Department of: Statistics

College of: Administration and Economics.

University of: Salahaddin-Hawler.

Subject: Reliability.

Course Book: *Ph.D.*

Lecturer's name: Dr. Bekhal Samad Sedeeq

Academic Year: 2023 - 2024

Course Book

1. Course name	Reliability
2. Lecturer in charge	Dr. Bekhal S. Sedeeq
3. Department/ College	Department of Statistics and Informatics / College of Administration and Economics.
4. Contact	e-mail: **Bikhal.sedeeq@su.edu.krd**
5. Time (in hours) per week	2 hours
6. Office hours	
7. Course code	
8. Teacher's academic profile Dr. Bekhal S. Sedeeq	I got a BSc degree from Salahaddin University-Erbil in 1998 in the College of Administration & Economics Statistics department. I earned a master's degree in Mathematical Statistics in 2002 and started as an assistant lecturer teaching in the Statistics department. I got a Ph.D. degree from Salahaddin University-Erbil in 2008 in the College of Administration & Economics Statistics department, and I finished my PhD degree in Reliability. I have been teaching in the Statistics department at Salahuddin University since 2002. I have taught (Principles of Statistics, Reliability, Differential Equations, and Decision Theory for undergraduate students). I supervised the research of four students in an MSc degree and during periods of teaching, I supervised the research of a graduate student's fourth stage.
9. Keywords	Introduction to Reliability, Definition of Reliability, The Reliability Function, Failure Lows, System of Reliability-Connection in Series, Connection in Parallel, Mixed connection- Series Parallel, Parallel Series, Bays theorem,…

10. Course overview:
Reliability refers to the consistency and dependability of a system, process, or measurement. It is an essential concept in various fields, including engineering, statistics, psychology, and more. Reliability can be understood in several different contexts.

11. Course objective:
The objectives of Reliability are to explain how system reliability can be measured and how reliability growth models can be used for reliability prediction, to describe safety arguments and how these are used, to discuss the problems of safety assurance, and To introduce safety cases and how these are used in safety validation.

12. Student's obligation

A student must exhibit honesty and respect the ethical standards of the profession in carrying out his or her academic assignments. Without limiting the application of this principle, a student may be found to have violated this obligation if he or she: (see note concerning more appropriate invocation of University of Pittsburgh Student Code of Conduct and Judicial Procedures)

 1. Refers during an academic evaluation to materials or sources, or employs devices, not authorized by the faculty member.

2. Assist in an academic evaluation of another person in a manner not authorized by the faculty member.

3. Receives assistance during an academic evaluation from another person in a manner not authorized by the faculty member.

4. Engages in unauthorized possession, buying, selling, obtaining, or use of any materials intended to be used as an instrument of academic evaluation in advance of its administration.

5. Acts as a substitute for another person in any academic evaluation process.

6. Utilizes a substitute in any academic evaluation proceeding.

7. Practices any form of deceit in an academic evaluation proceeding.

8. Depends on the aid of others in a manner expressly prohibited by the faculty member, in the research, preparation, creation, writing, performing, or publication of work to be submitted for academic credit or evaluation.

9. Provides aid to another person, knowing such aid is expressly prohibited by the instructor, in the research, preparation, creation, writing, performing, or publication of work to be submitted for academic credit or evaluation.

10. Presents as one's own, for academic evaluation, the ideas, representations, or words of another person or persons without customary and proper acknowledgment of sources.

13. Forms of teaching

Different forms of teaching will be used to reach the objectives of the course: PowerPoint presentations for the head titles and summary of conclusion, classification of material, and any other illustrations. There will be classroom discussions and the lecture will give enough background to translate, solve, and analyze.

14. Assessment scheme

The student must be examined in (20).

Putting grades for daily activities, and homework, for (5) marks.

The review article in (25).

The annual work of the material in (50) marks.

The final exam is out of (50) marks.

The grades of the annual work and the final exam will be out of (100) marks and the student will be successful if he gets (60) or more.)

15. Student learning outcome:

 Student learning outcomes statements clearly state the expected knowledge, skills, attitudes, competencies, and habits of mind that students are expected to acquire at an institution of higher education. Transparent student learning outcomes statements are:

• Specific to the institutional level and/or program level

•Clearly expressed and understandable by multiple audiences

- Prominently posted at or linked to multiple places across the website
- Updated regularly to reflect current outcomes
- Receptive to feedback or comments on the quality and utility of the information   provided

16. Course Reading List and References:

1. Besterfield, D.H. (1979): Quality Control. Prentice-Hall Inc. New York, U.S.A.
2. Besterfield, D.H. (2004): Quality Control. 7thEdition, Prentice-Hall Inc. New York, U.S.A.
3. Douglas, C. Montgomery. (2005): Introduction to Statistical Quality Control.
4. Grant, E. L. & Leavenworth, R. S. (1988): Statistical Quality Control. 6thEdition, McGraw- Hill Book Company. New York, U.S.A.
5. Juran, J. M. (1974): Quality Control Handbook. 3 Edition, McGraw-Hill Book Company. New York, U.S.A.
6. Robertson, A. G. (1971): Quality Control and Reliability. 8 Edition, Pitman Press, Bath. London, U.K.
7. David, J. Smith. (1972): Reliability Engineering

17. The Topics:

	Subject	Lecturer's name:
		Dr.Bekhal Samad
First week	Part One/ Introduction to Reliability ➤ The Reliability- Definition	
Second week	➤ The Reliability Function	
Third week	➤ Failure Lows	
Fourth week	➤ Survival analyses	
Fifth week	➤ Empirical Reliability	
Sixth week	➤ System of Reliability- Connection in Series	
Seventh week	➤ Examples	
Eighth week	➤ Connection in Parallel	
Ninth week	➤ Examples	
Tenth week	➤ Mixed connection- Series Parallel	
Eleventh week	➤ Parallel Series	
Twelfth week	➤ Connection in Parallel	
Thirteenth week	➤ Examples	
Fourteenth week	➤ Bayes theorem	
Fifteenth week	Exam 2 in (20 Degree)	

18. Practical Topics (If there is any)

In this section, the lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date, and time of the lecture.

19. Examinations:

1. Assume two units are connected in series and failure rates are λ_1 and λ_2 respectively find:
    1) Reliability of the system.
    2) Failure rate.
    3) $f_{ss}(t)$.
    4) MTBF.

2. If λ=0.01 parameter of exponential distribution and R(t)=0.90,
Find: t [the number of hours as a system operated]

3. prove that: $E(t) = \int_0^\infty R(t)\, dt$

4. : Five components having reliabilities of (0.73, 0.85, 0.56, 0.91, and 0.62) are connected in parallel. What is the system reliability and system unreliability?

5. If (2000) items are put under the test, and if $Z(t) = 2*10^{-3}$, find:
    1) Reliability for 200 hours.
    2) $N_s(t)$ for 200 hours.
    3) $N_f(t)$ for 200 hours.

6. If $Z(t) = 3*10^{-5}$ find:
    1) R(t) for 100 hours.
    2) What is the reliability equal MTTF?

20. Extra notes:

21. Peer review   پێداچوونەوەی هاوەڵ