**Self-Assessment Form**

**Instructions for Applicants**

**General:**

1. You must use your WES course-by-course (CxC) assessment to complete this form.
	1. When completing the self-assessment form, use the Bachelor’s degree courses.
	2. Only use your Master’s or Ph.D. in engineering **if they are necessary**. If you use too many graduate courses, the degree will **not be** eligible to use for waiving confirmatory exams.
2. Only complete column C2. Do not enter any information in column C3 or C4. If you do, it will be deleted.
	1. Enter the year, course name, credits and grade from the WES assessment Course-by-Course Analysis.
	2. Both the Basic Studies and Discipline Specific Syllabus Tables contain compulsory subjects and elective subjects. Include courses that cover any part of the syllabus even if you have more than the minimum number in the elective sections.
	3. Colour code the content in column C1 by highlighting it the same colour as the corresponding course you entered in column C2.

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| **C1** **APEGS Syllabus** | **C2** **Self-Assessment (by applicant)** | **C3** **for Staff only** | **C4** **for ARC only** |
| **COMPULSORY SUBJECTS** **(all required)** | **WES assessment: year, course name, credits and grade.**  | **Program Syllabus: page number, course name** | **Preliminary Review** | **Final Review** |
| **20-BS-A1 Mathematics:** Vector and Linear Algebra: Applications involving matrix algebra, determinants, eigenvalues and eigenvectors, vector functions and operations, orthogonal curvilinear coordinates. Calculus: first and second order linear ordinary differential equations, series solutions of ordinary differential equations, applications of partial derivatives, Lagrange multipliers, multiple integrals, line and surface integrals, integral theorems (Gauss, Green, Stokes). Power series. | 2004-2005: Applied Mathematics I, 2 credits. Grade: B2004-2005: Applied Mathematics II, 2 credits. Grade: B2005-2006: Applied Mathematics III,2 credits. Grade: B |  |  |  |

1. Once you have completed column C2, submit the **Word document** to documents-academicreview@apegs.ca.

**Program Syllabus (only required if requested by APEGS):**

1. Provide the program syllabus in a PDF document through the Contact Us page on the APEGS website.
2. If the course names in the program syllabus are different than those in your WES assessment you must provide an explanation of how they correlate in the program syllabus column of the form.
3. Use the page number of the PDF document of the program syllabus (not the original page number).

***By submitting this self-assessment, I declare that I have read and followed the instructions and that this self-assessment is accurate and complete, to the best of my knowledge and ability, and that I have provided all the relevant information that I have available to me. I understand that if information is incorrect or missing, that it may delay my application and may result in the assignment of academic deficiencies.***

**Self-Assessment Form – Water Resources Engineering**

Use the information provided on the WES assessment to complete this information

|  |  |
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| **Applicant Information:**  | **Last Name, First Name**  |
|   |
| **APEGS File #** |   |
| **Institution Information** |
| **Credential** | **Awarded By** | **Major/Specialization** | **Year** | **Country** |
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**SELF-ASSESSMENT – FOR APPLICANT TO COMPLETE**

**BASIC STUDIES SYLLABUS TABLE**

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| **COMPULSORY SUBJECTS** **(all required)** | **WES assessment: year, course name, credits and grade.**  | **Program Syllabus: page number, course name** | **Preliminary Review** | **Final Review** |
| **20-BS-A1 Mathematics:** Vector and Linear Algebra: Applications involving matrix algebra, determinants, eigenvalues and eigenvectors, vector functions and operations, orthogonal curvilinear coordinates. Calculus: first and second order linear ordinary differential equations, series solutions of ordinary differential equations, applications of partial derivatives, Lagrange multipliers, multiple integrals, line and surface integrals, integral theorems (Gauss, Green, Stokes). Power series. |  |  |  |  |
| **20-BS-A2 Probability and Statistics:** Concepts of probability, events and populations, probability theorems, concept of a random variable, continuous and discrete random variables, probability distributions, distributions of functions of a random variable, sampling and statistical estimation theory, hypothesis testing, simple regression analysis. |  |  |  |  |
| **20-BS-A3 Computation Methods:** Use of computers for numerical solution of engineering problems, including techniques involving high-level languages and other computational tools (e.g., spreadsheets). Data representation, approximations and errors. |  |  |  |  |
| **20-BS-A4 Engineering Design Process:** Design process and methods. Project management & teamwork. Requirements and function analysis in design. Conceptual design and testing. Concept evaluation design factors such as: cost, quality, manufacturability, safety, etc. Systems modelling & design detail. |  |  |  |  |
| **20-BS-B1 Statics and Dynamics:** Force vectors in two- and three-dimensions, equilibrium of a particle in two- and three-dimensions; moments and couples; equilibrium of rigid bodies in two- and three-dimensions; centroids, centres of gravity; second moment of area, moment of inertia; truss, frame and cable static analysis; friction. Planar kinematics of particles and rigid bodies; planar kinetics of particles and rigid bodies; work and energy, impulse, and momentum of particles and rigid bodies. |  |  |  |  |
| **20-BS-B3 Mechanics of Materials:** Definitions of normal stress, shearing stress, normal strain, shearing strain; shear force and bending moment diagrams; members subjected to axial loading; members subjected to torsional loading; compound stresses, Mohr's circle; deformation of flexural and torsional members; failure theories; elastic and inelastic strength criteria; columns. |  |  |  |  |
| **20-BS-B4 Mechanics of Fluids:** Fluid characteristics, dimensions and units, flow properties, and fluid properties; the fundamentals of fluid statics, engineering applications of fluid statics; the one-dimensional equations of continuity, momentum, and energy; laminar and turbulent flow, flow separation, drag and lift on immersed objects; wall friction and minor losses in closed conduit flow; flow of incompressible and compressible fluids in pipes; dimensional analysis and similitude; flow measurement methods. |  |  |  |  |
| **20-BS-B10 Biology:** Cellular reproduction, growth, and differentiation; metabolism and bioenergetics of living cells; cell structure and function related to the material properties of plant and animal tissues; introductory microbiology — characteristics and classification of microorganisms; interactions of microorganisms with humans in the natural world; kinetics and mathematical models of microbial growth; engineered biological systems such as bio-reactors, bio-instrumentation, bioprinted devices and waste treatment systems for sustainability. |  |  |  |  |
| **20-BS-B13 Advanced Mathematics:** Solutions of differential equations, boundary value problems and orthogonal functions, Fourier series, complex variable analysis. |  |  |  |  |
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| **ELECTIVE SUBJECTS** (minimum of one required) | **WES assessment: year, course name, credits and grade.**  | **Program Syllabus: page number, course name** | **Preliminary Review** | **Final Review** |
| **20-BS-B7 Thermodynamics:** Basic concepts and definitions, energy concepts and the first law of thermodynamics, properties of pure substances, closed systems, open systems, the second law of thermodynamics, enthalpy, entropy, exergy, gas power cycles, vapor and combined power cycles, refrigeration cycles. |  |  |  |  |
| **20-BS-B9 Organic Chemistry:** Principles of organic chemistry developed around the concepts of structure and functional groups. The main classes of organic compounds. Properties of pure substances. Introduction to molecular structure, bond types, properties, synthesis and reactions, reaction mechanisms, as a means of systematizing organic reactions. |  |  |  |  |
| **20-BS-B11 Geology:** The structure of the earth, plate tectonics, earthquakes and igneous activity. Minerals and rocks including their formation, identification, basic properties, and classification. Processes of weathering, erosion, transport, and deposition of geological materials and their results of significance to engineering. Occurrence, flow, and quality of groundwater. Introductory aspects of structural geology including faulting, folding, and the overall formation of discontinuities and their effect on the engineering properties of rock masses. Aerial photography and geological maps. |  |  |  |  |

**DISCIPINE SPECIFIC SYLLABUS TABLE**

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| **C1** **APEGS Syllabus** | **C2** **Self-Assessment (by applicant)** | **C3** **for Staff only** | **C4** **for ARC only** |
| **COMPULSORY SUBJECTS** **(all required)** | **WES assessment: year, course name, credits and grade.**  | **Program Syllabus: page number, course name** | **Preliminary Review** | **Final Review** |
| **07-WRSE- A1: Water Quality & Management:** Standard methods of water quality analysis for physical, chemical and biological characteristics of water; significance and interpretation of analytical results; modelling of water quality in natural systems; and introduction to engineered water and wastewater treatment systems; management of water supply, irrigation, flood control, drainage and water pollution control; economic and social aspects of water management decisions. |  |  |  |  |
| **07-WRSE- A2: Engineering Hydrology:** (98-Civ-B4) 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 modelling. 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. |  |  |  |  |
| **07-WRSE- A3 Soil Mechanics & Groundwater:** (04-ENV-A3 Geotechnical andHydrogeological Engineering) Soil composition, properties, identification and classification. Particle size distribution. Seepage and permeability. Concepts of pore water pressure and effective stress. Compressibility. Capillary pressure and hydraulic head. Principles of effective stress, stress-deformation and strength characteristics of soils, consolidation, compaction, slope stability, infiltration, stress distribution with soils and settlements. Fundamental physics and properties of groundwater flow in porous geologic material; anisotropy, heterogeneity. Introduction to the theory of groundwater flow; groundwater flow equations and patterns, recharge and discharge, flow nets, aquifer pumping, two-phase flow, well hydraulics and non-aqueous phase liquids. Numerical modeling concepts. Aquifer development and management. Wellhead protection. |  |  |  |  |
| **07-WRSE- A4 Hydraulics & Hydraulics Structures:** (98-Civ-A5)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. |  |  |  |  |
| **07-WRSE- A5 Water Resources Planning & Systems:** Application of engineering economics, microeconomic theory, and mathematical simulation and optimization models to the planning and management of water systems; major topics include systems analysis, flood control, hydroelectric power, water supply, multi-objective planning, and urban water resource management.  |  |  |  |  |
| **07-WRSE- A6 Municipal Engineering: (**98-Civ-A3) 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. |  |  |  |  |
| **Select ONE from: 07-WRSE-A7-1 or 07-WRSE-A7-2** |  |  |  |  |
| **07-WRSE- A7-1 Irrigation, Drainage & Erosion Control**: (04-Agri-B6)**Irrigation**: Land classification, development, and preparation. Consumptive use of water, estimation of crop water requirements. Design of distribution systems, canals and structures, design of sprinkler and surface systems. Selection of nozzles, pipes, pump, and power units. Analysis of rate of advance and recession curves. Irrigation efficiencies. Design of low earth dams. **Drainage**: Design, layout and installation of subsurface and surface systems. Spacing formulae for steady-state and transient conditions. Outlet ditch design. Flow through bridges and culverts. Drainage pumps, secondary drainage practices, surface drainage, grading, land levelling, water table control. Use of drainage systems to control water pollution. Implications of draining wetlands. **Erosion Control**: Basic principles of wind and water erosion. Soil loss prediction methods and sustainability. Methods of soil erosion and sediment control including contouring, terracing, grass waterways, silt fences, channel stabilization, and land management practices. Agroforestry and cropping systems.  |  |  |  |  |
| **07-WRSE- A7-2 Geomatics:** (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. |  |  |  |  |
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| **ELECTIVE SUBJECTS** (minimum of three required) | **WES assessment: year, course name, credits and grade.**  | **Program Syllabus: page number, course name** | **Preliminary Review** | **Final Review** |
| **07-WRSE- B1 Geomorphology & Pleistocene Geology:** (04-Geom- B4 Hydrography) Objectives and basic principles of physical oceanography and hydrography surveying; tides, water levels and vertical reference surfaces. Hydrography positioning including mathematical models, optical and radio techniques, radio propagation, satellite, acoustic and self-contained techniques. Depth determination including underwater acoustics, single and multi-beam systems, sea water properties, acoustic and non-acoustic techniques, sea tides, sea surface topography and sea bed properties. Data visualization and standards for safety of navigation. |  |  |  |  |
| **07-WRSE- B2 Numerical Methods:** Introduction to numerical techniques for water resources systems, focusing on the understanding of fundamental principles and an appreciation of the role of models. Finite difference, finite element, and particle tracing methods are studied and applied to the solution of problems. |  |  |  |  |
| **07-WRSE- B3 Water Supply and Waste Water Treatment**: (98-Civ- B5) 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. |  |  |  |  |
| **07-WRSE- B4Open Channel Hydraulics:** 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). |  |  |  |  |
| **07-WRSE- B5 Limnology:** Physical processes that affect the behaviour of lakes, including reservoirs, water filled mine pits, mine tailings, pond and other standing water bodies. Impacts of these processes on water quality and methods used in the rehabilitation of lakes. |  |  |  |  |
| **07-WRSE- B6 Contaminant Transport**: (04-ENV- B3) Major types of contaminants in air, surface water and ground water. Physical phenomena governing the transport of contaminants in different environments: advection, dispersion, diffusion, sorption, ion exchange, precipitation, dissolution, volatilization, equilibrium partitioning of contaminants amongst air, water, soil, sediments and biota. Development of governing transport equations, initial and boundary conditions, completely mixed and plug flow systems. Analytical and numerical solutions, model development, calibration, verification, sensitivity analysis, prediction and post audit. |  |  |  |  |
| **07-WRSE- B7 Coastal Engineering:** This course covers basic wave theory, wave measurement, wave statistics, wave record analysis, wave transformation, tides, water levels and storm surges. It introduces design of breakwaters and ocean structures, and uses hydraulic and numerical coastal models. The final projects consist of the 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 are also treated. |  |  |  |  |
| **07-WRSE- B8 River Engineering:** Prediction and consequences of sediment transport, aggradation and erosion, meandering and braiding, design of river engineering structures, water quality modeling, hydraulic modeling of fluvial processes and control structures, numerical modeling of dispersion and environmental impact of river engineering projects. |  |  |  |  |
| **07-WRSE- B9 Modelling of Surface Water Quality:** Development and application of water quality models for lakes, rivers, estuaries, and reservoirs.  Derivation of differential equations of pollutant transport; kinetic relationships for physical and chemical transformation of substances; numerical and analytical solutions to transport equations; and calibration and verification of models. |  |  |  |  |
| **07-WRSE- B10 Risk Management in Water Resources:** Risk Terminology and quantified risk analysis (QRA) techniques, Safety analysis studies. Decision-making methods in environmental engineering including matrix methods, linear programming, network models, Lagrange multipliers and dynamic programming. The concept of risk, risk probability, dose response models, decision analysis and risk-cost-benefit analysis. Evaluating environmental systems: probability and predicting failure. |  |  |  |  |
| **07-WRSE- B11 Environmental Engineering Systems:** (04-ENV-A1) 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. |  |  |  |  |
| **07-WRSE- B12 Environmental Assessment and Management Systems**: (04- ENV-B1)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. |  |  |  |  |