

**PALOMAR COLLEGE**  
**COURSE OUTLINE OF RECORD FOR**  
**DEGREE CREDIT COURSE**

X  Transfer Course  X  A.A. Degree applicable course  
(check all that apply)

**COURSE NUMBER AND TITLE:** QAT 125 Quality and Reliability Management

**UNIT VALUE:** 3

**MINIMUM NUMBER OF SEMESTER HOURS:** 48

**BASIC SKILLS REQUIREMENTS:** Appropriate language and computational skills.

Familiar with basic algebra, able to use a statistical calculator.

**ENTRANCE REQUIREMENTS**

**PREREQUISITE:** None.

**COREQUISITE:** None.

**RECOMMENDED PREPARATION:** QAT 100.

**SCOPE OF COURSE:**

Introduction to basic concepts of quality assurance and reliability management; the assurance sciences (quality control, reliability, maintainability and availability); probability and statistics; product reliability; equipment survival, reliability prediction methods; reliability testing, product availability, and reliability apportionment techniques.

**SPECIFIC COURSE OBJECTIVES:**

Successful students will be able to:

1. Apply basic reliability principles in the work environment.
2. Identify product characteristics and apply reliability techniques in the design area considering safety and human factors issues.
3. List the differences between reliability and quality control.
4. Analyze product failure modes using FMECA and FTA techniques.
5. Compare military and non-military standards to achieve industry standards and increase system reliability.
6. Compare design approaches and select options to increase product reliability.
7. Recognize and explain reliability prediction and apportionment methods.

8. Solve troubleshooting problems related to reliability testing.
9. Determine need and degree of product quality control and reliability trade offs.
10. Apply course material to help prepare for the ASQ Certified Reliability Engineer exam.

**CONTENT IN TERMS OF SPECIFIC BODY OF KNOWLEDGE:**

- I. Reliability Principles
  - A. Definitions (MIL-STD-721)
  - B. Design concepts
  - C. Failure/MTBF/Failure Rate
  - D. Maintainability
  - E. Availability
  - F. Failure modes
  - G. Software reliability
  - H. Reliability costs
  
- II. Design Review and Product Safety
  - A. Design review
  - B. Design checklists
  - C. FMEA, FMECA and FTA
  - D. Human factors
  - E. QFD, risk analysis
  - F. Safety and regulatory requirements
  
- III. FMECA and FTA
  - A. Failure mode, effects and criticality analysis
  - B. Fault tree analysis
  
- IV. Reliability Testing
  - A. Beta distribution
  - B. Sequential testing
  - C. Test methods
  
- V. Mathematical Models
  - A. Probability density function
  - B. Normal distribution
  - C. Hazard function
  - D. Log normal distribution
  - E. Exponential distribution
  - F. Weibull distribution
  - G. Gamma distribution
  - H. Chi-Square distribution
  - I. Student T distribution
  - J. F distribution
  - K. Bayes theorem
  - L. Binomial distribution
  - M. Hypergeometric distribution
  - N. Poisson distribution

- VI. Reliability Apportionment
  - A. MTBF estimation
  - B. MTBF confidence intervals
  - C. Reliability prediction: series systems
  - D. Reliability prediction: parallel systems
  - E. Reliability prediction: standby parallel systems
  - F. Application of Bayes theorem
  - G. System examples
  - H. Stress-strength considerations
  - I. Monte Carlo simulation

**REQUIRED READING:**

O'Connor, Patrick D.T. Practical Reliability Engineering. 4<sup>th</sup> edition. Halsted Press, 2002.

Dovich, Robert A. Reliability Statistics. Milwaukee, WI: American Society for Quality, 1990.

**SUGGESTED READING:**

Wortman. CRE Primer. 3<sup>rd</sup> edition. Terre Haute, IN: Quality Council of Indiana, 1994.

Juran and Godfrey. Juran's Quality Handbook. 5<sup>th</sup> edition. New York: McGraw-Hill Professional, 1988.

Triola, Mario. Elementary Statistics. 8<sup>th</sup> edition. Reading, MA: Addison Wesley, 2001.

**REQUIRED WRITING:**

Completion of problems at the end of each chapter of at least one page in length and a weekly written report of at least one page in length.

**OUTSIDE ASSIGNMENTS:**

**Students are expected to spend a minimum of three hours per unit per week in class and on outside assignments, prorated for short-term classes.**

Read required text, industrial brochures, reliability articles and handouts as assigned by the instructor. Study lecture notes, complete written report and assignments. Group case studies by groups of 5-10 students. Preparation and presentation of solutions to various reliability problems based on a case study.

**INSTRUCTIONAL METHODOLOGY:**

**Check all that apply:**

- lecture
- laboratory
- lecture-laboratory combination
- directed study

**DISTANCE LEARNING:**

**This course may be offered as a distance learning course and meets Title 5 regulations 55370, 55372, 55374, 55376, 55378, and 55380.**

Yes \_\_\_ No X

**If yes, check all that apply:**

- Television Course (Video one-way, e.g. ITV, video cassette, etc.)
- Online Course (Text one-way, e.g. newspaper, correspondence, electronic file, etc.)
- Two-Way Video Conferencing (Two-way interactive video and audio)
- One-Way Video Conferencing (One-way interactive video and two-way interactive audio)
- Computer Assisted Instruction (A specialized form of mediated instruction relying primarily on student access to information and prepared lessons or teaching materials through a computer terminal, but not under immediate supervision of a qualified instructor.)

**GRADING POLICY AND STANDARDS** (include methods of determining whether the stated objectives have been met by students):

The course grading policy will be determined by individual instructors and may include the following:

- Exams
- Quizzes
- Research projects
- Writing assignments
- Classroom presentations
- Research papers
- Lab assignments
- Journal writing
- Classroom participation & discussion
- Homework

**IS COURSE REPEATABLE FOR REASON(S) OTHER THAN DEFICIENT GRADE?**

Yes \_\_\_ No X Number of times course may be taken for credit: 1

If yes, identify specific provision of Title 5 Division 2 section(s), 55761-55763 and 58161 which qualifies course as repeatable:

**CONTACT PERSON:** Director, Occupational & Noncredit Programs, Ext. 2286

**SIGNATURES ON FILE:**