



Integrated Road Design and Engineering Course

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Overview

Integrated Road Design and Engineering Course is a ten-day advanced programme for highway and transport engineers, civil engineers, road designers, infrastructure project managers, pavement engineers, drainage specialists, traffic engineers, and public-works professionals. Participants connect project definition, surveys, geometric design, traffic, safety, geotechnics, earthworks, pavement, drainage, utilities, digital coordination, specifications, cost, quality, and maintenance, leaving with an Integrated Road Design Basis and Review Package. Agile Leaders Training Center presents road engineering as a coordinated, context-sensitive, performance-led design workflow.

Who Should Attend

- Highway and road designers responsible for alignments and cross sections
- Traffic and safety engineers coordinating operations and user needs
- Pavement, geotechnical, drainage, and utility specialists
- Project managers and design coordinators managing multidisciplinary interfaces
- Public-works and asset teams reviewing road investments and deliverables

The course assumes civil-engineering or infrastructure experience. It develops design and review capability but does not replace local standards, licensed calculations, surveys, environmental approvals, safety audits, or professional design certification.

Departments and Industries

The course supports organisations that plan, design, deliver, operate, or renew road infrastructure.

- Road authorities, municipalities, and transport agencies
- Engineering consultants and design-build contractors
- Infrastructure developers and programme-management offices
- Utilities, industrial developments, ports, and logistics corridors
- Asset management, maintenance, quality, and safety teams

Learning Objectives

By the end of this course, participants will be able to:



- Build a traceable road-design basis from project needs and site data
- Develop and review horizontal, vertical, and cross-section geometry
- Integrate traffic operations, intersections, access, and safety performance
- Coordinate earthworks, geotechnics, pavement, drainage, and utilities
- Control digital models, quantities, specifications, cost, risk, and quality
- Assemble an Integrated Road Design Basis and Review Package

Course Agenda

Day 1: Project Definition Context and Design Basis

- Road function, users, context, network role, and service objectives
- Applicable criteria, standards hierarchy, departures, and approvals
- Stakeholder, environmental, land, utility, and operational constraints
- Design speed, vehicle, demand horizon, and performance measures
- Road design basis and criteria register

Day 2: Surveys Data and Corridor Development

- Topographic, cadastral, utility, traffic, geotechnical, and hydrology data
- Data quality, coordinate systems, control, metadata, and gaps
- Terrain, constraints, desire lines, and corridor options
- Multicriteria comparison of alignment alternatives
- Survey brief and corridor-option evaluation

Day 3: Horizontal Alignment and Sight Distance

- Tangents, circular curves, transitions, and stationing
- Superelevation, widening, side friction, and speed consistency
- Stopping, decision, passing, and intersection sight distance
- Roadside constraints and horizontal-alignment coordination
- Horizontal geometry review and exception log

Day 4: Vertical Alignment and Cross Sections

- Grades, crest and sag curves, clearance, and profile control
- Coordination of horizontal and vertical alignment
- Lanes, shoulders, medians, verges, slopes, curbs, and shared modes
- Crossfall, drainage path, barriers, and roadside recovery
- Profile and typical-section design review



Day 5: Intersections Access Traffic and Safety

- Traffic demand, capacity, queues, level of service, and reliability
- At-grade intersection form and control selection
- Roundabouts, interchanges, ramps, weaving, and merge-diverge areas
- Access management, pedestrians, cyclists, transit, and heavy vehicles
- Safety performance, human factors, and design-stage audit readiness

Day 6: Geotechnics Earthworks and Slope Coordination

- Ground model, investigation needs, variability, and engineering inputs
- Cut, fill, borrow, spoil, shrinkage, bulking, and mass haul
- Subgrade treatment, improvement, stabilization, and settlement
- Slope stability, retaining needs, erosion, and constructability
- Earthworks quantities, risk register, and geotechnical interfaces

Day 7: Pavement Design and Materials

- Traffic loading, subgrade support, climate, and performance objectives
- Flexible and rigid pavement system selection
- Layer functions, materials, drainage, joints, and shoulders
- Mechanistic, empirical, and catalogue-design awareness
- Whole-life option comparison and pavement-design record

Day 8: Surface Water Subsurface Drainage and Resilience

- Catchments, design storms, runoff, conveyance, and outfalls
- Cross drainage, culverts, channels, inlets, and detention
- Pavement drainage, edge drains, filters, outlets, and maintainability
- Flood routes, erosion, water quality, and climate resilience
- Drainage schedule and hydraulic-interface review

Day 9: Utilities Digital Design and Deliverables

- Utility detection, protection, diversion, clearance, and staging
- Structures, lighting, signs, markings, ITS, and landscape interfaces
- 3D corridor models, data exchange, naming, versioning, and federation
- Model checks, clash review, quantities, drawings, and specifications
- Plans, specifications, estimates, and coordinated issue package



Day 10: Constructability Cost Quality and Lifecycle Review

- Construction sequencing, traffic management, temporary works, and access
- Cost estimate, value engineering, uncertainty, and change control
- Design verification, validation, independent review, and quality records
- Maintenance, inspection, renewal, handover, and asset information
- Capstone Exercise: Integrated Road Design Basis and Review Package

Practical Exercises

The course uses suggested exercises to turn multidisciplinary inputs into coordinated road-design decisions.

- Suggested activity: build a design-basis register and compare corridor options.
- Suggested activity: review alignment, sight distance, profile, and cross sections.
- Suggested activity: coordinate an intersection with traffic, safety, drainage, and user requirements.
- Suggested activity: balance earthworks and compare pavement and drainage options.
- Suggested activity: complete a model, quantities, specifications, risk, and quality review.

FAQs

What does comprehensive road design include?

It links project objectives and survey data with geometry, traffic, safety, geotechnics, earthworks, pavement, drainage, utilities, digital models, specifications, cost, quality, construction, and maintenance.

Is one geometric standard suitable for every road?

No. Criteria depend on jurisdiction, road function, context, users, speed, demand, terrain, environment, safety objectives, and approval requirements.

How are pavement and drainage connected?

Water affects subgrade and pavement performance, so surface runoff, infiltration, subsurface drainage, filters, outlets, maintenance access, and pavement details must be coordinated.

Does the course teach specific road-design software?

It teaches tool-neutral model coordination, checking, data exchange, quantities, and deliverable controls. Software commands and vendor certification are outside its scope.

Does completing the course authorise professional road design?

No. Projects require qualified professionals, current local criteria, verified data, calculations, independent checks, approvals, and documented design responsibility.



Conclusion

Participants return with an Integrated Road Design Basis and Review Package linking objectives, criteria, data, geometry, operations, safety, earthworks, pavement, drainage, utilities, digital models, quantities, specifications, cost, quality, construction, and lifecycle needs. It provides a traceable structure for coordinated design decisions.



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