

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE

Course Title	Quality, Reliability and Safety Engineering		
Course Code	PRPC22	No. of Credits	3
Department	Production Engineering	Faculty	Dr. Mubarak Ali
Pre-requisites Course Code	Basic Engineering and Statistics		
Course Coordinator(s) (if, applicable)	-		
Course Faculty E-mail	newstomubarak@gmail.com	Telephone No.	7012800442
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		

COURSE OVERVIEW

This course deals with both the theoretical and practical aspects of Quality, Reliability and Safety Engineering. Quality engineering focusses on quality control and quality assurance management of manufacturing systems and product through the use of statistical tools and International Quality Standards.

Reliability engineering deals with mitigating product and system failure. The need for reliability in manufactured product is ever increasing because of competition, customer satisfaction, increase in complexity of system/products and consideration for safety and product liability.

Modern engineers are required not only to create products and systems, but to make them safe and economical as well. This course also addresses the fundamentals of safety, legal aspects, hazard control, the human element of safety, and techniques for managing safety & health in engineering decisions.

COURSE OBJECTIVES

The objective of this course is

1. To enable the students to understand and gain competence in quality improvements techniques through effective use of statistical tools and quality management systems.
2. To inculcate the need of reliability in manufactured product and systems and to analyze engineering systems for its reliability and motivate students to design engineering systems with improved reliability
3. To enable the students to understand the safety aspects in engineering and to make them control hazards in products and working environments.

COURSE OUTCOMES (CO)			
Course Outcomes			Aligned Programme Outcomes (PO)
1. Ability to manage continuous quality improvement efforts in an organization 2. Ability to implement statistical quality control through control charts 3. Ability to design and use sample plans and schemes 4. Ability to analyze the reliability of various systems and products 5. Ability to control hazard and manage safety & health in engineering environment			PO1, PO2, PO4, PO5, PO6, PO7, PO12
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week	Topic	Mode of Delivery
1	Week 1	Introduction, Definitions, Dimensions of Quality, Case Study, Approach to product design, Quality Management Principles	Chalk and Talk / PPT
2	Week 2	Total Quality management, Deming's principles, Deming's 14 points, Quality costs, Quality Awards,	Chalk and Talk / PPT
3	Week 3	Quality Systems, ISO 9000 series, ISO 14000, Kaizen, Introduction to the concept of Control, Seven Major Tools of Statistical Process Control,	Chalk and Talk / PPT
4	Week 4	Control charts for attributes, number nonconforming, fraction nonconforming, number of conformities, fraction of nonconformities	Chalk and Talk / PPT
5	Week 5	Control charts for variables, average range chart, average standard deviation chart, Shewhart Control chart for individuals	Chalk and Talk / PPT
6	Week 6	Advanced control charts – EWMA and CUSUM	Chalk and Talk / PPT
7	Week 7	Process Capability Analysis, Measurement system Capability	Chalk and Talk / PPT
8	Week 8	Acceptance sampling – introduction, OC curves, Single sampling, rectifying inspection, Double and sequential sampling	Chalk and Talk / PPT
9	Week 9	Reliability- introduction, exponential model MTBF, MTTF, system reliability – serial, parallel, standby, design for reliability	Chalk and Talk / PPT
10	Week 10	Redundancy, Reliability Allocation, Mechanical Reliability, Failure Mode and effect Analysis.	Chalk and Talk / PPT

11	Week 11	Safety - Importance -Fundamental Concepts and Terms- Workers' Compensation - Product Liability - Hazards and their Control - Walking and Working Surfaces,	Chalk and Talk / PPT
12	Week 12	Electrical Safety and Radiation - Biohazards - Managing Safety and Health Prevention Fire Protection and Prevention -Explosions and Explosives	Chalk and Talk / PPT

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	End of 4 th Week	60 min	20 %
2	Cycle Test 2	End of 8 th Week	60 min	25 %
3	Quiz	End of 10 th Week	30 min	15 %
4	Compensation Assessment	-	60 min	
5	End Semester Exam	End of the Semester	3 hours	40 %

ESSENTIAL READINGS :

Text books:

1. **Introduction to Statistical Quality Control**, Douglas C. Montgomery, John Wiley & Sons, Inc., 7e, 2012
2. **Reliability, Maintainability and Risk, Practical Methods for Engineers**, David J Smith, Elsevier Ltd, 8e, 2012
3. **Occupational Safety and Health, For Technologists, Engineers and Managers**, David L Goetsch, Prentice Hall, 7e, 2011

Reference Book:

1. **Total Quality Management**, Dale H. Besterfield, Carol Besterfield-Michna, Glen H. Besterfield, Mary Besterfield-Sacre, Hemant Urdhwareshe, Rashmi Urdhwareshe, Pearson Education, Inc., 3e, 2012.
2. **Maintainability, Maintenance and Reliability for Engineers**, B.S. Dhillon, CRC Press, 2006
3. **Safety and Health for Engineers**, Roger L. Brauer, John Wiley Sons, 2e, 2006

COURSE EXIT SURVEY

1. Feedback from students during class committee meetings
2. Anonymous feedback through questionnaire at the end of the course
3. Students can share their feedback directly to course faculty anytime to improve the teaching-learning process

COURSE POLICY


1. Participation in the discussions is essential during the tutorial classes.
2. Strict academic disciplines have to be maintained inside the classroom.
3. Students are strongly encouraged to attend the Cycle test and Quiz without absence. If any student is not able to attend any of the Cycle test (1, 2) or Quiz due to genuine reason, the student will be permitted to attend the compensation assessment. However, the question paper for compensation assessment will be difficult and intensive.
4. Attending classes regularly and continuously is required for the students to understand the concepts.
5. Attendance will be marked in every class. Student should maintain $\geq 75\%$ attendance to get eligible to write end semester examination. However, if any student has $< 75\%$ attendance, he will have to take compensation assessment and must get $\geq 40\%$ marks in compensation assessment to get eligible to write end semester examination. The question paper for compensation assessment will be difficult and intensive.
6. Those Students who do not have $\geq 75\%$ attendance and fail in compensation assessment (scoring $< 40\%$) will have to RE DO the course.
7. Grading would be Relative Grading.

ADDITIONAL COURSE INFORMATION

The Course Faculty is available in the department after class hours for discussions. Queries may also be emailed to the Course Faculty directly at newstomubarak@gmail.com

FOR SENATE'S CONSIDERATION

Course Faculty 

CC-Chairperson 

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