

UNIVERSITY OF NEVADA, RENO – MECHANICAL ENGINEERING DEPARTMENT
QUALIFYING EXAM (QE) POLICY AND PROCEDURE S
Version Fall 2021

remedial activity as assessed by the QE committee that the student passes the exam which the remedial activity has been recommended. If the student fails to successfully complete the remedial activity within the allotted time frame, the student fails the exam which the remedial activity has been recommended.

3. Schedule and Required Students Actions

21. The QE is typically offered every semester as long as students have applied
22. A student must register for the QE within 2 semesters (if the student has a MS already) or 3 semesters (if the student has only a BS or Direct PhD) of the admission to their degree program, their first attempt to pass the QE. The student will then take the exam at the beginning of the semester following the registration.
23. In their first attempt, the student must take all exams in the written part of the exam. In their first attempt, the student must take the oral part if s/he passes the written part.
24. Taking classes in the Graduate Core Curriculum (GCC) is

Graphs and Subsystem Reduction; Stability; Steady State Error; Root Locus; Root Locus Design; Frequency Response; Frequency Response Design

- Suggested textbooks:
Palm, "System Dynamics", McGraw-Hill
Nise, "Control Systems Engineering", Wiley
Dorf and Bishop, "Modern Control Systems", Pearson Prentice Hall

4. Solid Mechanics

- Statics Review; Stress, Strain, and Hooke's Law; Properties of Stress Curves; Generalized Hooke's Law; Axial Deformations & Factor of Safety; Indeterminate Axial Systems; Gaps & Thermal Effects; Torsion; Indeterminate Torsional Systems; Internal Shear and Moment Functions; Shear & Bending Moment Diagrams; Bending Stress; Bending Stress & Combined Loading; Composite Beams/Eccentric Loads; Computing Shear Stress and Q; Built-up Beams & Design for Shear; Plane Stress and Transformations; Mohr's Circle; Pressure Vessels; Beam Deflection & Superposition; Bending, singularity functions, and statically indeterminate problems; Buckling Theory and Applications; Unsymmetrical loading of beams; Transverse shear stresses, Shear Center; Composite Beams, Curved beams; Rotating disks, Torsion of shafts and tubes; Energy methods; Strain energy and strain energy theorem; Castigliano's Theorem and applications
- Suggested textbooks:
Philpot, "Mechanics of Materials, an Integrated Learning System", Wiley
Budynas, "Advanced Strength and Applied Stress Analysis", McGraw-Hill
Boresi and Sidebottom, "Advanced Mechanics of Materials", Wiley
Ugural and Fenster, "Advanced Strength and Applied Elasticity", Prentice Hall

5. Mechanical Design

- Safety factor, σ diagram and M diagram; Principal stress, Mohr's circle; Beam bending & shear & torsion; Combined loads, Stress concentration; Curved beam, Pressure vessel; Buckling; Beam Direct integration, Singularity functions; Strain energy and Castigliano's theorem; Static failure; Rotating element; Fatigue; S-N curve; Endurance limit, Stress concentration; Fatigue failure criterion; Quality function deployment; Product design specification; Functional decomposition; Morphological chart, Decision matrix; Design philosophy; Friction and Wear; Geometric dimensioning & tolerance, fit system, limit system, deviations; Materials, properties and testing; Manufacturing processes; Simple stresses in machine part; thick shells; Machine element: Leaf spring; Belt drive; Shaft and shaft components; Threaded fasteners; Power screws; Flywheels; Helical Springs; Spur gears; Helical gears; Bevel gears; Worm gears; Shoe brakes; Disk brakes; Band brakes; Flat belt drives; Sliding contact; Rolling contact; Levers; IC Engine parts; Pipes and pipe joints; Welded joints; Adhesive joints; Riveted joints; Screwed and threaded joints

Menezes et al, "Tribology for Scientists and Engineers", Springer
 Rabinowicz, "Friction and Wear of Materials", Wiley
 Bhushan, "Introduction to Tribology", Wiley
 Hutchings, "Tribology, Friction and Wear of Engineering Materials", CRC Press
 Halling, "Principles of Tribology", Macmillan
 Bhushan, "Principles and Applications of Tribology", Wiley
 Suh, "Tribophysics", Prentice Hall
 Bowden and Tabor, "The Friction and Lubrication of Solids", Clarendon Press
 Stachowiak and Batchelor, "Engineering tribology", Butterworth Heinemann

7. Thermodynamics

- Review of Units and Introduction; Energy and Energy Transfer; Properties of Pure Substances; Energy Analysis of Closed Systems; Mass and Energy Analysis of Open Systems; Second Law of Thermodynamics; Entropy; Exergy/Simple Cycles; Basic Considerations, Carnot Cycle, Air Standard Cycle, Otto Cycle, Diesel Cycle; Stirling, Ericsson, Brayton Cycles; Brayton Cycle with Regeneration, Intercooling, Reheating; Ideal Jet Propulsion Cycles; Second Law Analysis; Carnot and Rankine Vapor Cycles; Parameters Affecting Efficiency, Reheat Cycle; Regenerative Rankine Cycle; Second Law Analysis of Vapor Power Cycles; Cogeneration; Combined Gas Vapor Power Cycles; Refrigerators & Heat Pumps, Reversed Carnot Cycle, Ideal Refrigeration Cycle; Actual Vapor Compression Refrigeration Cycle; Advanced Refrigeration Topics; The Maxwell Relations; The Clapeyron Equation; General Relations for du , dh , ds , C_v , and C_p ; T Joule-Thomson Coefficient; Composition of Gas Mixtures v - P