KFUPM Civil & Environmental Engineering Department
College of Design & Built Environment

PhD Comprehensive Examination: Guide for Students

Department of Civil and Environmental Engineering, KFUPM

Issued by the Graduate Committee and approved by the Department Council.

This guide explains how the PhD Comprehensive Examination works, what you need to do, and the rules that apply to you.

At a glance

Item	Rule
Exam components	Three written exams, one in each of your three approved areas, and one oral exam on all three areas and how they connect
Result	Pass or Fail for each part. You must pass all four.
When	First attempt in the first semester you are eligible (normally your third), or the next semester at the latest
Retakes	Only the parts you failed, in the next regular semester. Each part may be sat at most twice.
Oral exam	Up to 60 minutes, before three faculty members. Your advisor does not attend.
Appeals	In writing to the Department Chairman, within two working days after results are released
CE 699 and CE 711	Register CE 699 in the semester of your first attempt. Register CE 711 only after passing.

Your timeline

When	What you do
Semesters 1 and 2	With your advisor, choose three areas that relate to your research direction, and plan courses that support them.
The semester you sit	Read the Department announcement of the application deadline, the exam window, and the length and allowed materials for each exam.
By the application deadline	Apply through the online system with your three areas, approved by your advisor. Register CE 699.
Two weeks before the window	Last day to withdraw a first-attempt application.
Exam window	Sit the three written exams, then the oral.
Normally within ten working days after the window	Results are released: Pass or Fail for each part.
Two working days after results	Last day to appeal a result.
Next regular semester	Retake only the parts you failed. This is your last chance at each of them.
After passing all four	Register CE 711 and start your dissertation proposal.

How to prepare

- Study the topic list for each of your areas in Annex A. Papers test these topics.
- Focus on fundamentals: why methods work and when they fail, not only how to use them.
- For the oral, practice explaining ideas aloud and connecting your three areas. Expect follow-up questions. Annex B shows what the panel looks for.
- Talk to your advisor early. Your advisor is your first point of guidance on these rules.

Definitions

Term	Meaning
Advisor	Your thesis advisor and any co-advisor.
Area	A subject listed in Annex A with a published topic list.
Part	One of the four parts of the exam: the three written exams and the oral.
Sitting	One occasion on which you sit a part.
Window	The period in a regular semester when the exams are held.
Regular semester	Any semester other than a summer term.
Option area	Your PhD specialization within the Department.
Working day	A day on which the university is open.
In writing	By email from your university account, or through the online system, to the Department Chairman.
CGIS	The College of Graduate and Interdisciplinary Studies. Its Graduate Regulations also apply to you.

Rules

S1. About this guide.

(a) The exam checks that you know the fundamentals of your field in breadth and depth, can apply them to new problems, and can explain and connect them well enough to start independent doctoral research. Passing it is a university requirement for the PhD.

(b) This guide sets out the rules that apply to you. The CGIS Graduate Regulations also apply. Where this guide is silent, the Department decides in line with those regulations.

(c) This guide replaces all earlier Department statements on the PhD comprehensive exam. If you failed an area under the previous rules, or became eligible before Term 261, also read the Transition Notice.

(d) The Department may update this guide. Check the Department website for the current version.

S2. Your advisor.

(a) Your advisor is your first point of guidance. He or she helps you choose your areas, plan the courses that support them, and understand these rules.

(b) Your advisor approves your three areas before you submit them. Your advisor does not attend your oral.

S3. Who can apply. You may apply once you have:

(a) completed at least two regular semesters (see S4(e)) and at least 18 credit hours of graduate courses in your approved PhD degree plan, including courses recognized or waived under CGIS rules; and

(b) an approved degree plan and an assigned advisor.

The same rules apply to full-time and part-time students.

S4. When you sit.

(a) The exam is held once each regular semester, in an exam window. Each semester, the Department announces the application deadline and the window.

(b) You sit for the first time in the first semester you are eligible, or the next semester at the latest.

(c) Only an approved deferral for a documented emergency gives you one more semester. This is allowed once. Withdrawing your application does not.

(d) If you have not sat by your deadline, you are recorded as failing all four parts at your first attempt.

(e) Semesters are counted as regular semesters in the PhD program. Summer terms and semesters postponed under CGIS rules are not counted.

S5. CE 699 and CE 711.

(a) Register CE 699 in the semester of your first attempt. If your degree plan shows it later, adjust your degree plan accordingly.

(b) CE 699 is graded under the university grading policy. It is completed when you have passed the exam and met the seminar requirement.

(c) You may not register CE 711 before passing the exam.

S6. Choosing your areas.

(a) You are examined in three areas from Annex A. All three must relate to your research direction and be approved by your advisor.

(b) Ideally, each area is supported by a graduate course you have completed, or by earlier graduate coursework.

(c) Submit your three areas through the online system. For each area, say briefly how it relates to your research direction and which course, if any, supports it.

(d) Once your advisor has approved them, the Graduate Coordinator approves your areas and informs you by email. Either may return them. If your areas are returned, you may revise and resubmit them once, within three working days.

(e) You may change your approved areas only before the application deadline. Any change needs the same approvals.

S7. Areas and topic lists.

(a) Annex A lists the areas and the topics each written exam covers.

(b) The Department may update the areas and topic lists. An update applies from the next application deadline after it is issued.

(c) A retake follows the topic list that applied when you first sat that part.

S8. How the exam works and how you pass.

(a) The exam has four parts: three written exams, one in each of your areas, and one oral exam on all three areas and how they connect.

(b) You receive Pass or Fail for each part.

(c) You must pass all four parts. Doing well in one part does not make up for failing another.

S9. Written exams.

(a) Each written exam lasts up to three hours. The length and any allowed materials or software are announced with the window.

(b) Exams are closed-book unless allowed materials are announced.

S10. Oral exam.

(a) The oral lasts up to 60 minutes. It is held in the same window, after the written exams, regardless of your written results.

(b) A panel of three faculty members conducts it. A faculty member from another KFUPM department may be invited to serve on the panel when needed.

(c) Your advisor does not attend. A Department representative also attends.

(d) Questions cover the fundamentals of your three areas, the links between them, and the related graduate courses on your transcript, with follow-up questions. The oral is not a defense of your research proposal.

(e) At the end of the oral, the panel assesses you on the spot against the criteria in Annex B.

(f) A retake may have a different panel.

S11. Results.

(a) The Department Chairman, the Graduate Coordinator, or their designee informs you of your results, directly or through the online system, normally within ten working days after the window closes. The results of all parts sat in a window are released together.

(b) You receive Pass or Fail for each part. Marks are not released.

(c) Your advisor may discuss areas for improvement with you.

S12. Retakes.

(a) If you fail one or more parts, you retake only those parts in the next regular semester. Parts you passed stand.

(b) Each part may be sat at most twice. A sitting that is deferred or canceled does not count.

(c) You retake a failed written exam in the same area.

(d) If you fail any part at its second sitting, you have failed the exam. No further sitting or other assessment is offered.

(e) Once any appeal is decided, the Department refers your case to CGIS, which may dismiss you from the PhD program. The Department may recommend transfer to an MS program.

S13. Withdrawal, deferral, and absence.

(a) You may withdraw a first-attempt application up to two weeks before the window. Withdrawing does not move your deadline: if you withdraw in your last allowed semester, you are recorded as failing all four parts. A retake cannot be withdrawn.

(b) If an emergency supported by KFUPM-approved documents (such as illness or bereavement) stops you from sitting a part, ask in writing for a deferral before the exam or, if that is not possible, within three working days after it. The Department decides.

(c) If you start a part, you are treated as fit to sit it, and no deferral is given for that part.

(d) A deferral applies only to the part deferred. Your other parts go ahead as scheduled unless the Department decides otherwise. A deferred written exam is sat in the next window. A deferred oral may be held later in the same window or in the next window.

(e) If you miss a part without an approved deferral, or leave before it ends without the proctor's permission, you receive a Fail for that part.

(f) If the Department cancels a part, it is rescheduled and does not count as a sitting.

(g) A deferral does not extend any university time limit, such as the maximum period of study.

S14. Exam conduct.

(a) Bring your university ID card.

(b) Mobile phones, smart watches, and other smart devices are not allowed in the exam hall.

(c) Bring your own calculator and writing materials. Sharing is not allowed.

(d) Software may be used only where announced. Internet access is not allowed.

(e) Follow the proctor's instructions. If you arrive more than 30 minutes after the start, you are not admitted and are treated as absent.

(f) Cheating or attempted cheating in any part results in a Fail for that part and referral under university disciplinary rules. The Department hears you before deciding.

(g) Approved accommodations for disability or health conditions are provided through the university process. They do not change the standard of the exam.

S15. Appeals.

(a) You may appeal a result in writing to the Department Chairman within two working days after it is released.

(b) Any further appeal follows university regulations.

S16. Records. The Department keeps exam records under the university records policy.

Frequently asked questions

1. Why do I receive only Pass or Fail?

The Department releases only the result of each part. Your advisor may discuss areas for improvement with you.

2. Why might I fail an area even though I earned an A or A+ in a related course?

Course grades and comprehensive exam results are separate assessments with different purposes. The exam tests your command of the fundamentals of an area and your ability to apply and connect them. A high grade in a related course does not guarantee a Pass.

3. I failed one written exam. Do I have to sit everything again?

No. You retake only the part you failed, in the next regular semester. The parts you passed stand.

4. Will I still sit the oral if I fail a written exam?

Yes. The oral is held in the same window, after the written exams. The results of all parts sat in a window are released together.

5. Can I postpone my first attempt?

You sit in the first semester you are eligible, or the next semester at the latest. Only an approved deferral for a documented emergency gives you one more semester. Withdrawing your application does not. If you miss your deadline, you are recorded as failing all four parts at your first attempt.

6. What does my advisor do?

Your advisor is your first point of guidance. He or she helps you choose your areas, plan the courses that support them, and understand these rules, and approves your areas before you submit them. Your advisor does not attend your oral.

7. Can I appeal my result?

Yes. Write to the Department Chairman within two working days after results are released.

8. Who is in the room for my oral?

The panel and a Department representative. Your advisor does not attend.

9. What happens if I fail a part at its second sitting?

You have failed the exam, and no further sitting or other assessment is offered. Once any appeal is decided, the Department refers your case to CGIS, which may dismiss you from the PhD program. The Department may recommend transfer to an MS program.

10. What grade do I get in CE 699, and when can I register CE 711?

Under the university grading policy, CE 699 is graded NP when you have passed the exam and met the seminar requirement, IC while you have not passed and a second sitting remains, and NF if you fail the exam. You may register CE 711 only after passing all four parts.

Contact

Send all questions, and all written requests under this guide (deferral, appeal, change of area), to the Department Chairman of the Department of Civil and Environmental Engineering.

- Questions about which areas fit your research: ask your advisor first.

Annex A. Approved examination areas by option area

Each written exam tests the topics listed for its area. Areas are grouped by option area. Materials and Structures share one list. Pavement areas are listed under Transportation Engineering. The Department may update this annex (S7).

Structures and Materials

Area	Topics
Concrete Materials	Properties of concrete constituents; cement hydration; role of mineral and chemical admixtures; concrete mix design; fresh and hardened properties of concrete; factors affecting mechanical properties of concrete, shrinkage and durability of concrete; concrete sustainability perspective.
Concrete Design A: Reinforced Concrete	Design loads; reinforcing steel and concrete; shrinkage and creep in concrete; serviceability issues; cracking; deflection; flexural analysis of beams; strength analysis; design of beams and slabs; design of T-beams and doubly reinforced beams; bond; development lengths; splices; shear and diagonal tension; short and slender columns; moment-curvature relation; column interaction diagram; sway and non-sway frames; two-way slabs; direct design method; equivalent frame method; flat slab flooring systems; footings; continuous reinforced concrete structures; yield line analysis for beams and slabs; design of reinforcement at joints; analysis and design of buildings for lateral loads; walls; shear walls; retaining walls; design for torsion; strut-and-tie models; design considerations for seismic loading; reinforced concrete design applications.
Concrete Design B: Prestressed Concrete	Prestressing systems; materials and properties; hardware; loading stages; behavior of prestressed concrete beams; criteria for analysis and design; loss of prestress; analysis of stresses; cracked and uncracked sections; cracking load; flexural design; allowable stresses; design criteria; tendon profile; load balancing; ultimate strength; shear strength and design; torsional design; diagonal cracking; web reinforcement; continuity in prestressing; indeterminate prestressed concrete structures; end blocks; bond; anchorage; deflection and camber; crack control; composite members and design; continuous beams; secondary moments from prestress; linear transformation; prestressed columns; partial prestress; anchor zone; axially loaded members; prestressed compression and tension members; floor and roof slabs; two-way prestressed slabs; introduction to segmental construction; connections; prestressed concrete design applications.

Mechanics	Fundamentals (statics and basic mechanics); beams on elastic foundation; stress and strain tensors and their transformations; stress vector and boundary conditions; constitutive equations; linear elasticity; plate analysis; mechanics of composite materials; failure theories.
Structural Analysis	Basic concepts and principles of structural analysis; shear force and bending moment diagrams; influence lines for beams and trusses; fundamental methods of analysis (Castigliano's theorem, moment-area method, slope-deflection method, moment distribution method); virtual work; structural indeterminacy; flexibility and stiffness methods; structural vibrations; applications of commercial structural analysis software.
Dynamics and Earthquake Engineering	Kinematics and dynamics of particles and rigid bodies; work and energy; impulse and momentum; equations of motion; free and forced vibration of single and multi degree of freedom systems; harmonic and impulsive loading; numerical solutions; principles of earthquake engineering; earthquake analysis of linear systems; base isolation; damping and response spectra; static and dynamic lateral force procedures for buildings; modal analysis; load combinations; lateral force resisting systems, torsion and rigidity; seismic design of reinforced concrete, steel, and masonry structures, including special moment resisting frames, shear walls, and braced frames.

Geotechnical Engineering

Area	Topics
Foundation Engineering	Geotechnical field inspection methods; bearing capacity and settlement analysis; drained and undrained response of foundations; shallow, deep, and mat foundations selected for the structural loads and site conditions.
Geotechnical Earthquake Engineering	Earthquake reconnaissance; ground motion characterization; seismic site response; seismic zonation; earthquake-induced ground failures (soil liquefaction, cyclic softening of clays, surface fault rupture, seismic slope stability); wave propagation through soils; dynamic properties of geomaterials; strength and deformation of cyclically loaded soils; experimental analysis (cyclic tests, shake table, centrifuge testing); dynamic soil-structure interaction; seismic code provisions; analysis and design of foundations under seismic load; computer applications.
Soil Behavior	Soil formation, composition, crystallography, and mineralogy; soil-water-electrolyte system; physicochemical nature of soil; soil fabric and structure; relationship between soil composition and mechanical behavior; time-deformation processes; compressibility and volume change in clay soils; conduction phenomena.
Advanced Soil Mechanics	Basic concepts of soil mechanics; stresses and strains in soil media; lateral earth pressure; shear strength; stress paths; constitutive models; failure criteria; critical state soil mechanics; consolidation theory; unsaturated soils; elasticity, viscoelasticity, and plasticity theories; constitutive, numerical, and experimental modeling.

Transportation Engineering

Area	Topics
Urban Transportation Planning and Modeling	Transportation planning processes; transportation and land use interaction; travel evaluation and demand estimation; trip generation theories and assignment models; transit analysis; analysis and forecasting of user behavior and demand; formulation and estimation of discrete choice models and their applications.

Advanced Demand Modeling	Advanced theories and applications for analysis and forecasting of user behavior and demand; discrete choice models, including panel data, complex choices, and large choice sets; multidimensional probabilistic choice models; probit, logit mixtures, hybrid choice models, hidden Markov models; Monte Carlo simulation; Bayesian methods.
Traffic Flow Theory	Macroscopic and microscopic characteristics of flow, speed, and density; statistical distribution of traffic characteristics; time-space diagram; shock wave analysis; queuing theory; bottleneck analysis; application of traffic flow theory to design and control of traffic; traffic simulation; existing tools and software.
Transportation Data Analysis	Methods and statistics of model estimation; linear and nonlinear regression; error propagation and parameter sensitivity analysis; analysis of variance and its applications; hypothesis testing; questionnaire design; sampling; advanced data analysis techniques.
Traffic Control and Operation	Traffic control at road segments and intersections; traffic signal theory; signal actuation and coordination; multimodal signal operation; freeway control (ramp metering); roundabout control; capacity analysis; urban traffic management; relevant ITS technologies in vehicle detection and advanced control systems.
Transportation Safety Analysis	Traffic safety challenges and influencing factors; safety impact studies and design of countermeasures; safety in cross-section and roadside design; safety auditing; traffic conflict analysis and other surrogate techniques; safety indices; crash prediction methods; implications of ITS concepts for traffic safety.
Sustainable Transportation	Environmental, economic, and social impacts of transportation systems; design and evaluation of multimodal networks using sustainability metrics; estimation and modeling of energy consumption and emissions; policy instruments for emissions mitigation; smart technologies, electrification, intelligent mobility, and data-driven planning for sustainable transportation.
Pavement Structural Design	Pavement-vehicle interaction; mechanics of pavement response; stress analysis in flexible and rigid pavements; nonlinear analysis; fatigue and permanent deformation; back-calculation of layer moduli; mechanistic-empirical design methods; theories of pavement behavior; design of flexible and rigid pavements for highways and airports; performance evaluation; reliability in design and construction; pavement evaluation and cost analysis.
Pavement Materials Analysis and Design	Nature, engineering characteristics, and selection of pavement materials; hot and cold asphalt mix design, including Marshall and Superpave; composition, behavior, production, construction, and performance of bituminous materials and mixtures; concrete mixes for rigid pavements; durability of concrete and asphalt mixes; polymers and additives; material characterization; simulation of in-service conditions; fatigue cracking and plastic deformation modeling under repetitive loading; constitutive laws; accelerated conditioning and loading; durability testing; performance-based evaluation.
Pavement Management and Maintenance	Transportation asset management; network and project level pavement management; mapping and facility management systems; field evaluation methods and equipment; performance modeling; maintenance and rehabilitation strategies; nondestructive testing for structural evaluation; rehabilitation design; recycling and overlay design; priority ranking; quality control and assurance; performance-based maintenance specifications.

Water Resources Engineering

Area	Topics

Subsurface Flow and Transport	Storage mechanisms; moisture distribution; Darcy's law; recharge and infiltration; well hydraulics; mechanisms of contaminant transport.
Hydraulic Structures and Dam Design	Open channel design; water distribution network design; culvert hydraulic design; gravity and earth dam design.
Engineering Hydrology	Hydrological cycle; unit hydrograph; rainfall-runoff relationships; hydrological models; frequency analysis.

Environmental Engineering

Area	Topics
Waste Management	Waste characteristics, handling, collection, transportation, and disposal; design of landfills; leachate and gas production; conversion of waste into energy; recycling of waste materials.
Environmental Chemistry	Water chemistry; chemical thermodynamics; chemical equilibrium and precipitation; chemical kinetics and modeling; acid-base systems; redox chemistry.
Physicochemical Environmental Processes	Theory, modeling, and applications of physical and chemical processes, including coagulation, flocculation, sedimentation, softening, membrane filtration, adsorption, absorption, fluoridation, gas transfer, disinfection, and advanced oxidation.
Biological Environmental Processes	Microbial growth kinetics and bioenergetics; theory, modeling, and applications of biological processes in water treatment, wastewater treatment and reuse, composting, hazardous waste treatment, and subsurface bioremediation.
Quantitative Sustainability Assessment	Theory, modeling, and applications of quantitative sustainability assessment in civil and environmental engineering, focusing on life cycle assessment (LCA), life cycle costing (LCC), and related tools for evaluating environmental, economic, and social trade-offs in the planning and optimization of infrastructure systems.

Annex B. Oral exam: what the panel looks for

At the end of the oral, the panel assesses you on the spot on the four criteria below. The descriptors show what each level looks like.

Criterion	Strong	Adequate	Weak
Command of fundamentals	Accurate and complete; minor slips only	Correct on core principles, with some gaps	Material errors or gaps in core principles
Depth under follow-up questions	Extends answers correctly without prompting	Extends answers with some prompting	Cannot go beyond first answers
Integration across the three areas	Links the areas correctly and applies them to unfamiliar problems	Makes the main links when prompted	Treats the areas as unrelated or links them incorrectly
Clarity of explanation	Clear, precise, and well organized	Understandable, with minor lapses	Unclear or inaccurate in ways that obscure the reasoning