**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 – Metallurgical 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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| **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. |  |  |  |  |
| **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-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-B8 Properties of Materials:** Properties of materials for mechanical, thermal and electrical applications. Atomic bonding, solid solutions, crystallisation. Equilibrium phase diagrams, applications to steel and aluminium alloys, heat treatments. Structure and special properties of polymers and ceramic materials. General characteristics of metallic composites, polymeric composites and concrete. Introduction to materials in hostile environments: corrosion, creep at high temperature, refractory materials, subnormal temperature brittle fracture. |  |  |  |  |
| **C1** **APEGS Syllabus** | **C2** **Self-Assessment (by applicant)** | **C3** **for Staff only** | **C4** **for ARC only** |
| **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-B2 Electric Circuits and Power:** Current, voltage, Ohm’s law, Kirchoff’s voltage and current laws, power; DC circuits, network theorems, network analysis; simple transients, AC circuits. Impedance concept, resonance; application of phasors and complex algebra in steady-state response; application of Laplace transforms; simple magnetic circuits; basic concepts and performance characteristics of transformers; an introduction to diodes and transistors; rectification and filtering; simple logic circuits. |  |  |  |  |
| **20-BS-B12 Engineering Graphics:** Engineering drawing: Orthographic sketching. Standard orthographic projection. Principal views, selection and positioning of views. Visualization. Conventions and practices. First and second auxiliary views. Basic descriptive geometry. Section views, types, hatching conventions. Basic dimensioning requirements. Tolerance for fits and geometry control. Detail drawings and assembly drawings, other drawings and documents used in an engineering organization. Bill of materials. Fasteners and welds. |  |  |  |  |
| **20-BS-B13 Advanced Mathematics:** Solutions of differential equations, boundary value problems and orthogonal functions, Fourier series, complex variable analysis. |  |  |  |  |

**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** |
| **98-Met-A1 Metallurgical Thermodynamics:** First, second, and third laws, enthalpy and heat balances, entropy, free energy, chemical equilibrium, equilibrium constant, phase rule, solution chemistry, chemical potential, activities. Application of the laws of thermodynamics to metallurgical processes, electrochemistry, interfacial phenomena, extraction and refining of materials, corrosion, and electrodeposition. Computational thermodynamics. |  |  |  |  |
|  **98-Met-A2 Metallurgical Rate Phenomena:** Fluid flow, heat transfer, mass transfer as applied to metallurgical processes. Laws of viscosity, conduction and diffusion. Equations for the conservation of heat, mass and momentum transfer. Process engineering metallurgy and reactor theory (plug flow and well-mixed) as applied to hydrometallurgical, pyrometallurgical, electrochemical, and corrosion processes. |  |  |  |  |
|  **98-Met-A3 Metal Extraction Processes:** Principles of mineral dressing: comminution, physical separation techniques, flotation, dewatering. Extraction processes: hydrometallurgy and electrometallurgy including leaching, solution purification, solvent extraction, metal winning, refining; pyrometallurgy including roasting, smelting, converting, and refining. Fuels, furnaces, metallurgical reactors, refractories, energy efficiency. Calculations based on flow sheets, heat and mass balances. Environment protection. Automatic control. |  |  |  |  |
| **98-Met-A4 Structure of Materials:** Atomic and molecular structure. Metallic, ionic, covalent and Van der Walls’s, Crystal structure, space lattices and Miller indices. Crystalline and non-crystalline (amorphous). Solidification (crystallisation) and associated microstructures of cast metals and phenomena of grain boundaries. Observations of material structure (X-ray techniques, metallography, optical and electron microscopy). Defects in solids, dislocation and slip, vacancies and diffusion. Basic mechanisms of deformation processes of materials. Phase diagrams (solid solution systems, eutectic and eutectoid systems, monotectic peritectic reaction, intermetallic compounds). Application of lever rule to phase proportions in common single- and binary-phase systems. |  |  |  |  |
| **98-Met-A5 Mechanical Behaviour and Processing and Performing of Materials:** Mechanical properties and mechanical testing. Stress-strain-time relations, work hardening, toughness, fatigue, and stress-rupture. Principles in the forming of materials: sintering, melting and casting, extrusion, injection moulding, drawing, rolling and forging. Moulding techniques for particulate and fibre reinforcing. Theoretical strength, defects and fracture mechanics theory. Environmental aspects and materials performance; stress corrosion, corrosion fatigue, hydrogen embrittlement, degradation due to nuclear and ultra-violet radiation. Other degradation and service failure and their prevention (wear, friction, etc.). |  |  |  |  |
| **98-Met-A6 Thermal Treatment of Metals and Alloys:** The cold-worked state; recovery, recrystallization, grain growth, secondary recrystallization, and heat treatments based on these phenomena. Nucleation and growth kinetics. Precipitation in alloy systems and precipitation hardening. The iron-carbon alloy system and the eutectoid reaction in Fe-C alloys. The hardening of steel. |  |  |  |  |
| **C1** **APEGS Syllabus** | **C2** **Self-Assessment (by applicant)** | **C3** **for Staff only** | **C4** **for ARC only** |
| **ELECTIVE SUBJECTS** **(minimum of three required)** | **WES assessment: year, course name, credits and grade.**  | **Program Syllabus: page number, course name** | **Preliminary Review** | **Final Review** |
| **98-Met-B1 Mineral Processing:** Minerals of economic importance (metallic and industrial). Comminution techniques, size classification, hydrocyclones. Flotation: surface chemistry, reagents, on-stream analysis, process optimization, oxide flotation. Gravity and magnetic separations. Tailings disposal, water pollution control, closed circuit operation. Mineral processing plant design. Process analysis, simulation, optimization, and control. |  |  |  |  |
| **98-Met-B2 Hydrometallurgy:** Unit processes in hydrometallurgy: acid, alkaline, and pressure leaching methods. Thermodynamic and kinetic aspects. Purification of leach liquors by ion exchanges, solvent extraction, and selective precipitation operations. Solid-liquid separation techniques. Recovery of metal values by cementation, electrowinning, and hydrogen precipitation methods. |  |  |  |  |
| **98-Met-B3 Iron and Steelmaking:** Fundamental thermodynamic and kinetic aspects of iron and steelmaking reactions. Composition, structure, properties and performance of fluxes, slags and refractories. Direct reduction processes. Ironmaking in the blast furnace. External treatment of hot metal. Converter processes and electric furnace steelmaking. Ladle metallurgy operations including deoxidation, desulfurization, sulfide shape control, inert gas rinsing, and vacuum reactors. Factors affecting the formation and removal of inclusions. Secondary refining processes including AOD, VAD, VOD, VAR, and ESR. Ingot manufacture and continuous casting. Plasma applications in iron and steelmaking. Environmental control, automation, energy minimization, and process optimization. |  |  |  |  |
| **98-Met-B4 Non-Ferrous Extractive Metallurgy:** The application of the principles of thermodynamics, kinetics, and heat and mass transfer to the extraction and refining of non-ferrous metals. These include the common base metals (copper, nickel, lead, and zinc), light metals (magnesium, aluminum), and refractory metals (titanium, zirconium, and chromium). Recent process developments in non-ferrous metallurgy, for example flash smelting. Environmental problems associated with the non-ferrous industry. |  |  |  |  |
| **98-Met-B5 Metal Fabrication:** Casting methods including ingot casting, continuous casting, sand casting, die casting, investment casting, and shell moulding. Cast structures, grain refinement and casting defects. Hot working: hot rolling, extrusion, and forgings. Cold working: cold rolling, pressing, impact extrusion, drawing, and sheet metal forming. Joining techniques: welding methods, weld defects, weld inspection, brazing, and soldering. Powder metallurgy processes. |  |  |  |  |
| **98-Met-B6 Physical Metallurgy of Iron and Steel:** The Fe-C diagram. Structures of slowly cooled steels. Specialized heat treatments including full annealing, normalizing, process annealing. Batch and continuous annealing. Martensite formation: quenching and tempering. Bainite formation. Austempering and martempering. TTT curves. Hardenability and the Jominy test. Alloy steels, HSLA steels, and stainless steels. Surface hardening. Cast irons, their structure and heat treatment. |  |  |  |  |
| **98-Met-B7 Physical Metallurgy of Non-Ferrous Metals and Alloys:** Aluminum and its alloys: properties, effects of alloying elements, heat treatment, modification of properties, corrosion resistance. Magnesium and its alloys: cast and wrought alloys — effect of alloying elements, grain refinement, corrosion resistance. Copper and its alloys: properties — brasses, bronzes. Low melting point alloys: diecasting alloys, type metals, solder, bearing metals. Nickel-base super alloys. Cobalt base alloys. Titanium. |  |  |  |  |
| **98-Met-B8 Ceramic Materials:** Crystal structure of ceramics. Glass formation and structure of oxide glasses. Processing and shaping of crystalline materials and glasses. Phase diagrams in ceramic systems. Microstructure of ceramics. Mechanical properties of ceramics: strength, fracture toughness, creep, fatigue, thermal shock resistance, viscous flow, tempering and annealing of glass. Thermal, optical, electrical, and magnetic properties of ceramic materials. |  |  |  |  |
| **98-Met-B9 Polymers and Fibre-Reinforced Polymers:** Fundamental properties and applications of polymers; characterization of polymers; properties of polymers, including crystallization, thermal and oxidative degradation, specific heat, thermal conductivity, and thermal expansion; polymer processing techniques; failure mechanisms; and introduction to fibre-polymer composites. |  |  |  |  |