Online PG Certificate Course in Quality and Reliability Engineering for DGQA (MoD) Officers by the Subir Chowdhury School of Quality and Reliability

1. Introduction

The proposal is focused on imparting education in the area of QRAMS (Quality, Reliability, Availability, Maintenance, and Safety) to Directorate General of Quality Assurance (DGQA) Engineers for ensuring that the products and processes meet high-quality standards and demonstrate sustainable performance over time.

- *Importance in Various Industries*: QRAMS plays a critical role in the products/processes/services across various industries, including manufacturing, healthcare, Defence, automotive, aerospace, electronics, and more.
- *Objective of the PG Certificate Course:* The executive PG Certificate program in Quality and Reliability Engineering aims to equip DGQA professionals with advanced knowledge and skills essential for ensuring product quality and reliability, optimizing design, processes, and services to improve safety and minimize associated risks.

2. About DGQA

The Directorate General of Quality Assurance (DGQA) is a critical entity in ensuring the quality of defense equipment in India. Established under the Ministry of Defence, DGQA plays a vital role in maintaining the reliability of stores, weapons, and equipment for the armed forces. The Defense Institute of Quality Assurance (DIQA), located in Bangalore, is integral to DGQA's training efforts. DIQA employs a comprehensive training methodology, including interactive lectures, case studies, workshops, and industrial visits, to enhance the skills and knowledge of officers in quality assurance.

DIQA continually adapts its training methods, incorporating online platforms and hybrid modes to cater to diverse learning styles and geographically dispersed participants. The institute collaborates with experts from academia, industries, and government departments to provide a holistic learning experience. Additionally, DIQA actively seeks feedback from participants for continuous improvement.

This document proposes a collaboration between DGQA and IIT Kharagpur for a PG Certificate course for executives. This program aims to upskill DGQA officers, leading to improved job performance, career advancement, increased credibility, and a significant contribution to national security. The PG Certificate course is viewed as a game-changing opportunity for DGQA to empower its officers with advanced technology, knowledge, and skills, ultimately enhancing the efficiency and effectiveness of the organization.

3. Program Overview

The PG Certificate Course in Quality and Reliability Engineering program at IIT Kharagpur is designed to enhance the skillset in QRAMS of in-service DGQA engineers aiming to excel in the domain of QRAMS.

- *Comprehensive Curriculum:* The program offers a comprehensive curriculum encompassing both theoretical and practical facets of QRAMS engineering.
- *Building a Strong Foundation:* Core modules establish a strong foundation in QRAMS engineering, covering fundamental topics such as applied statistical methods and QRAMS analysis.
- *Skill Development and Practical Application:*
    - The program equips DGQA professionals with the skills and knowledge essential to navigate the evolving landscape of QRAMS Engineering.
    - Participating students have the opportunity to work on real-world projects in QRAMS domain under the guidance of experienced professionals, translating theoretical knowledge

into practical applications.
    - Opening of new vistas for research and development.
- *Empowering Future QRAMS Engineers*
    - Graduates of the program will possess a strong understanding of QRAMS principles and practices, empowering them to make significant contributions to their respective organizations.
    - The program hones aspirants' abilities to apply theoretical concepts to address real-world challenges in QRAMS Engineering.

4. Duration and Structure of the Program

- *Program Duration*: One (1) year.
- *Course plan*: consists of a total eight (8) Subjects.
- *Semester Structure*: Two (2) Semesters (S1 & S2)
    - S1: 4 Subjects (C1– C4, 20 Credits)
    - S2: 4 Subjects (C5 – C8. 20 Credits)
- *Project:* Project Plan submission and Seminar Presentation (P1 – 04 Credits): May 2025, Project completion and evaluation: (Dec 2025) (P2 – 16 Credits), Total: 20 Credits (Table 3 OR Table 4)
- *Credit System*:
    - Each course: Five (5) credits (3-2-0).
    - Total Required Credits: Eight (8) courses (40 credits) + Project (20 credits) = 60 credits.
- *Semester Structure*: As per semester structure as appended below at Tables 1 & 2; Yearly schedule is placed at Table 3 (Jan-Dec Cycle) and Table 4 (July-May Cycle)
    - Thirteen (13) available weeks for learning, one (1) week of mid-term exam, and one (1) week of final exam.
    - Total available hours for learning are 260 hours. Total required hours are 240 hours to meet 20 credits of semester hours.

Table1. Semester 1 (Spring: Jan 2025-April 2025) Weekly Structure (Tentative*)

	Monday	Tuesday	Wednesday	Thursday	Friday
C1	2:00 – 3:55 PM		2:00 – 3:55 PM		2:00 – 2:55 PM
C2	4:00 – 5:55 PM		4:00 – 5:55 PM		3:00 – 3:55 PM
C3		2:00 – 3:55 PM		2:00 – 4:00 PM	4:00 – 4:55 PM
C4		4:00 – 5:55 PM		4:00 – 6:00 PM	5:00 – 5:55 PM

Table 2. Semester 2 (Autumn: August 2025- November 2025) Weekly Structure (Tentative)

	Monday	Tuesday	Wednesday	Thursday	Friday
C5	2:00 – 3:55 PM		2:00 – 3:55 PM		2:00 – 2:55 PM
C6	4:00 – 5:55 PM		4:00 – 5:55 PM		3:00 – 3:55 PM
C7		2:00 – 3:55 PM		2:00 – 4:00 PM	4:00 – 4:55 PM
C8		4:00 – 5:55 PM		4:00 – 6:00 PM	5:00 – 5:55 PM

* For C1, C2, … please refer item#5 later.

Table 3. Yearly Calendar (Jan-Dec Cycle)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S1												
Mid-Sem Exam												
Final Exam												
P1												
Holidays												
S2												
Mid-Sem Exam												
Final Exam												
P2												Project Report Submission & Presentation

Alternatively,

Table 4. Yearly Calendar (Jul-May Cycle)

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
S1												
Mid-Sem Exam												
Final Exam												
P1												
S2												
Mid-Sem Exam												
Final Exam												
P2										Project Report Presentation &Presentation		
Holidays												

5. Curriculum Overview

- *S1 Modules*:
  - **C1**: Statistical Methods in QRAMS: Application of statistical methods for analyzing and enhancing the reliability and performance of systems.
  - **C2**: Reliability Analysis and Prediction: In-depth study of reliability methods and techniques to design and maintain engineering systems, ensuring optimum performance and longevity.
  - **C3**: Quality Control and Analysis: Understanding statistical tools and techniques for maintaining and improving quality in manufacturing and business processes.
  - **C4**: Reliability Estimation and Life Testing: In-depth study of reliability field/test data analysis methods to quantify, estimate, predict reliability metrics for informed decision-making.
- *S2 Modules*:
  - **C5**: Quality Engineering and Robust Design: Application of experimental design and inferential statistical methods for variability and process capability analysis leading to concepts of robust design.
  - **C6**: Maintainability Analysis and Prediction: Study of tools and techniques of maintainability metrics assessment to design and maintain engineering systems, ensuring

optimum performance and longevity.

- **C7**: Repairable Systems and Reliability-Centered Maintenance: Understanding of various reliability–centered maintenance techniques, reliability modeling and estimation of repairable systems.
- **C8**: Probabilistic Risk and Functional Safety Analysis: System safety assessment and risk mitigation identification to ensure safety through the lifecycle of products.

- *Project*:
  - **P1:** Students will submit and present their project proposal & execution plan through project seminar(s) (Refer Table 3 and Table 4).
  - **P2:** Final Project Work will be presented, submitted and evaluated. (Refer Table 3 and Table 4).

6. Performance Evaluation, Grading Pattern, and Attendance Policy

The Grading pattern will be followed as per IIT Kharagpur Grading norms. The attendance has to be $\geq$ **70**%.

7. Who can Attend?

- *Eligibility Criteria*:
  - Bachelor's and/or Master's Degree in any engineering discipline with a minimum of 55% marks or equivalent CGPA.
  - Work Experience: 2 years (applicant need not be employed to be eligible).
- *Admission Process*: As shortlisted/nominated by DGQA/DIQA based on their internal and above eligibility criteria.

8. Program Objectives and Outcomes

- *Primary Goals*:
  - Comprehensive Education: Provide a comprehensive education in QRAMS Engineering, encompassing theoretical knowledge and practical skills.
  - Skill Development: Develop expertise in QRAMS Engineering methodologies, tools, and techniques to enhance career prospects.
  - Professional Excellence: Foster a culture of professional excellence, enabling graduates to contribute significantly to their organizations and the field at large.
- *Outcomes*:
  - PG Certificate: Receive a PG Certificate from CEP in Quality and Reliability Engineering from IIT Kharagpur, a prestigious institution known for academic excellence. The Grading Sheet duly signed by the Coordinators will also be provided along with the PG Certificate.
  - In-depth Understanding: Gain an in-depth understanding of modern QRAMS Engineering principles and practices through a well-structured curriculum and expert instruction.
  - Faculty and Mentorship: Learn from leading research faculty and benefit from their guidance, expertise, and mentorship throughout the program.
  - Alumni Network: Join the esteemed alumni network of IIT Kharagpur, connecting with professionals and industry leaders in the field, opening doors for collaboration and growth.

9. Faculty and Expertise

Course Coordinators

- *Prof. Rajiv Nandan Rai*
  - Expertise: RAMS analysis, Preventive Maintenance, Prognostic Health Monitoring, Process

Reliability, TQM and Analytics, Repairable Systems Reliability Analysis, Quality Management and Engineering

- *Prof. Sanjay Kumar Chaturvedi*
    - Expertise: FMEA/FMECA, Reliability Apportionment, Reliability-based Design, Reliability Data Analysis, Maintenance, System Reliability Modelling and Analysis
- *Prof. Heeralal Gargama*:
    - Expertise: RAMS for Railway Systems, Functional Safety for Automotive, System Reliability Modelling & Analysis, Physics of Failure

Faculty Members

- *Prof. Sanjay Kumar Chaturvedi*
    - Expertise: FMEA/FMECA, Reliability Apportionment, Reliability-based Design, Reliability Data Analysis, Maintenance, System Reliability Modelling and Analysis.
- *Prof. Rajiv Nandan Rai*
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- *Prof. Heeralal Gargama*:
    - Expertise: RAMS for Railway Systems, Functional Safety for Automotive, System Reliability Modelling & Analysis, Physics of Failure.
- *Prof.* Indranil Hazra
    - Expertise: Structural Reliability & Health Monitoring, Degradation Modeling, Probabilistic Design.

Note: *Other Faculty Members from IIT Kharagpur, Other IITs and Industry Professionals may also be invited for guest lectures during the course period.*

Note: *During the first six months after PG Certificate course completion, based on the experience gained and takeaways of the Pilot PG Certificate course through CEP, IIT Kharagpur, the proposal for conducting e-Masters Degree Program will then be formulated and put up to PGPEC followed by Senate of IIT Kharagpur for their approval, where DGQA can field their sponsored candidates separately in mutual Consultation/Agreement with IIT Kharagpur. The proposed e-Masters Degree program so formulated will be aligned with the Academic calendar of IIT Kharagpur as shown in Table 5 as placed below:*

Table 5. Yearly Calendar (2026-2027 Onwards)

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
S1												
Mid-Sem Exam												
Final Exam												
P1												
S2												
Mid-Sem Exam												
Final Exam												
P2												
Holidays												

10. Budget Details

Sl No.	Heads	Amount (INR) (lakhs)	Remarks
1	Honorarium to Faculty	60.00	600 hours (@10000 per hour)
2	Course Staff	1.50	15000 per month
3	Certificates	0.10	
4	Contingencies	4.00	
5	Auditor	0.04	
6	**Total (1-5)**	**65.64**	
7	Coordinator (10% of 6)	6.56	
8	**Total (6-7)**	**72.20**	
9	Overheads (20% of 8)	14.44	
10	**Total(8-9)**	**86.64**	
11	**GST**	**0.00**	AS per "Services provided to Central Government"Notification No. 9/2017 Integrated Tax (Rate) dated 28 Jun 2017, under heading 9992
12	Total(10-11)	**86.64**	15 heads
	Say (87 lakhs)	Per head (@INR5.8 lakhs) approx	

Note:

a) *The budget shown in item# 10 above is for minimum of 15 candidates (@INR5.8 lakhs per candidate) and a maximum of 20 (@INR4.40 lakhs per candidate).*

b) *If the number of candidates falls below 15 and DIQA wishes to run the course, the total budget shown in item#10, subitem#12 will remain unchanged.*

11. Payment Schedule

Instalments *(Table 3)*	Month and Year	Amount (INR)	Remarks
First	Dec 2024	45 lakhs	First Semester classes will commence from 02 Jan 2025
Second	June 2025	42 lakhs	Second Semester classes will commence from 01 August 2025
Instalments *(Or Table 4)*	Month and Year	Amount (INR)	Remarks
First	June 2025	45 lakhs	First Semester classes will commence from 02 Jan 2025
Second	Dec 2025	42 lakhs	Second Semester classes will commence from 01 August 2025

Note: *In case for any reason the course does not start in January 2025 (Table 3), then the course shall begin from August 2025, then the first semester has to begin from August 2025 (Table 4) and will end in July 2026.*