REDLINES INDICATE CHANGE FROM PREVIOUS SYLLABUS

Civil engineering examinations

Group A - Compulsory examinations (six required)

16-Civ-A1 Elementary Structural Analysis

Computation of reactions, shearing forces, normal forces, bending moments, and deformations in determinate structures. Influence lines for moving loads. Moment distribution, slope deflection, and energy methods for indeterminate structures without side sway.

Textbooks (most recent edition is recommended):

Primary Text:

- Hibbeler, R. C. Structural Analysis. 8th edition. Prentice Hall, 2012. ISBN-10: 013257053X, ISBN-13: 9780132570534
- Secondary Text:
- Leet, K. M. and Uang, C.-M. Fundamentals of Structural Analysis, 4th edition. McGraw-Hill, 2011. ISBN-13: 9780073401096
- Kassimali, A. Structural Analysis, SI Edition, 4th Edition. Nelson, 2011. ISBN-10: 0495295671, ISBN-13: 978-0495295679

16-Civ-A2 Elementary Structural Design

Limit states design concepts. Loading due to use and occupancy, snow, wind, and earthquake. Design of tension members, beams, and columns in timber and steel. Design of timber connections and simple welded and bolted connections in steel. Design of determinate reinforced concrete beams and columns.

Textbooks (most recent edition is recommended):

- Grondin, G. Y. and Kulak, G. L. Limit States Design in Structural Steel 9th Edition. Canadian Institute of Steel Construction, 2010. ISBN-13: 978-088811-157-9
- Brezev, S. and Pao, J. Reinforced Concrete Design: A Practice Approach, 2nd Edition. PrenticeHall, 2013. ISBN-10: 1256873845, ISBN-13: 9781256873846

- Handbook of Steel Construction. Current edition. Canadian Institute of Steel Construction. http://www.cisc-icca.ca
- Concrete Design Handbook. Current edition. Canadian Portland Cement Association. www.cement.ca
- Wood Design Manual. Current edition. Canadian Wood Council. www.cwc.ca
- Challaal, O. Structure en béton armé, 2e édition. Presse de l'Université du Québec, 2012. ISBN13: 978-2760533806
- Calcul des charpentes d'acier, Tome 1. Edition actuelle. Institut Canadien de la construction en acier. http://quebec.cisc-icca.ca/
- Manuel de calcul charpentes en bois. Edition actuelle. Conseil Canadien du bois. www.cwc.ca

16-Civ-A3 Elementary Environmental Engineering NOT APPLICABLE TO PEO

Population, economic growth, industrialization, urbanization and energy-use, as causes of environmental pollution. The characteristics of particles, chemistry of solutions and gases, material balances, reaction kinetics, microbiology and ecology, as related to the environment.

The application of environmental principles (technical and non-technical) to: water resource management, water and wastewater treatment, air pollution control, solid waste management, environmental impact assessment, sustainable development and environmental ethics.

Textbooks (most recent edition is recommended):

- Mines, R. and Lackey, L. Introduction to Environmental Engineering. Prentice Hall, 2010. ISBN10: 0132347474, ISBN-13: 9780132347471

16-Civ-A4 Geotechnical Materials and Analysis

Materials: Origin of soils, soil identification and classification. Compaction. Permeability, pore water pressure and effective stress. Compressibility and consolidation. Shear strength, stress paths, and critical states. Frost action. Associated laboratory tests.

Analysis: Elastic stress distribution, settlements, times of settlements. Introductory analysis of lateral earth pressures, bearing capacity, and slopes. Seepage; well flow and confined 2-D flow problems.

Textbooks (most recent edition is recommended):

- Budhu, M. Soil Mechanics and Foundations, 3rd edition. John Wiley and Sons, Inc., 2011. ISBN13: 978-0-470-55684-9
- Craig, R. F. Craig's Soil Mechanics, 8th Edition. CRC Press, 2012. ISBN-13: 9780415561266
- Das, B.J. Principles of Geotechnical Engineering, 8th Edition. Nelson, 2014. ISBN-10: 1133108660, ISBN-13: 9781133108665

16-Civ-A5 Hydraulic Engineering

Dimensional analysis and hydraulic models. Application of continuity, momentum and energy principles. Steady, closed conduit flow in single pipes and pipe networks. Steady, open-channel flow under uniform and gradually varied conditions, control sections, hydraulic jumps, and energy dissipaters. Hydraulic transients; surges and water hammer in closed conduits, surface waves in open channels. Concepts and principles of turbo machinery, especially centrifugal pumps; similarity relations and cavitation; operation of pump-and-pipe systems. Introductory concepts of hydraulic structures, including environmental aspects of hydraulic works and water quality management.

Textbooks (most recent edition is recommended):

- Finnermore, E. J. and Franzini, J. B., Fluid Mechanics with Engineering Applications, 10th Edition. McGraw-Hill Science, 2001.
- Houghtalen, Robert and Osman Akan, A. and Hwang, Ned H. C. Fundamentals of Hydraulic Engineering Systems, 4th Edition. Prentice Hall, 2009.

16-Civ-A6 Highway Design, Construction, and Maintenance WAS 98-CIV-B7

Route surveying. Geometric design, including horizontal and vertical alignment and intersections. Properties of road-making materials. Asphalt mix design. Structural design for flexible and concrete pavements. Earthworks and drainage. Pavement CUT-OFF ON WEBSITE (NO CHANGE FROM 98-CIV-B7)
Pavement management, including condition evaluation, maintenance, and rehabilitation.

Textbooks (most recent edition is recommended):

- Mannering, F. L. and Washburn, S. S. and Kilareski, W. P. Principles of Highway Engineering and Traffic Analysis, 4th Edition, Wiley, 2008.

- Roess, R. P. and Prassas, E. S. and McShane, W. R. Traffic Engineering, 3rd Edition, Prentice Hall, 2004.
- AASHTO Guide for Design of Pavement Structures. 4th Edition, American Association of State Highway and Transportation Officials (AASHTO), 1998.
- The Asphalt Handbook. Manual Series # 4 (MS-4), Asphalt Institute, 2007. www.asphaltinstitute.org.
- Geometric Design Standards for Canadian Roads. Roads and Transportation Association of Canada, Ottawa, 2011. www.tac-act.ca
- Shahin, M.Y., Pavement Management for Airports, Roads and Parking Lots. 2nd Edition, Springer, 2006.
- Handbook of Steel Drainage & Highway Construction Products. Corrugated Steel Pipe Institute, 2007. www.cspi.ca

Group B - Optional examinations (three required)

16-Civ-B1 Advanced Structural Analysis

Analysis of statically indeterminate structures, including trusses, beams, frames, and arches. Formulation of flexibility (force) and stiffness (displacement), and matrix methods of analysis.

Textbooks (most recent edition is recommended):

Primary Text:

- Hibbeler, R.C. Structural Analysis. 8th Edition. Prentice Hall, 2012. ISBN-10: 013257053X, ISBN-13: 9780132570534

Secondary Text:

- Leet, K.M. and Uang, C.M. Fundamentals of Structural Analysis. 4th Edition, McGraw-Hill, 2011

16-Civ-B2 Advanced Structural Design

Limit states design of steel members and connections in continuous framing; of slabs and footings in reinforced concrete, of pre-stressed concrete members and assemblies; and of composite steel-concrete construction. Influence of creep and shrinkage in concrete construction.

Textbooks (most recent edition is recommended):

- Grondin, G. Y. and Kulak, G. L. Limit States Design in Structural Steel 9th Edition. Canadian Institute of Steel Construction, 2010. ISBN-13: 978-088811-157-9
- Brezev, S. and Pao, J. Reinforced Concrete Design: A Practice Approach, 2nd Edition. PrenticeHall, 2013. ISBN-10: 1256873845, ISBN-13: 9781256873846
- Handbook of Steel Construction. Current edition. Canadian Institute of Steel Construction. http://www.cisc-icca.ca
- Concrete Design Handbook. Current edition. Canadian Portland Cement Association. www.cement.ca
- CAN/CSA-S6-06 Code canadien sur le calcul des ponts routiers
- Design Manual. Current edition. Canadian Precast/Prestressed Concrete Institute.
- Challaal, O. Structure en béton armé, 2e édition. Presse de l'Université du Québec, 2012. ISBN13: 978-2760533806
- Calcul des charpentes d'acier, Tome 1. Edition actuelle. Institut Canadien de la construction en acier. http://quebec.cisc-icca.ca/

16-Civ-B3 Geotechnical Design

Characterization of natural deposits, subsurface investigation, and field measurements. Design procedures for settlement and stability of shallow and deep foundation systems in soil and rock. Design of excavations and retaining structures; slopes and embankments. Geoenvironmental design topics covering seepage through dams and landfills and the control of seepage through the use of filters and low permeability layers including the use of geosynthetic liners and filters.

Textbooks (most recent edition is recommended):

- Budhu, M. Soil Mechanics and Foundations. 3rd Edition, John Wiley and Sons, Inc. 2010.
- Craig, R. F. and Knappett, J. Craig' Soil Mechanics. 8th Edition, CRC Press, 2012.

16-Civ-B4 Engineering Hydrology

Hydrologic processes: precipitation and snow melt, infiltration, evaporation and evapotranspiration, ground-water flow, runoff. Point and area estimates of precipitation. Stream flow measurement. Runoff hydrographs, unit hydrographs, conceptual models of runoff, and basics of hydrologic modeling.

Channel system: reservoir and lake routing, channel routing and flood wave behavior Statistical methods: frequency and probability with application to precipitation, floods, and droughts. Urban and highway drainage structure design. ADD

Textbooks (most recent edition is recommended):

- Fetter, C. W. Applied Hydrogeology, 4th Edition, Prentice Hall, 2000.
- Domenico, P. A. and Schwartz, F. W. Physical And Chemical Hydrogeology, 2nd Edition, John Wiley & Sons, Inc. 1997.

16-Civ-B5 Water Supply and Wastewater Treatment

Physical, chemical, and microbiological characteristics of water and wastewater. Regulation of water quality for supply and discharge, elements of receiving water characterization and specification of effluent limits. Elements of water and wastewater treatment including, coagulation, flocculation, filtration, settling, softening, disinfection, fluoridation, taste and odour control and biological processes. Sludge disposal.

Quantity and quality estimation of water and wastewater. Water storage and distribution systems. Wastewater collection systems.

Textbooks (most recent edition is recommended):

- Shammas, N. K. and Wang, L. K. Fair, Geyer, and Okun's Water and Wastewater Engineering: Water Supply and Wastewater Removal, 3rd Edition, Wiley, October 2010.
- American Water Work Association and American Society of Civil Engineers. Water Treatment Plant Design 4th Edition, McGraw-Hill Professional, 2004.
- Hammer, M. J. Sr. and Hammer, M. J. Jr. Water and Wastewater Technology. 6th Edition, Prentice Hall, 2007.

16-Civ-B6 Urban and Regional Planning

The context of urban planning; basic planning studies, including population, economic, and land-use studies. The strategy, development, and engineering associated with comprehensive plans and full infrastructure development including housing, industry, transportation, recreation, water and sewerage, social service components. The use of analytical procedures and data systems. Plan

implementation measures and controls, including zoning, land subdivision, and urban renewal. The role of the planner in directing and monitoring urban and regional development.

Textbooks (most recent edition is recommended):

- Hodge, G. and Gordon, D. Planning Canadian Communities. 5th Edition, Nelson College Indigenous, 2007. ISBN-10: 0176252428, ISBN-13: 978-0176252427
- Wang, X. and Hofe, R. V. Research Methods in Urban and Regional Planning. 1st Edition, Springer, 2007.
- Levy, J. M. Contemporary Urban Planning, 10th edition, Prentice Hall, 2013. ISBN-10: 0205951627 ISBN-13: 9780205951628
- Macionis, J. J. and Parrillo, V. N. Cities and Urban Life, 6th Edition, Pearson,2012.

16-Civ-B7 Transportation Planning and Engineering WAS 98-CIV-A6

Socio-economic impacts on transportation, demand modelling. Characteristics of transportation systems; rail, road, air, water, and pipelines. Transportation systems in Canada. Characteristics of traffic flow, queuing theory, capacity analysis, space-time diagrams. Urban traffic management, traffic signals, pedestrians, accidents. Intelligent transportation systems.

Textbooks (most recent edition is recommended):

- Mannering, F. L. and Washburn, S. S. and Kilareski, W. P. Principles of Highway Engineering and Traffic Analysis, 4th Edition, Wiley, 2008.
- Roess, R. P. and Prassas, E. S. and McShane, W. R. Traffic Engineering, 3rd Edition, Prentice Hall, 2004.
- C.S. Papacostas, C. S. and Prevedouros, P. D. Transportation Engineering and Planning. 2nd Edition, Prentice-Hall, 2000.
- Note: No available text, including the one recommended, adequately covers all topics in the Syllabus. Candidates will have to seek more depth on: “Deterministic” queuing theory; rail, air, water, and pipeline systems; accidents.
- Fricker, J. D. and Whitford, R. K. Fundamentals of Transportation Engineering, 1st Edition, Pearson / Prentice Hall, 2004.

16-Civ-B8 Management of Construction

Size and structure of Canadian design and construction sectors. Methods of project delivery, project management, and organizational form. Site investigation. Estimating and bidding, project planning, scheduling and control, activity planning. Safety practices and regulations, insurance, quality assurance and control. Labour relations. Contract administration. Litigation.

Textbooks (most recent edition is recommended):

- Knutson, K. and Schexnayder, C. and Fiori, C. and Mayo, R. Construction Management Fundamentals. 2nd Edition, McGraw-Hill, 2008.
- Provincial Health and Safety Act, for the candidate's jurisdiction.

16-Civ-B9 The Finite Element Method

Introductory concepts in discretization techniques for solving Civil Engineering problems. The finite element method including; derivation of element and global force-displacement equations employing both the variational and direct stiffness methods, criteria for selection of approximating functions, available finite elements, general constitutive relations, substructure analysis and constraint equations, numerical methods of solution. Finite element applications to structural, geotechnical, and hydraulic engineering analysis.

Textbooks (most recent edition is recommended):

Primary Text:

- Logan, D. L. A First Course in the Finite Element Method. 3rd Edition, Thomson Learning, 2011.

Secondary Text:

- Fish, J. and Belytschko, T. A First Course in the Finite Elements. Wiley, 2007. Zienkiewicz, O. C. and Taylor, R. L. and Zhu, J. Z. The Finite Element Method: Its Basis and Fundamentals. 7th Edition, Butterworth-Heinemann, 2013.

16-Civ-B10 Traffic Engineering REWRITTEN, NO CHANGE IN SCOPE

Introductory concepts in traffic engineering and control. Vehicle – driver – roadway environment; theories of traffic flow; application of queuing theory, capacity and delay analysis of unsignalized and

signalized intersections; design optimization of isolated and co-ordinated traffic signal timing plans; traffic simulation model calibration and application; and field data collection and analysis. State-of-practice analysis and design methods.

Textbooks (most recent edition is recommended):

- Roess, R. P. and Prassas, E. S. and McShane, W. R. Traffic Engineering. 4th Edition, Prentice Hall, 2011.
- Garber, N. J. and Hoel, L. A. Traffic and Highway Engineering. 3rd Edition, Thomson Learning, 2001.
- Mannering, F. L. and Washburn, S. S. and Kilareski, W. P. Principles of Highway Engineering and Traffic Analysis. 4th Edition, Wiley, 2008.

16-Civ-B11 Structural Materials NEW

Properties and uses of non-renewable and recycled materials; energy efficient design and green material selection. Linear and nonlinear material behavior, time-dependent behavior; structural and engineering properties of structural metals; behavior of wood; production and properties of concrete; bituminous materials, ceramics, plastics; advanced composite materials; cements and aggregates: types, chemistry, microstructure. Sustainability and durability issues of structural materials.

Textbooks (most recent edition is recommended):

- Somayji, S. Civil Engineering Materials. Prentice Hall, 1995.

16-Civ-B12 Risk and Safety in Civil Engineering NEW

Introductory concepts in fundamentals of uncertainty, risk, risk analysis, safety and decision-making in civil engineering. Risk and safety issues related to planning, design, construction/implementation and operations in the context of environmental, transportation, structures, geotechnical, natural hazards or other civil engineering disciplines.

Textbooks (most recent edition is recommended):

- Ang, A. H. and Tang, W. H. Probability Concepts in Engineering. 2nd Edition, Wiley, 2006.

- Benjamin, J. R. and Cornell, C. A. Probability, Statistics and Decisions for Civil Engineers. McGraw-Hill Inc., 1970.
- Jordaan. Decisions Under Uncertainty: Probabilistic Analysis for Engineering Decisions. 1st Edition, Cambridge University Press, 2011.

16-Civ- B13 Numerical Methods NEW

Numerical solution of systems of linear and non-linear algebraic equations, eigenvalue problems. Numerical solutions of systems of ordinary and partial differential equations. Initial value and boundary value problems. Finite difference and finite element methods. Numerical stability.

Textbooks (most recent edition is recommended):

- Chapra, S. and Canale, R. Numerical Methods for Engineers 6th Edition, Mc-Graw-Hill, 2009.

16-Civ- B14 Open Channel Hydraulics NEW (07-WRSE-B4)

Analysis and characteristics of flow in open channels (natural and artificial); channel design considerations including uniform flow (rivers, sewers), flow measuring devices (weirs, flumes), gradually varied flow (backwater and other flow profiles, flood routing), rapidly varied flow (hydraulic jump, spillways), and channel design problems (geometric considerations, scour, channel stabilization, sediment transport).

Textbooks (most recent edition is recommended):

- Chow, V.T. Open-Channel Hydraulics. Blackburn Press, 2009.

16-Civ- B15 Coastal Engineering NEW

Basic wave theory, wave measurement, wave statistics, wave record analysis, wave transformation, tides, water levels and storm surges. Design of breakwaters and ocean structures; hydraulic and numerical coastal models. Design of a breakwater, design of a hydraulic model of the breakwater and testing with the hydraulic model to determine breakwater stability. Environmental considerations, coastal zone management, coastal sediment transport and design in the coastal zone.

Textbooks (most recent edition is recommended):

- Sorensen, R. M. Basic Coastal Engineering. Springer, 2005.
- Reeve, D. and Chawick, A. and Fleming, C. Coastal Engineering: Processes, Theory and Design Practice. 2nd edition, Taylor and Francis, 2012.

16-Civ- B16 Advanced Environmental Engineering NEW

Population, economic growth, industrialization, urbanization and energy-use, as causes of environmental pollution. Mass and energy balance for environmental engineering systems under steady state and unsteady state conditions. Physical and transport properties of homogeneous and heterogeneous mixtures. Contaminant partitioning and transport in air, water and solids. Characteristics of particles, chemistry of solutions and gases, material balances, reaction kinetics, microbiology and ecology, as related to the environment. Application of environmental principles (technical and non-technical) to: water resource management, water and wastewater treatment, air pollution control, solid waste management, environmental impact assessment, and environmental ethics. Thermal pollution, noise pollution, greenhouse effect, acid precipitation, ozone depletion, air toxics, and ground-level ozone and fine particulates (photochemical smog). Sustainable development, life cycle analysis, and principles of environmental quality objectives, standards and guidelines.

Applicable federal and provincial environmental regulations. Analysis of environmental impact using technical and non-technical parameters. Environmental impact assessment legislation and regulatory framework. Environmental impact assessment applied to solid and liquid waste management, effluent control, air pollution control, urban development, and transportation systems. Environmental audits. Introduction to geographical information systems (GIS). Environmental management systems (EMS) ISO 14000/14001 standards, and applications. Principles of sustainable development and implications of finite biosphere and complexities for engineering design and decision-making. Design of controlled environments to enhance health and protection of natural resources for sustainable development. Resource problems and design with ecological, economic, demographic and social dimensions. Techniques to integrate knowledge and define policy. Risk analysis. Life cycle analysis. Risk management

Textbooks (most recent edition is recommended):

- Mines, R. and Lackey, L. Introduction to Environmental Engineering. Prentice Hall, 2010. ISBN10: 0132347474, ISBN-13: 9780132347471
- Sarte, S. B. Sustainable Infrastructure: The Guide to Green Engineering and Design. Wiley, 2010.

- Carroon, J. Sustainable Preservation: Greening Existing Buildings. Wiley, 2010.
- Pearce, A. and Ahn, Y.H. Sustainable Buildings and Infrastructure: Paths to the Future. Routledge, 2012.

16-Civ-B17 Intelligent Transportations Systems NEW (07-TRA-B2)

Modern techniques to optimize the performance of a transportation system with emphasis on traffic networks in congested urban areas; Intelligent Transportation Systems; analysis of advanced traffic management and information systems; history of ITS; ITS user services and subsystems; ITS interoperability and system architecture; enabling technologies for ITS; introductory concepts in telecommunication technologies for ITS; introductory concepts in control theory for transportation systems; traffic flow modelling; static and dynamic transportation network analysis; incident detection; freeway control; and surface street network control.

Textbooks (most recent edition is recommended):

- Cascetta, E. Transportation Systems Analysis: Models and Applications. 2nd Edition, Springer, 2009.

16-Civ-B18 Geomatics NEW (07-WRSE-A7-2/07-TRA-B10|)

Satellite-based positioning systems (GPS); observations and development of mathematical models used for absolute and differential static and kinematic positioning; error analysis; quantitative remote sensing methods using optical, infrared and microwave radiation; physical principles, including governing equations; imaging system geometries; space and airborne sensor systems; radiometric corrections, including calibration and atmospheric correction; geometric corrections; geographic Information Systems (GIS); characteristics of GIS data structures and database management systems; applications to map projections; geodetic datums; coordinate systems; georeferencing; spatial modelling and analysis.

Textbooks (most recent edition is recommended):

- Wolf, P. R. and Ghilani, C. D. Elementary Surveying: An Introduction to Geomatics. 13th Edition, Prentice Hall, 2010.
- Chang, K.-T. Introduction to Geographic Information Systems. 6th Edition, McGraw Hill, 2011

16-Civ-B19 Foundation Engineering NEW (07-STR-B5)

Design of spread footings, rafts and pile foundations according to modern professional practice. Procedures for estimation of bearing capacity and settlements, both immediate and long term, design of structures associated with foundation excavations, drainage and site developments such as braced cuts, retaining walls and anchored sheet pile bulkheads. The role of geological history, penetration testing and simple index properties in prediction of foundation performance.

Textbooks (most recent edition is recommended):

- Canadian Geotechnical Society. Canadian Foundation Engineering Manual. 4th Edition, BiTech Publishers, 2006. www.cgs.ca
- Das, B. M. Principles of Foundation Engineering. 7th Edition, Thomson-Engineering, 2007.
- L. Reese, L. C. and Isenhower, W. M. and Wang, S.-T. Analysis and Design of Shallow and Deep Foundations. 1st Edition, Wiley, 2005.
- Craig, R. F. Craig's Soil Mechanics, 8th Edition. CRC Press, 2012. ISBN-13: 9780415561266

16-Civ-B20 Building Engineering and Services NEW (07-STR-B6)

Functioning of the building enclosure: behaviour of building elements and their sub-assemblies under differential temperature and pressure stresses; fundamentals of acoustics; nature and use of building materials; response of building materials to climatic cycles, radiation, precipitation, heating and cooling; principles of building service systems, including electrical, gas, communications, service-water supply and distribution; introduction to plans, codes, and standards for utility distribution systems.

The range of requirements that drive a building's design including architecture, engineering, constructability, building codes, and budget. The influence of technology, energy conservation, and environmental constraints on built form. Integration of structural and mechanical systems into building types including residential, office, commercial, and retail.

Textbooks (most recent edition is recommended):

- Chadderton, D. Building Services Engineering. 6th edition, Routledge, 2013. ISBN-13: 978415699310.

16-Civ-B21 Advanced Structural Mechanics NEW

Stress and equilibrium conditions, strain and compatibility conditions, stress-strain relations and yield/failure criteria are considered in the context of civil engineering materials. Two-and three-dimensional elasticity theory is developed, with an introduction to the use of tensor notation. Advanced topics in bending, shear and torsion of beams are also covered, as is elementary plate bending theory. Energy methods including virtual work, potential energy, strain energy, and related approaches. Importance of dynamic loads in the design of structures.

Textbooks (most recent edition is recommended):

- Hjelmstad, K. D. Fundamentals of Structural Mechanics. 2nd Edition, Springer, 2005.
- Johnson, D. Advanced Structural Mechanics, 2nd edition, Thomas Telford, 2000. ISBN-13: 9780727728609.

16-Civ-B22 Dynamics of Engineering Structures NEW (07-STR-A6-3/07--STR-B10)

Structural dynamics related to practical analysis of earthquake-resisting structures. Analysis of single-degree systems include: free vibration, response to time-dependent forces, response to earthquake support motions, response spectra, hysteresis models, and computation of inelastic response. Concepts of energy dissipation, ductility, and inelastic displacement demands. Multi-degree building systems. Earthquake design provisions in national codes including: design loads, and special provisions for earthquake-resisting reinforced concrete and structural steel systems and members.

Textbooks (most recent edition is recommended):

Primary Text:

- Filiatrault, A. Tremblay, R. and Christopoulos, C. and Foltz, B. and Pettinga, D. Elements of Earthquake Engineering and Structural Dynamics, Presses Internationales Polytechnique, 3rd Edition, 2013. ISBN-13: 9782553016493.

Secondary Text:

- Chopra, A. K. Dynamics of Structures, Theory and Applications to Earthquake Engineering. 4th Edition, Prentice Hall, 2012.

- Humar, J. L. Dynamics of Structures. 3rd Edition, CRC Press, 2012.
- Paultre, P. Dynamique des structures, application aux ouvrages de génie civil. Hermès-Lavoisier, 2004.

20-Civ-B23 Forensic Engineering and Rehabilitation NEW

Mechanisms of degradation of structures and forensic assessment of deteriorated structures; structural health monitoring and non-destructive evaluation of structures; repair strategies for deteriorated structures; designing stabilizing and strengthening techniques for structural elements.

Textbooks (most recent edition is recommended):

- No Referenced Textbooks

16-Civ-A3 Municipal and Environmental Engineering

PEO ONLY

Municipal infrastructure including, water supply, Unit process for water and wastewater disposal, water and waste Water treatment. roads and land development; population forecasting; demand analysis. Water supply; source development, transmission, storage, pumping, distribution networks. Sewerage and drainage; sewer and culvert hydraulics; collection networks; stormwater management. Maintenance and rehabilitation of water and wastewater systems; buried pipe design; optimization of network design.

2016 PEO CIVIL ENGINEERING EXAMINATIONS SUGGESTED TEXT BOOK REFERENCE LIST

NOTE: Please feel free to use the most recent edition of textbooks referenced in this list

16-Civ-A1Elementary Structural Analysis

Primary Reference:

Hibbeler, R. C. Structural Analysis. 8th edition. Prentice Hall, 2012. ISBN-10: 013257053X, ISBN-13: 9780132570534

Secondary References:

Leet, K. M. and Uang, C.-M. Fundamentals of Structural Analysis, 4th edition. McGraw-Hill, 2011. ISBN-13: 9780073401096

Kassimali, A. Structural Analysis, SI Edition, 4th Edition. Nelson, 2011. ISBN-10: 0495295671, ISBN-13: 978-0495295679

16-Civ-A2 Elementary Structural Design

Grondin, G. Y. and Kulak, G. L. Limit States Design in Structural Steel 9th Edition. Canadian Institute of Steel Construction, 2010. ISBN-13: 978-088811-157-9

Brezev, S. and Pao, J. Reinforced Concrete Design: A Practice Approach, 2nd Edition. Prentice-Hall, 2013. ISBN-10: 1256873845, ISBN-13: 9781256873846

Handbook of Steel Construction. Current edition. Canadian Institute of Steel Construction. http://www.cisc-icca.ca

Concrete Design Handbook. Current edition. Canadian Portland Cement Association. www.cement.ca

Wood Design Manual. Current edition. Canadian Wood Council. www.cwc.ca

16-Civ-A3 Municipal and Environmental Engineering PEO ONLY

Shammas, N.K. and Wang, L.K. (2011) Water Supply and Wastewater Removal. 3rd ed. Wiley, Hoboken, N.J. ISBN 978-0-470-41192-6

Viessman and Hammar, Perez and Chadik Water Supply and Pollution Control, 8th Edition, Harper Collins College Publishers 1988, ISBN no. 0-13-233717-7

Brière, François G. (1999) Drinking-Water Distribution, Sewage, and Rainfall Collection, Presses internationale Polytechnique, École Polytechnique de Montréal. ISBN number: 2-55300-796-5

McGhee, T.J., Water Supply and Sewerage, 6th Edition, McGraw-Hill Publishing Co. ISBN # 0-07-060938-1, 1991

Metcalf & Eddy Inc., Wastewater Engineering: Collection and Pumping of Wastewater, McGraw-Hill Publishing Co. ISBN # 0-07-041680-X, 1981

16-Civ-A4 Geotechnical Materials and Analysis

Budhu, M. Soil Mechanics and Foundations, 3rd edition. John Wiley and Sons, Inc., 2011. ISBN-13: 978-0-470-55684-9

Craig, R. F. Craig's Soil Mechanics, 8th Edition. CRC Press, 2012. ISBN-13: 9780415561266

Das, B.J. Principles of Geotechnical Engineering, 8th Edition. Nelson, 2014. ISBN-10: 1133108660, ISBN-13: 9781133108665

16-Civ-A5 Hydraulic Engineering

Finnermore, E. J. and Franzini, J. B., Fluid Mechanics with Engineering Applications, 10th Edition. McGraw-Hill Science, 2001.

Houghtalen, Robert and Osman Akan, A. and Hwang, Ned H. C. Fundamentals of Hydraulic Engineering Systems, 4th Edition. Prentice Hall, 2009.

16-Civ-A6 Highway Design, Construction, and Maintenance

Mannering, F. L. and Washburn, S. S. and Kilareski, W. P. Principles of Highway Engineering and Traffic Analysis, 4th Edition, Wiley, 2008.
Roess, R. P. and Prassas, E. S. and McShane, W. R. Traffic Engineering, 3rd Edition, Prentice Hall, 2004.
AASHTO Guide for Design of Pavement Structures. 4th Edition, American Association of State Highway and Transportation Officials (AASHTO), 1998.
The Asphalt Handbook. Manual Series # 4 (MS-4), Asphalt Institute, 2007. www.asphaltinstitute.org.
Geometric Design Standards for Canadian Roads. Roads and Transportation Association of Canada, Ottawa, 2011. www.tac-act.ca
Shahin, M.Y., Pavement Management for Airports, Roads and Parking Lots. 2nd Edition, Springer, 2006.
Handbook of Steel Drainage & Highway Construction Products. Corrugated Steel Pipe Institute, 2007. www.cspi.ca

16-Civ-B1 Advanced Structural Analysis

Primary Reference:
Hibbeler, R.C. Structural Analysis. 8th Edition. Prentice Hall, 2012. ISBN-10: 013257053X, ISBN-13: 9780132570534
Secondary References:
Leet, K.M. and Uang, C.M. Fundamentals of Structural Analysis. 4th Edition, McGraw-Hill, 2011

16-Civ-B2 Advanced Structural Design

Grondin, G. Y. and Kulak, G. L. Limit States Design in Structural Steel 9th Edition. Canadian Institute of Steel Construction, 2010. ISBN-13: 978-088811-157-9
Brezev, S. and Pao, J. Reinforced Concrete Design: A Practice Approach, 2nd Edition. Prentice-Hall, 2013. ISBN-10: 1256873845, ISBN-13: 9781256873846
Handbook of Steel Construction. Current edition. Canadian Institute of Steel Construction. http://www.cisc-icca.ca
Concrete Design Handbook. Current edition. Canadian Portland Cement Association. www.cement.ca
CAN/CSA-S6-06 Code canadien sur le calcul des ponts routiers
Design Manual. Current edition. Canadian Precast/Prestressed Concrete Institute.

16-Civ-B3 Geotechnical Design

Budhu, M. Soil Mechanics and Foundations. 3rd Edition, John Wiley and Sons, Inc. 2010.
Craig, R. F. and Knappett, J. Craig' Soil Mechanics. 8th Edition, CRC Press, 2012.

16-Civ-B4 Engineering Hydrology

Fetter, C. W. Applied Hydrogeology, 4th Edition, Prentice Hall, 2000.
Domenico, P. A. and Schwartz, F. W. Physical And Chemical Hydrogeology, 2nd Edition, John Wiley & Sons, Inc. 1997.

16-Civ-B5 Water Supply and Wastewater Treatment

Shammas, N. K. and Wang, L. K. Fair, Geyer, and Okun's Water and Wastewater Engineering: Water Supply and Wastewater Removal, 3rd Edition, Wiley, October 2010.
American Water Work Association and American Society of Civil Engineers. Water Treatment Plant Design" 4th Edition, McGraw-Hill Professional, 2004.
Hammer, M. J. Sr. and Hammer, M. J. Jr. "Water and Wastewater Technology. 6th Edition, Prentice Hall, 2007.

16-Civ-B6 Urban and Regional Planning

Hodge, G. and Gordon, D. Planning Canadian Communities. 5th Edition, Nelson College Indigenous, 2007. ISBN-10: 0176252428 , ISBN-13: 978-0176252427
Wang, X. and Hofe, R. V. Research Methods in Urban and Regional Planning. 1st Edition, Springer, 2007.
Levy, J. M. Contemporary Urban Planning, 10th edition, Prentice Hall, 2013. ISBN-10: 0205951627 ISBN-13: 9780205951628

Macionis, J. J. and Parrillo, V. N. Cities and Urban Life, 6th Edition, Pearson,2012.

16-Civ-B7 Transportation Planning and Engineering

Mannering, F. L. and Washburn, S. S. and Kilareski, W. P. Principles of Highway Engineering and Traffic Analysis, 4th Edition, Wiley, 2008.
Roess, R. P. and Prassas, E. S. and McShane, W. R. Traffic Engineering, 3rd Edition, Prentice Hall, 2004.
C.S. Papacostas, C. S. and Prevedouros, P. D. Transportation Engineering and Planning. 2nd Edition, Prentice-Hall, 2000.
Note: No available text, including the one recommended, adequately covers all topics in the Syllabus. Candidates will have to seek more depth on: "Deterministic" queuing theory; rail, air, water, and pipeline systems; accidents.

Fricker, J. D. and Whitford, R. K. Fundamentals of Transportation Engineering, 1st Edition, Pearson / Prentice Hall, 2004.

16-Civ-B8 Management of Construction

Knutson, K. and Schexnayder, C. and Fiori, C. and Mayo, R. Construction Management Fundamentals. 2nd Edition, McGraw-Hill, 2008.
Provincial Health and Safety Act, for the candidate's jurisdiction.
Hegazy, T. (2002) "Computer-Based Construction Project Management," Prentice Hall.
Nunnally, S.W. (2015) "Construction Methods and Management," Prentice Hall, 8th ed.

16-Civ-B9 The Finite Element Method

Primary Reference:
Logan, D. L. A First Course in the Finite Element Method. 3rd Edition, Thomson Learning, 2011.
Secondary References:
Fish, J. and Belytschko, T. A First Course in the Finite Elements. Wiley, 2007.
Zienkiewicz, O. C. and Taylor, R. L. and Zhu, J. Z. The Finite Element Method: Its Basis and Fundamentals. 7th Edition, Butterworth-Heinemann, 2013.

16-Civ-B10 Traffic Engineering

Roess, R. P. and Prassas, E. S. and McShane, W. R. Traffic Engineering. 4th Edition, Prentice Hall, 2011.
Garber, N. J. and Hoel, L. A. Traffic and Highway Engineering. 3rd Edition, Thomson Learning, 2001.
Mannering, F. L. and Washburn, S. S. and Kilareski, W. P. Principles of Highway Engineering and Traffic Analysis. 4th Edition, Wiley, 2008.

16-Civ-B11 Structural Materials

Somayji, S. Civil Engineering Materials. Prentice Hall, 1995.

16-Civ-B12 Risk and Safety in Civil Engineering

Ang, A. H. and Tang, W. H. Probability Concepts in Engineering. 2nd Edition, Wiley, 2006.
Benjamin, J. R. and Cornell, C. A. Probability, Statistics and Decisions for Civil Engineers. McGraw-Hill Inc., 1970.
Jordaan. Decisions Under Uncertainty: Probabilistic Analysis for Engineering Decisions. 1st Edition, Cambridge University Press, 2011.

UPDATED: APRIL 2022

4.3 INTRODUCTION

Seventeen engineering disciplines are included in the Examination Syllabus issued by the Canadian Engineering Qualifications Board of the Canadian Council of Professional Engineers.

Each discipline examination syllabus is divided into two examination categories: compulsory and elective. A full set of Civil Engineering examinations consists of nine, three-hour examination papers. Candidates will be assigned examinations based on an assessment of their academic background. Examinations from discipline syllabi other than those specific to the candidates' discipline may be assigned at the discretion of the constituent Association/Ordre.

Before writing the discipline examinations, candidates must have passed, or have been exempted from, the Basic Studies Examinations.

Information on examination scheduling, textbooks, materials provided or required, and whether the examinations are open or closed book, will be supplied by the constituent Association/Ordre.

4.3.1 CIVIL ENGINEERING EXAMINATIONS

GROUP A

COMPULSORY EXAMINATIONS (SIX REQUIRED)

98-Civ-A1 Elementary Structural Analysis

Computation of reactions, shearing forces, normal forces, bending moments, and deformations in determinate structures. Influence lines for moving loads. Moment distribution, slope deflection, and energy methods for indeterminate structures without sidesway.

98-Civ-A2 Elementary Structural Design

Limit states design concepts. Loading due to use and occupancy, snow, wind, and earthquake. Design of tension members, beams, and columns in timber and steel. Design of timber connections and simple welded and bolted connections in steel. Design of determinate reinforced concrete beams and columns.

98-Civ-A3 Environmental Engineering NOT APPLICABLE TO PEO

Population, economic growth, industrialization, urbanization and energy-use, as causes of environmental pollution.

The characteristics of particles, chemistry of solutions and gases, material balances, reaction kinetics, microbiology and ecology, as related to the environment.

The application of environmental principles (technical and non-technical) to: water resource management, water and wastewater treatment, air pollution control, solid waste management, environmental impact assessment, sustainable development and environmental ethics.

98-Civ-A4 Geotechnical Materials and Analysis

Materials: Origin of soils, soil identification and classification. Compaction. Permeability, pore water pressure and effective stress. Compressibility and consolidation. Shear strength, stress paths, and critical states. Frost action. Associated laboratory tests.

Analysis: Elastic stress distribution, settlements, times of settlements. Introductory analysis of lateral earth pressures, bearing capacity, and slopes. Seepage; well flow and confined 2-D flow problems.

98-Civ-A5 Hydraulic Engineering REWRITTEN

Dimensional analysis and hydraulic models. Application of continuity, momentum and energy principles. Steady, closed conduit flow in single pipes and pipe networks. Steady, open-channel flow under uniform and gradually varied conditions, control sections, hydraulic jumps, and energy dissipaters. Hydraulic transients; surges and water hammer in closed conduits, surface waves in open channels. Concepts and principles of turbo machinery, especially centrifugal pumps; similarity relations and cavitation; operation of pump-and-pipe systems.

Introductory concepts of hydraulic structures, including environmental aspects of hydraulic works and water quality management.

98-Civ-A6 Transportation Planning and Engineering

Socio-economic impacts on transportation, demand modelling. Characteristics of transportation systems; rail, road, air, water, and pipelines. Transportation systems in Canada. Characteristics of traffic flow, queuing theory, capacity analysis, space-time diagrams. Urban traffic management, traffic signals, pedestrians, accidents. Intelligent transportation systems.

ADD

GROUP B

ELECTIVE EXAMINATIONS (THREE REQUIRED)

98-Civ-B1 Advanced Structural Analysis

Analysis of statically indeterminate structures, including trusses, beams, frames, and arches. Formulation of flexibility (force) and stiffness (displacement) methods of analysis.

98-Civ-B2 Advanced Structural Design

Limit states design of steel members and connections in continuous framing; of slabs and footings in reinforced concrete, of pre-stressed concrete members and assemblies; and of composite steel-concrete construction. Influence of creep and shrinkage in concrete construction.

98-Civ-B3 Geotechnical Design MINOR EDITS

Characterization of natural deposits, subsurface investigation, and field measurements. Design procedures for settlement and stability of shallow and deep foundation systems in soil and rock. Design of excavations and retaining structures; slopes and embankments. Geoenvironmental design topics covering seepage through dams and landfills and the control of seepage through the use of filters and low permeability layers including the use of geosynthetic liners and filters.

98-Civ-B4 Engineering Hydrology

Hydrologic processes: precipitation and snow melt, infiltration, evaporation and evapotranspiration, ground-water flow, runoff. Point and area estimates of precipitation. Stream flow measurement. Runoff hydrographs, unit hydrographs, conceptual models of runoff, and basics of hydrologic modeling. Channel system: reservoir and lake routing, channel routing and flood wave behavior Statistical methods: frequency and probability with application to precipitation, floods, and droughts.

Urban and highway drainage structure design.

98-Civ-B5 Water Supply and Wastewater Treatment

Physical, chemical, and microbiological characteristics of water and wastewater. Regulation of water quality for supply and discharge, elements of receiving water characterization and specification of effluent limits. Elements of water and wastewater treatment including, coagulation, flocculation, filtration, settling, softening, disinfection, fluoridation, taste and odour control and biological processes. Sludge disposal.

Quantity and quality estimation of water and wastewater. Water storage and distribution systems. Wastewater collection systems.

98-Civ-B6 Urban and Regional Planning

The context of urban planning; basic planning studies, including population, economic, and land-use studies. The strategy, development, and engineering associated with comprehensive plans and full infrastructure development including housing, industry, transportation, recreation, water and sewerage, social service components. The use of analytical procedures and data systems. Plan implementation measures and controls, including zoning, land subdivision, and urban renewal. The role of the planner in directing and monitoring urban and regional development.

98-Civ-B7 Highway Design, Construction, and Maintenance

Route surveying. Geometric design, including horizontal and vertical alignment and intersections. Properties of road-making materials. Asphalt mix design. Structural design for flexible and concrete pavements. Earthworks and drainage. Pavement management, including condition evaluation, maintenance, and rehabilitation.

98-Civ-B8 Management of Construction

Size and structure of Canadian design and construction sectors. Methods of project delivery, project management, and organizational form. Site investigation. Estimating and bidding, project planning, scheduling and control, activity planning. Safety practices and regulations, insurance, quality assurance and control. Labour relations. Contract administration. Litigation. ADD

98-Civ-B9 Civil Engineering Analysis and the Finite Element Method

Introduction to discretization techniques for solving Civil Engineering problems. The finite element method including; derivation of element and global force-displacement equations employing both the variational and direct stiffness methods, criteria for selection of approximating functions, available finite elements, general constitutive relations, substructure analysis and constraint equations, numerical methods of solution. Finite element applications to structural, geotechnical, and hydraulic engineering analysis.

Civil Engineering Syllabus - 1998

INTRODUCTION

Seventeen engineering disciplines are included in the Examination Syllabus Issued by the Canadian Engineering Qualifications Board of the Canadian Council of Professional Engineers.

Each discipline examination syllabus is divided into two examination categories: compulsory and elective. A full set of Civil Engineering examinations consists of nine, three-hour examination papers. Candidates will be assigned examinations based on an assessment of their academic background. Examinations from discipline syllabi other than those specific to the candidates' discipline may be assigned at the discretion of the constituent Association/Ordre.

Before writing the discipline examinations, candidates must have passed, or have been exempted from, the Basic Studies Examinations.

Information on examination scheduling, textbooks, materials provided or required, and whether the examinations are open or closed book, will be supplied by the constituent Association/Ordre.

CIVIL ENGINEERING EXAMINATIONS

Suggested texts are given at the bottom of the page

GROUP A - COMPULSORY EXAMINATIONS (SIX REQUIRED)

98-Civ-A1 Elementary Structural Analysis

Computation of reactions, shearing forces, normal forces, bending moments, and deformations in determinate structures. Influence lines for moving loads. Moment distribution, slope deflection, and energy methods for indeterminate structures without sidesway.

98-Civ-A2 Elementary Structural Design

Limit states design concepts. Loading due to use and occupancy, snow, wind, and earthquake. Design of tension members, beams, and columns in timber and steel. Design of timber connections and simple welded and bolted connections in steel. Design of determinate reinforced concrete beams and columns.

98-Civ-A3 Municipal Engineering PEO ONLY

Municipal Infrastructure Including, water supply, wastewater disposal, roads and land development; population forecasting; demand analysis. Water supply; source development, transmission, storage, pumping, distribution networks. Sewerage and drainage; sewer and culvert hydraulics; collection networks; stormwater management. Maintenance and rehabilitation of water and wastewater systems; buried pipe design; optimization of network design.

98-Civ-A1 - Elementary Structural Analysis

Aslam Kassimali, Structural Analysis. PWS Publishers Latest Edition. ISBN # 0534950469.

98-Civ-A2 - Elementary Structural Design

Handbook of Steel Construction, Current Edition, Canadian Institute of Steel Construction.

Concrete Design Handbook, Current Edition, Canadian Portland Cement Association.

Wood Design Manual, Current Edition, Canadian Wood Council, Ottawa Tel: 613-247-7077.

NOT APPLICABLE TO PEO

98-Civ-A3 - Environmental Engineering

J. Glynn Henry and Gary W. Heinke. Environmental Science and Engineering. Prentice Hall, 1989. ISBN 0-13-283177-5.

98-Civ-A4 - Geotechnical Materials and Analysis

R.F. Craig, Soil Mechanics, 5th Edition. Chapman Hall.

B.J. Das, Principles of Geotechnical Engineering, 4th Edition. PWS-Kent.

98-Civc-A5 - Hydraulic Engineering

R.L. Daughtery, J.B. Franzini and E.J. Finnermore, Fluid Mechanics with Engineering Applications, 8th Edition. McGraw-Hill, 1985 (omit chapters 5, 9, 16, and 17).

or

V.L. Streeter, E.B. Wylie, Fluid Mechanics, SI Edition. McGraw-Hill, 1981 (omit chapter 6 on compressible flow) (note there may be a more recent version of this text if there is please use the latest edition.).

98-Civ-A6 - Transportation Planning and Engineering

C.S. Papcostas & P.D. Prevedouros, Transportation Engineering and Planning, 2nd Edition. Prentice-Hall.

Note: No available text, including the one recommended, adequately covers all topics in the Syllabus. Candidates will have to seek more depth on: "Deterministic" queuing theory; rail, air, water, and pipeline systems; accidents.

98-Civ-B1 - Advanced Structural Analysis

Ghali & A.M. Neville, Structural Analysis, Latest Edition. Chapman & Hall, John Wiley and Sons, New York, 1989.

98-Civ-B2 - Advanced Structural Design

G.L. Kulak, P.F. Adams, & M.I. Gilmore, Limit States Design in Structural Steel. Canadian Institute of Steel Construction, 1995.

Plastic Design in Steel: A Guide and Commentary, 2nd Edition, American Society of Civil Engineers, New York, NY, 1971. Address: 345 East 47th St. New York, NY, 100172398, USA, Tel: 212-705-7538.

T.Y. Lin & N.H. Burns, Design of Prestressed Concrete Structures. John Wiley and Sons Inc., 1981.

C.K. Wang & C.G. Salmon, Reinforced Concrete Design, 4th Edition. Harper and Row, 1985.

Handbook of Steel Construction, 6th Edition. Canadian Institute of Steel Construction, 1995.

98-Civ-B3 - Geotechnical Design

R.F.Craig, Soil Mechanics, Latest Edition.Van Nostrand.

98-Civ-B4 - Engineering Hydrology

Ven Te Chow, David Maidment and Larry Mays, Applied Hydrology. McGraw Hill, 1988. ISBN 0-07-010810-2.

.98-Civ-B5 - Water Supply and Wastewater Treatment

Viessman and Hammar, Water Supply and Pollution Control, 6th Edition. Harper Collins College Publishers, 1988. ISBN # 0-321-01460-X.

98-Civ-B6 - Urban and Regional Planning

Brian Field and Bryan MacGregor, Forecasting Techniques for Urban and Regional Planning. UCL Press, 1992. ISBN 1-85728-011-3.

G. Hodge, Planning Canadian Communities. Methuen, 1986. ISBN 0-458-95880-8.

Melville, Comprehensive City planning: Introduction and Explanation. Branch Planners Press, American Planning Association, 1985. ISBN 0-918286-41-7.

98-Civ-B7 - Highway Design, Construction, and Maintenance

Huang, Yang H., Pavement Analysis and Design. Prentice Hall, Englewood Cliffs, New Jersey, 1993.

AASHTO Guide for Design of Pavement Structures. American Association of State Highway and Transportation Officials (AASHTO), 1993. Washington, D.C.

The Asphalt Handbook. Manual Series # 4 (MS-4), Asphalt Institute, Lexington, Kentucky, 1989.

Manual of Geometric Design Standards for Canadian Roads. Roads and Transportation Association of Canada, Ottawa, 1986.

Haas, R, Hudson, W.R., and Zaniewski, J., Modern Pavement Management. Krieger Publishing Company, Malabar, Florida, 1994.

Or

Shahin, M.Y., Pavement Management for Airports, Roads and Parking Lots. Chapmaan & Hall, New York, 1994.

98-Civ-B8 - Management of Construction

Donald S. Barrie and Boyd C. Paulson Jr., Professional Construction Management. McGraw-Hill, 1991, ISBN # 0070038899.

Ontario Health and Safety Act, Ontario Regulation 213/91 (Construction Projects), Queen's Printing of Ontario, May 10, 1991. The provincial legislation is quite similar in all provinces. The candidate should obtain the Health and Safety Act of their province for study.

98-Civ-B9 - Civil Engineering Analysis and the Finite Element Method

T.R. Chandrupatla and A.D. Belegundu, Introduction to Finite Elements in Engineering. Prentice Hall, 1991. ISBN 0-13-483082-2.

O. C Zienkiewicz and R. L . Taylor, The Finite Element Method - Fourth Edition, Vol 1. McGraw Hill, 1989. ISBN 0-07-084174-8.

2016 PEO CIVIL ENGINEERING EXAMINATIONS SUGGESTED TEXT BOOK REFERENCE LIST

NOTE: Please feel free to use the most recent edition of textbooks referenced in this list

16-Civ-A1Elementary Structural Analysis

Primary Reference:

Hibbeler, R. C. Structural Analysis. 8th edition. Prentice Hall, 2012. ISBN-10: 013257053X, ISBN-13: 9780132570534

Secondary References:

Leet, K. M. and Uang, C.-M. Fundamentals of Structural Analysis, 4th edition. McGraw-Hill, 2011. ISBN-13: 9780073401096

Kassimali, A. Structural Analysis, SI Edition, 4th Edition. Nelson, 2011. ISBN-10: 0495295671, ISBN-13: 978-0495295679

16-Civ-A2 Elementary Structural Design

Grondin, G. Y. and Kulak, G. L. Limit States Design in Structural Steel 9th Edition. Canadian Institute of Steel Construction, 2010. ISBN-13: 978-088811-157-9

Brezev, S. and Pao, J. Reinforced Concrete Design: A Practice Approach, 2nd Edition. Prentice-Hall, 2013. ISBN-10: 1256873845, ISBN-13: 9781256873846

Handbook of Steel Construction. Current edition. Canadian Institute of Steel Construction. http://www.cisc-icca.ca

Concrete Design Handbook. Current edition. Canadian Portland Cement Association. www.cement.ca

Wood Design Manual. Current edition. Canadian Wood Council. www.cwc.ca

16-Civ-A3 Municipal and Environmental Engineering PEO ONLY

Shammas, N.K. and Wang, L.K. (2011) Water Supply and Wastewater Removal. 3rd ed. Wiley, Hoboken, N.J. ISBN 978-0-470-41192-6

Viessman and Hammar, Perez and Chadik Water Supply and Pollution Control, 8th Edition, Harper Collins College Publishers 1988, ISBN no. 0-13-233717-7

Brière, François G. (1999) Drinking-Water Distribution, Sewage, and Rainfall Collection, Presses internationale Polytechnique, École Polytechnique de Montréal. ISBN number: 2-55300-796-5

McGhee, T.J., Water Supply and Sewerage, 6th Edition, McGraw-Hill Publishing Co. ISBN # 0-07-060938-1, 1991

Metcalf & Eddy Inc., Wastewater Engineering: Collection and Pumping of Wastewater, McGraw-Hill Publishing Co. ISBN # 0-07-041680-X, 1981

16-Civ-A4 Geotechnical Materials and Analysis

Budhu, M. Soil Mechanics and Foundations, 3rd edition. John Wiley and Sons, Inc., 2011. ISBN-13: 978-0-470-55684-9

Craig, R. F. Craig's Soil Mechanics, 8th Edition. CRC Press, 2012. ISBN-13: 9780415561266

Das, B.J. Principles of Geotechnical Engineering, 8th Edition. Nelson, 2014. ISBN-10: 1133108660, ISBN-13: 9781133108665

16-Civ-A5 Hydraulic Engineering

Finnermore, E. J. and Franzini, J. B., Fluid Mechanics with Engineering Applications, 10th Edition. McGraw-Hill Science, 2001.

Houghtalen, Robert and Osman Akan, A. and Hwang, Ned H. C. Fundamentals of Hydraulic Engineering Systems, 4th Edition. Prentice Hall, 2009.

92-Civ-A1 Elementary Structural Analysis

Computation of reactions, shearing forces, normal forces, bending moments, and deformations in determinate structures. Influence lines for moving loads. Moment distribution, slope deflection, and energy methods for indeterminate structures *without sidesway. (98-Civ-A1)*

Text:
J.C. Smith, ***Structural Analysis***, Harper and Row, New York, NY, 1990 ISBN # 0-06-046317-1

92-Civ-A2 Elementary Structural Design

Limit states design concepts. Loading due to use and occupancy, snow, wind and earthquake. Design of tension members, beams and columns in timber and steel. Design of timber connections and simple welded and bolted connections in steel. Design of determinate reinforced concrete beams and columns.

Recommended Texts:

1. ***Handbook of Steel Construction***, Current edition, Canadian Institute of Steel Construction.
2. ***Concrete Design Handbook***, Current edition, Canadian Portland Cement Association.
3. ***Wood Design Manual***, Current edition, Canadian Wood Council, Ottawa, Tel # 613-247-7077

Note: No textbook currently suggested

CANADIAN COUNCIL OF PROFESSIONAL ENGINEERS

EXAMINATION SYLLABUS

1992 Edition

Canadian Engineering Qualifications Board
401 - 116 Albert Street
Ottawa, Ontario
K1P 5G3
TEL: (613) 232-2474
FAX: (613) 230-5759

(SYL-1992)

92-Civ-A5 Hydrology and Hydraulic Engineering

Hydrology: Hydrologic systems and processes; precipitation and snow melt, runoff, infiltration, evapotranspiration, ground water movement. Point and area estimates of precipitation. Conceptual models of runoff, hydrographs, unit hydrographs, and simulation methods in hydrology. Statistical methods; frequency and probability with application to precipitation, floods, and droughts.

Hydraulics: Application of momentum energy principles and continuity. Steady, closed conduit flows in single pipes and pipe networks. Open-channel flow under uniform and gradually varied conditions, control sections, hydraulic jumps, and energy dissipators. Hydraulic transients; surges and water hammer in closed conduits, surface waves in open channels.

92-Civ-B8 Management of Construction

Size and structure of Canadian design and construction sectors. Methods of project delivery, project management, and organizational form. Site investigation. Estimating and bidding, project planning, scheduling and control, activity planning. Safety practices and regulations, insurance, quality assurance and control. Labour relations. Contract administration.

Texts:

1. Donald S. Barrie and Boyd C. Paulson Jr., ***Professional Construction Management***, McGraw-Hill, 1991. ISBN # 0070038899.
2. ***Ontario Health and Safety Act***, Ontario Regulation 213/91 (Construction Projects), Queen's Printing of Ontario, May 10, 1991.

92-Civ-A6 Transportation Planning and Engineering

Socio-economic impacts on transportation, demand modeling. Characteristics of transportation systems; rail, road, air, water, and pipelines. Transportation systems in Canada. Characteristics of traffic flow, queuing theory, capacity analysis, space-time diagrams. Urban traffic management, traffic signals, pedestrians, accidents.

Recommended Text:

C.S.Papacostas & P.D. Prevedouros, ***Transportation Engineering and Planning,*** Prentice-Hall, 2nd edition.

Note: No available text, including the one recommended, adequately covers all topics in the Syllabus. Candidates will have to seek more depth on: Transportation Systems in Canada, “deterministic” queuing theory, rail, air, water, and pipeline systems; accidents.

92-Civ- B1 Advanced Structural Analysis

Analysis of statically indeterminate structures, including trusses, beams, frames, and arches. Matrix formulation of the flexibility (force) and stiffness (displacement) methods of analysis. Introductory finite element analysis.

Text:

A. Ghali & A.M. Neville, ***Structural Analysis: A Unified Classical & Matrix Approach***, Chapman & Hall, John Wiley and Sons, New York, 1989.

92-Civ-B3 Geotechnical Design

Characterization of natural deposits, subsurface investigation, and field measurements. Design procedures for settlement and stability of shallow and deep foundation systems in soil and rock. Design of excavations and retaining structures; slopes and embankments. Seepage through dams, filters.

Recommended Text:

R. F. Craig, ***Soil Mechanics***, 5th edition, Van Nostrand Reinhold (U.K.) Co. Ltd., Nelson Canada, ISBN # 0-412-39590-8.