire procurement process.
2) Developed a methodology for determining a threshold for rendering aircraft and aero engine components as "High failure rate components" (HFRC).
3) Designed and developed a model for reviewing "Time between overhauls" (TBOs) of "High failure rate components" of various aircraft and aero engines to improve their Availability.
4) Designed and Developed Repair Effectiveness based modified FMEA model for MRO facilities to undertake analysis of high failure rate components of aircraft, aero engines and associated components.
5) Developed a framework for repair schedule to reduce cycle time/ increase throughput of the overhaul line of a Repair and Overhaul (RAOH) depot.

## 11. Outreach

- **Conference/Workshop organized:**  *National Conference* on Emanations of Sustainable Technologies in Engineering, Science and Management and Education (ESTESME 2017) (Participants 150).
- *Workshop*: Reliability, Present and Future Trends in Indian Air Force, 2012 (Participants 100).
- *Workshop: Techno-M-53,* Repair and Reclamation of Mirage Engine Parts 2007 (Participants 150).
- *Workshop: EmTech 07,* Repair and Reclamation of Aero Engine Parts 2007 (Participants 200).
- *Session Chair :*9 th International Conference on applied Human Factors and Ergonomics (AHFE-2018) held at Orlando Florida USA, 22-26 July 2018.
- *Webinar:* Coordinated Fortnightly Distinguished speaker series on QRAMS at SCSQR, IIT Kharagpur.
- **Short term courses:**  One Month STC on Computer-Aided three-dimensional interactive Application CATIA, 2017, (Participants 50), **02 weeks** Online STC for Defence Institute of Quality Assurance (DIQA) twice a year (01May-13 May 23), Next (Sep-Oct 23), **04 Weeks** QRAMS Course for Indian Air Force (Under Approval), **03 Days** STC for VARROC, Pune (Under Approval)
- **Invited Lectures/Lecture Delivered (in STCs): 29** Invited lectures for DRDO Labs, ISRO, HAL, DGQA, L&T, Adani and in several STCs organized by SCSQR, IT Kharagpur (Details attached as **"Annexure B"**).
- MOU with Defence Institute of Quality Assurance (DIQA), Ministry of Defence for Research & Consultancy Projects, STCs, Executive M Tech etc. Letter of Intent awaited.
- Empaneled as Eminent Academician by DMDE Hyderabad for design and development of Underwater Vehicles for Electrical and Mechanical Systems.

## 12. Development Work

1) Quality lab has been set up and operational   at Subir Chowdhury School of Quality and Reliability. The lab is being utilized for undertaking a two credit course for the subject of RE69007 "Quality Engineering laboratory" for M Tech students.
2) As a part of ISIRD sponsored project an "On condition Monitoring Laboratory" for an automobile gear box has been set up for undertaking research work on "On condition Monitoring" of multi stage gearbox.
3) Proposed a 04 Credit Elective Course titled "Repairable Systems Modelling and Analysis" for Spring (2021-2022). The course is presently running.
4) Prepared a New M Tech Programme for M Tech in Quality Engineering.
5) Proposed a new quality simulation lab as a part of proposed New M Tech Programme for M Tech in Quality Engineering.

## 13. Professional Activities

- Member-IEEE
- Co-ordinated Fortnightly Distinguished speaker series on QRAMS.
- Undertook Selection of Defence sponsored candidates as IIT Kharagpur representative at DRDO New Delhi in the month of April 2018 ,2019 and July 2021.
- Reviewer: International J of Reliability Engg and System Safety, International Journal of Quality and Reliability Management, International Journal of Performability Engineering, Quality and Reliability Engineering International, International Journal of Expert System with Applications, Defense Science Journal, SRESA Journal of Life Cycle Reliability and Safety Engineering, MDPI Journals, ICPSE-2022.Reviewed 50+ Journal papers till date including review of 10+ Journal papers in year 2022-23.
- Reviewer of Research Projects of ai4icps, IIT Kharagpur.

## 14. Students' Projects and Innovations

- As a part of development of entrepreneurship skills of the students, **12 Start-ups** have been designed with the help of Quality Function Deployment tool under my guidance. Any student passing out of this school can initiate their own Start-up based on the development of 12 Start-ups at this school.
- Two BTP Projects undertaken for UG Mechanical Engineering Students in 2023.

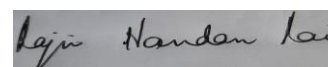## 15. Contribution to Non-Teaching Work

- **SCSQR:** Faculty Advisor, TnP in charge, Institute Representative for GATE Examination, Laboratory In-Charge, Quality Engineering Laboratory (QENL), Seminar-In-Charge. Member, Department Academic (UG, PG&R), Administrative, Purchase and Faculty Recruitment Committees,
- **Institute Level:** Program Officer Unit-I, NSO (H&F)

## 16. Academic or Professional Awards (Honours)

1) Outstanding Reviewer awarded by International Journal of Reliability Engineering and System Safety (RESS) and Quality, Reliability Engineering International (QREI) in 2018 and 2019 respectively.
2) Commendation by AOC IN C conferred by Air Officer Commanding- in- Chief, Head Quarters Maintenance Command, Nagpur, Indian Air Force in 2009.
3) Air Officer Maintenance (AOM) Gold Medal conferred by Air Officer Maintenance, (AOM), Air Head Quarters, New Delhi, Indian Air Force in 2005.

## 17. Visit Abroad

- Visited Orlando, Florida, Unites States of America from 22-07-2018 to 26-07-2018. The purpose was to present and Co-Chair in the "9th International Conference on Applied Human factors and Ergonomics (AHFE- 2018).

**Date:** 23 April 2023                                                                                    **Signature**

**Annexure "A"**

**Publications' List**

PUBLISHED**: 33**
UNDER REVIEW**: 8**

**Book (01)**

1. **Rajiv Nandan Rai**, Sanjay Kumar Chaturvedi, Nomesh Bolia. Repairable Systems Reliability Analysis: A Comprehensive Framework. *John Wiley & Sons,* USA,**2020.**

**Book Chapters (03)**

1. G. Sharma and **R. N. Rai**. Modified Failure Modes and Effects Analysis Model for Critical and Complex Repairable Systems. *Safety and Reliability Modeling and its Applications (Elsevier)*. First Edition. ISBN: 9780128233238. Chapter 9. Pages (245-260) **2021.**
2. G. Sharma and **R. N. Rai**. Methodology to Select Human Reliability Analysis Technique for Repairable Systems. *Safety and Reliability Modeling and its Applications (Elsevier).* First Edition. ISBN: 9780128233238. Chapter 10. Pages (261-280) **2021.**
3. Goswami, P., Sahu, P. K., and **Rai, R. N**. "An Optimum Segmentation of Gear Vibration Signals for an

Effective Fault Classification Using Time-Domain Feature and Multi-class Support Vector Machines," in ***Intelligent Systems, Springer Nature***. Chapter 29, **2022**. DOI: 10.1007/978-981-19-0901-6.

## International Journals (22)

1. Saed Enam Mustafa, **Rajiv Nandan Rai** and Raashid Firoz. Enhancement of joint properties and reduction of intermetallics in FSW of highly dissimilar Al/Ti alloys. ***Welding in the World*. (*Springer, SCIE, Scopus, Impact Factor:2.137)***. Pages: 1-18,**2023**. https://doi.org/10.1007/s40194-023-01493-8.

2. Priyom Goswami and **Rajiv Nandan Rai**. A systematic review on failure modes and proposed methodology to artificially seed faults for promoting PHM studies in laboratory environment for an industrial gearbox. ***Engineering Failure Analysis*. (*Elsevier, SCIE, Scopus, Impact Factor: 3.634)***.Vol 146, 107076, **2023**. https://doi.org/10.1016/j.engfailanal.2023.107076.

3. Anwesa Kar, Garima Sharma and **Rajiv Nandan Rai.** A Fuzzy Bayesian Network based Approach for Modeling and Analyzing Factors Causing Process Variability*. **International Journal of Quality & Reliability Management,** Vol. 40, No.3, Pages 820-844,**2023 DOI 10.1108/IJQRM-08-2021-0281.**

4. Prashant Kumar Sahu and **Rajiv Nandan Rai**. Fault Diagnosis of Rolling Bearing Based on an Improved Denoising Technique Using Complete Ensemble Empirical Mode Decomposition and Adaptive Thresholding Method. ***Journal of Vibration Engineering & Technologies* (*Springer, SCIE, Scopus, Impact Factor:2.333)***. Vol 11, Pages: 513-535. **2023**. **DOI:10.1007/s42417-022-00591-z.**

5. Prashant Kumar Sahu, **Rajiv Nandan Rai**, T.CH. Anil Kumar. Grease Contamination Detection in the Rolling Element Bearing Using Deep Learning Technique. ***International Journal of Mechanical Engineering and Robotics Research,*** Vol. 11, No. 4, **2022**. **DOI**: **10.18178/ijmerr.11.4.275-280**.

6. G. Sharma, Prashant Kumar Sahu and **R. N. Rai**. Imperfect Maintenance and Proportional Hazard Models: A Literature Survey from 1965 to 2020. ***Life Cycle Reliability and Safety Engineering (Springer),*** Vol 11, pages 87–103, **2022**. **DOI**:**10.1007/s41872-021-00181-0.**

7. G. Sharma and **R. N. Rai**. Progressive Maintenance Policy for Multiple Repairable systems with Imperfect Maintenance, ***Journal of Quality in Maintenance Engineering.*** Vol 28, No. 3, Pages- 668-685, **2021**. **DOI:**10.1108/JQME-08-2019-0075**.**

8. G. Sharma and **R. N. Rai**. Failure Modes based Censored Data Analysis for Repairable Systems and its Industrial Perspective. ***Computer and Industrial Engineering***. ***(Elsevier, SCI, Scopus, Impact Factor: 7.18).*** Vol*. 158, 107439, **2021**. **DOI**: 10.1016/j.cie.2021.107439.

9. G. Sharma and **R. N. Rai**. Reliability Parameters Estimation of Repairable Systems with Imperfect Maintenance, Repair and Overhaul. ***International Journal of Quality & Reliability Management ,***Vol. 38 (4),892-907, **2021**. **DOI**:10.1108/IJQRM-05-2019-0139.

10. G. Sharma and **R. N. Rai**. Age Based Overhaul Policy for Multiple Repairable Systems with Imperfect Maintenance: Case Study of Aero Engines. ***International Journal of Mathematical, Engineering and Management Sciences***. Vol. 6 (1), 193-206, **2021**. DOI: 10.33889/IJMEMS.2021.6.1.012.

11. G. Sharma and **R. N. Rai**. Risk Based Threshold on Intensity Function of Repairable Systems: A Case Study on Aero Engines. ***International Journal of Reliability, Quality and Safety Engineering (World Scientific, ESCI, Scopus).*** Vol. 28, (3), 2150020 (17 pages),**2021**. DOI:10.1142/S0218539321500200.

12. M. K. Loganathan., B. Mishra, C. M. Tan., T. Kongsvik and **R.N. Rai**. Multi-Criteria Decision Making (MCDM) for the selection of Li-Ion batteries used in Electric Vehicles (EVs). ***Materials T o d a y : Proceedings.*** Vol41(5), 1073-1077, **2021**. **DOI**:10.1016/j.matpr.2020.07.179.

13. G. Sharma a n d **R. N. Rai**. Modeling and Analysis of Factors Affecting Repair Effectiveness of Repairable Systems using Bayesian Network, ***Applied Soft Computing (Elsevier, SCIE, Scopus, Impact Factor:8.263).*** Vol. 92, 106261, **2020**. **DOI**: 10.1016/j.asoc.2020.106261.

14. G. Sharma and **R. N. Rai**. Reliability Modelling and Analysis of Environmental Control and Life Support Systems of Space Stations: A Literature Survey. ***Acta Astronautica (Elsevier, S C I E , S c o p u s , I m p a c t F a c t o r :2.954).*** Vol. 155, 238-246, 2 0 1 9 . **DOI**: 10.1016/j.actaastro.2018.12.010.

15. **Rajiv. N. Rai** and G. Sharma. GOF Test for Generalized Renewal Process. ***International Journal of Reliability and Safety.*** Vol.11(1-2), 116–131,**2017**. DOI: 10.1504/IJRS.2017.088552.

16. **Rajiv. N. Rai** and N. Bolia. Throughput analysis of the Overhaul Line of a Repair Depot. ***International Journal of Services and Operations Management***. *Vol* 25(4),459-478, **2016**. **DOI**:10.1504/IJSOM.2016.080276.

17. **Rajiv. N. Rai** and Nomesh Bolia. Modified FMEA model with Repair Effectiveness Factor using Generalized Renewal Process. ***Life Cycle Reliability and Safety Engineering*.** Vol 4(3),36-46, **2015**.

18. **Rajiv. N. Rai** and Nomesh Bolia. Availability based Optimal Maintenance Policies for Repairable Systems in Military Aviation by identification of Dominant Failure Modes. ***I Mech E Part O: Journal of Risk and Reliability (Sage, SCIE, SCI, Scopus, Impact Factor:1.891)***. Vol 228(1), 52-61, **2014**. **DOI**:10.1177/1748006X13495777.

19. **Rajiv. N. Rai** and Nomesh Bolia. Optimal Decision Support for Air Power Potential. ***IEEE Transactions on Engineering Management (IEEE, Impact Factor:8.702).*** Vol 61(2), 310-322, **2014**. **DOI:** 10.1109/TEM.2013.2293420.

20. **Rajiv Nandan Rai** and Nomesh Bolia. Availability based Methodologies for Optimal Maintenance Policies in Military Aviation. ***International Journal of Performability Engineering*** Vol 10(6),641-648, **2014. DOI**: 10.23940/ijpe.14.6.p641.mag.

21. Monika Tanwar, **Rajiv. N. Rai**, and Nomesh Bolia. Imperfect Repair Modeling Using Kijima Type Generalized Renewal Process. ***Reliability Engineering and System Safety (Elsevier, SCI, Scopus, Impact Factor:6.188)*** Vol 124,24-31, **2014**. **DOI**: 10.1016/j.ress.2013.10.007.
22. Nomesh Bolia and **R. N. Rai**. Reliability based Methodologies for Optimal Maintenance Policies in Military Aviation. ***International Journal of Performability Engineering***. *Vol* 9(3), 296-303, **2013**. **DOI**: 10.23940/ijpe.13.3.p295.mag

## International Conferences (07)

1. Prashant Kumar Sahu and Rajiv Nandan Rai "Effect of Time-Frequency Representations for Fault Classification of Rolling Bearing in Noisy Conditions Using Deep Learning". XXV International Conference on Digital Signal Processing and Its Applications (DSPA). **(Publisher: IEEE)**, Moscow, Russia, 29-31 Mar **2023**.
2. Saed Enam Mustafa and Rajiv Nandan Rai, "Optimization of Process Parameters and Variability Study in Friction Stir Welding of 6061-T6 Aluminum Alloy and Ti64 Alloy with Interlayer, "International Manufacturing Science and Engineering Conference **(MSEC-2023),** New Brunswick, New Jersey, USA, 12-16 June 2023.
3. Prashant Kumar Sahu and Rajiv Nandan Rai, "Degradation Monitoring and RUL Prediction of Rolling Element Bearing Using Proposed C-MMPE Feature". 11th International Conference on Power Science and Engineering **(ICPSE), 2022**, Eskisehir, Turkey, 23-25 Sep 2022, pp. 54-60. **(Publisher: IEEE)** DOI: 10.1109/ICPSE56329.2022.9935431.
4. G. Sharma and **R. N. Rai**. Modified Repair Quality Index for Complex Repairable Systems, "Proceedings of the 30th European Safety and Reliability Conference and the 15th Probabilistic Safety Assessment and Management Conference (***ESREL2020- PSAM15)***", **2020**. ISBN/DOI*:* 978-981-14-8593-0.
5. G. Sharma and **R. N. Rai**. A Modified FMEA Model with Repair Effectiveness Index (REI) using Fuzzy AHP for Life Support Systems of Space Stations. 9 th International Conference on applied Human Factors and Ergonomics *(AHFE-2018)* held at **Orlando Florida USA, 22-26 July 2018**. DOI: 10.1007/978-3-319-94391-6_8.
6. **R. N. Rai** and G. Sharma. Human Reliability Analysis Technique Selection for Life Support Systems Maintenance of Orbital Space Stations using Fuzzy AHP and ANN. 9 th International Conference on applied Human Factors and Ergonomics *(AHFE-2018)* held at **Orlando Florida USA, 22-26 July 2018**. DOI: 10.1007/978-3-319-94391-6_13.
7. M.K.Loganathan, C.M.Tan, S, Sultana, I.L.Hsieh, L. A. Kumaraswamidhas and **R.N.Rai**. Parametric performance analysis of battery operated electric vehicle. International Conference on Sustainable Energy and Future Electric Transportation, SeFet, Hyderabad, India, 21-23 June 2021.DOI: 10.1109/SeFet48154.2021.9375788.

## Under Review (Book) (01)

1. Garima Sharma and **Rajiv Nandan Rai**. "Advanced Techniques for Maintenance Modelling and Reliability Analysis of Repairable Systems". ***John Wiley & Sons, 2023.***

## Under Review (In International Journals) (06)

1. Anwesa Kar, **Rajiv Nandan Rai**, Process Failure Mode and Effects Analysis (PFMEA) with Fuzzy ANP-MARCOS - based Approach for Manufacturing Process Quality Assessment, Arabian Journal for Science and Engineering.
2. Anwesa Kar, **Rajiv Nandan Rai**, A QFD-based Hybrid Neutrosophic DEMATEL-ANP-COPRAS Approach for Process Quality Evaluation, Journal of Engineering Design (Under review).
3. Prashant Kumar Sahu and **Rajiv Nandan Rai**, "LSTM-Based Deep Learning Approach for Remaining Useful Life Prediction of Rolling Bearing Using Proposed C-MMPE Feature". Engineering Applications of Artificial Intelligence. (Elsevier, SCI, Scopus, IF: 7.802) (Under Review).
4. Prashant Kumar Sahu and **Rajiv Nandan Rai**. "Effective Fault Classification of Rolling Bearings in Noisy Conditions Using Deep Learning Algorithm combined with CEEMD and VMD Method". Journal of Sound and vibration. (Elsevier, SCIE, Scopus, IF: 4.761.)
5. Neha Patel, Prashant Kumar Sahu and **Rajiv Nandan Rai** "Effective RUL Prediction of the Milling Tool based on Shannon Entropy Feature Selection Method and Squared Exponential-Gaussian Process Regression Model". Journal of Computers & Industrial engineering. (Elsevier, SCI, Scopus, Impact Factor:7.18)
6. Priyom Goswami and **Rajiv Nandan Rai. "**A Novel Methodology for Chipped Tooth and Worn Tooth Gear Fault Detection Using Minimum Entropy Deconvolution and CEEMDAN". Journal of Vibration and Control. Under Review.

**Annexure "B"**

**Invited Lectures**

1. Failure Data Analysis at SCSQR, IIT Kharagpur, India (July 2017), Type: Invited Lecture, Event Name: STC, RAMS for Railway Systems.
2. Repairable Systems Reliability Analysis at SCSQR, IIT Kharagpur, India (July 2017), Type: Invited Lecture, Event Name: STC, RAMS for Railway Systems.
3. Failure Analysis at CQA Pune, India (2017)
4. Root Cause Failure Analysis at CQA Pune, India (2017)
5. Failure Modes and Effects Analysis at CQA Pune, India (2017)
6. Repairable Systems Reliability Analysis at L&T Metro Rail Limited Hyderabad, India (04-06-2018 to 08-06-2018), Event Name: STC, RAMS for Railway Systems.
7. Failure Modes and Effects Analysis for Maintained Systems at IIT Kharagpur, India (09-07-2018 to 13-07-2018)
8. Random Variables and Reliability Distributions at TVS Hossur, Bangalore, India (17-09-2018 to 20-09-2018)
9. Reliability Prediction and Analysis of Aero Engines at HAL Koraput, Orissa, India (01-12-2018 to 01-12-2018)
10. Burn-In Testing at TVS Hossur, Bangalore, India (24- 02-2019 to 28-02-2019)
11. Repairable Systems Reliability Analysis at TVS Hossur, Bangalore, India (24- 02-2019 to 28-02-2019)
12. FMEA of Maintained Systems at TVS Hossur, Bangalore, India (24- 02-2019 to 28-02-2019)
13. Ensuring Quality and Reliability through Advanced Tools and Techniques at NSTL DRDO, Visakhapatnam, India (14-11-2019 to 14-11-2019), Type: Invited Lecture, Event Name: World Quality Day 2019.
14. Repairable Systems Reliability Analysis at SCSQR, IIT Kharagpur, India (09-07-2019 to 09-07-2019), Type: Invited Lecture, Event Name: STC, RAMS for Railway Systems
15. Ensuring Quality and Reliability through Advanced Tools and Techniques. "Implementing Six Sigma & Reliability– Best practices and Challenges" for the Online Technology Development Programme on Reliability, Availability, Maintainability and Safety (RAMS) from August 22nd-23rd, 2020 at VIT Chennai.
16. Failure Data Analysis at SCSQR, IIT Kharagpur, India (15 Dec 2020), Type: Invited Lecture, Event Name: STC, RAMS for Railway Systems.
17. Repairable Systems Reliability Analysis at SCSQR, IIT Kharagpur, India (16 Dec 2020), Type: Invited Lecture, Event Name: STC, RAMS for Railway Systems.
18. Failure Modes Effects and Criticality Analysis (FMECA) at SCSQR, IIT Kharagpur, India (08 March 2021). Event Name: STC, Whirlpool.
19. Failure Reporting, Analysis, and Corrective Action System (FRACAS) at SCSQR, IIT Kharagpur, India (09 March 2021). Event Name: STC, Whirlpool.
20. Repairable System Analysis at SCSQR, IIT Kharagpur, India (19 April 2021). Event Name: STC, Whirlpool.
21. Warranty Data Analysis at SCSQR, IIT Kharagpur, India (19 April 2021). Event Name: STC, Whirlpool.
22. 22.Introduction to Quality and Quality Tools at SCSQR, IIT Kharagpur, India (17 May 2021). Event Name: STC, Whirlpool.
23. Design of Experiments-I (ANOVA) at SCSQR, IIT Kharagpur, India (18 May 2021). Event Name: STC, Whirlpool.
24. Design of Experiments-II (Robust Design: Taguchi Methods) at (18 May 2021). Event Name: STC, Whirlpool.
25. Reliability Assessment Framework for Defence Systems at DRDO Hyderabad, India (08 October 2021). Event Name: DRDO Workshop on "Role of Quality & Testing in Missile Industry".
26. "Reliability Assessment Framework for Defence / Aerospace Systems at Liquid Propulsion Systems Centre (LPSC), ISRO, Thiruvananthapuram, India (18 Nov 2021). Event Name: Quality Day 2021.
27. Optimal Decision Support for Air Power Potential at IIT Delhi, India (20 Dec 2021). Event Name: Public Systems Planning and Optimization Symposium (PSPO).
28. Reliability Centered Maintenance for Adani Group at IIT Kharagpur on 12 September 2022.
29. Repairable Systems Modelling and Analysis: Aero Engines: A case study at GTRE Bengaluru on 02 Dec 2022. Event Name: Maintainability Workshop at GTRE.