**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: B  2004-2005: Applied Mathematics II, 2 credits. Grade: B  2005-2006: Applied Mathematics III,2 credits. Grade: B |  |  |  |

1. Once you have completed column C2, submit the **Word document** to [documents-academicreview@apegs.ca](mailto: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 – Agricultural or Biological 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-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-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-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. |  |  |  |  |
| **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-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-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. |  |  |  |  |
| **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-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**  **(for food engineers five required: A3 to A7, for all others 6 of your choice are required)** | **WES assessment: year, course name, credits and grade.** | | **Program Syllabus: page number, course name** | **Preliminary Review** | **Final Review** |
| **04-Agric-A1 Applied Plant, Animal or Human Physiology:** choose **one** of the following:  Plant Physiology  Application of engineering principles to plant production systems. Basic plant and crop physiology including cell structure and cell function. Photosynthesis and respiration as related to biomass production. Plant growth dynamics as influenced by light, temperature, carbon dioxide, water, nutrient supply, and other environmental factors. Seed structure and germination. Plant structure and life cycles. Energy relationships in the plant and crop microclimates. Plant tolerance to stress. Environmental requirements for greenhouse and growth chamber design. Environmental requirements for product storage. Introduction to modeling of plant and crop growth.  Animal or Human Physiology  Engineering considerations in animal production systems or human dwellings. General treatment of mammalian and avian physiology. Physiological basis for design parameters for temperature, humidity, air movement, radiation, space, sound and other environmental requirements. Physiological mechanisms for control of body temperature, cardiovascular function, respiratory function, digestion, and other body processes. Comparison of animal species reproductive efficiencies. Introduction to modeling of animal or human production to predict the influence of environmental factors on performance. | |  |  |  |  |
| **04-Agric-A2 Soil Physics and Mechanics:** Soil origin and classification systems. Physical properties of soils related to tillage, soil conservation and land use. Particle size distribution, water retention in soils, water movement into and within soils. Clay mineralogy, swelling and shrinking, soil structure and its measurements, soil temperature and freezing. Soil shear strength and laboratory and field methods for measurement. Subsurface exploration methods, foundation design, soil cutting and tillage, settlement, consolidation, compaction, and slope stability. | |  |  |  |  |
| **04-Agric-A3 Heat Engineering:** Heat Sources: Mineral fuels, biomass, solar energy, electric energy.  Heat Transfer:Heat balances, enthalpy, heat capacity and latent heat, steam tables. Heat conduction through plane and curved sections, single and multiple layers. Thermal properties of building and biological materials. Forced and free convection, film and overall heat transfer coefficients. Radiation heat transfer, view factors. Non-steady state heat transfer, use of Heisler charts for slabs, cylinders and spheres. Numerical solution of transient heat transfer problems. Heat exchanger calculations.  Heat Utilization:Air and liquid distribution systems, including ducts, piping and controls. Radiant heating applications. Measurement of heat utilization variables and instrumentation of heating and cooling systems. Principles of refrigeration systems. | |  |  |  |  |
| **04-Agric-A4 Fluid Flow:** Piping networks. Rotational flow applied to sprinklers. Flow in porous media. Newtonian and non-Newtonian fluids. Pumping of food and agricultural products, both homogeneous and non homogenous. Special requirements for pumps and piping systems for food and other products that may have special requirements (e.g., high pH). Cavitation. Fans and fan control. Flow control in pipes and open channels. Hydraulic jumps. | |  |  |  |  |
| **04-Agric-A5 Principles of Instrumentation:** Basic concepts of error, resolution, accuracy, precision, sensitivity, and calibration. Analysis and interpretation of data. Transducers for the sensing of strain, displacement, velocity, acceleration, pressure, flow, temperature, humidity, moisture content, and electromagnetic radiation. Signal conditioning for noise reduction and control. Operational amplifiers, filters, and bridges. Systems for data acquisition, telemetry, display, recording and processing. Microcomputer interfacing. | |  |  |  |  |
| **04-Agric-A6 Physical Properties of Biological Materials and Food Products:** Measurement and use of physical properties in the design and control of handling, classifying, and processing systems for biological materials and food products. These properties include size, shape, bulk and solid densities, aerodynamic, frictional, mechanical, dielectric, rheological, thermal, optical and electromagnetic properties. | |  |  |  |  |
| **04-Agric-A7 Chemistry and Microbiology of Foods:** Chemistry:Water molecule and water activity. Proteins: composition, structure, denaturation, functional properties, and enzymes. Fats: structure, physical and chemical properties. Carbohydrates: structure, chemical reactions, and functional properties. Kinetics in food systems. Phase transition in food systems. Food nutritive value (e.g. texture, colour, vitamins) and the impact of treatment and storage systems on such values.  Microbiology:Bacteria, virus, yeasts and fungi. Factors affecting the development of microorganisms in foods. Alterations of food and means of controls. | |  |  |  |  |
| **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** |
| **04-Agric-B1 Systems Engineering and Materials Handling:** Systems Engineering and Materials Handling:Introductory principles of systems engineering and analysis, materials handling techniques and equipment. Environment Control:Heat, moisture, and gas production and environmental modification. Summer and winter ventilation systems. Controlled atmosphere, modified atmosphere, and ventilated storage systems. Functional Requirements:Factors affecting the functional requirements of agricultural and food processing buildings, including principles of planning and economics of design. Design of electronic systems to control the performance of the operations. | |  |  |  |  |
| **04-Agric-B2 Structural Design for Agricultural, Biosystems, and Food Industries:** Properties of composite materials, concrete, polymers. Loads on agricultural structures. Various methods of structural analysis. Complete design procedures for buildings. Principles of structural design applied to frames. Structural elements (beams, columns, and roof trusses) in steel and timber design. Riveted, bolted, welded, nailed, and glued connections. Limit states design for ultimate loading. Analysis and design of concrete structures, including reinforced beams and slabs, flat slabs, joist and other types of floors, columns, spread footings, and retaining walls. Design of prestressed sections. Concrete design based on ultimate strength design, shear resistance, bond, and anchorage. | |  |  |  |  |
| **04-Agric-B3 Machine Design for Agricultural, Biosystems, and Food Industries:** Application of principles of stress analysis and materials behaviour to the design of mechanical power transmission systems using gears, brakes, clutches, belts, chains, and universal joints. Selection and specification of bearings, couplings, fasteners, and other machine elements. Design of hydraulic systems and components for machinery used in agriculture and other biosystems. Application of principles of friction, wear, and lubrication. Material types required for the agricultural, biological, and food industry. | |  |  |  |  |
| **04-Agric-B4 Machinery Analysis for Agricultural, Biosystems, and Food Industries:** Integration of applied mechanics, functional requirements, and properties of biological materials in the analysis of biological machinery. Soil reaction forces, mechanics of tillage tools and towed wheels, soil/machine relationships. Dynamics and kinematics of particles and rigid bodies pertaining to processes and product/machine relationships involved in crop and food production. Machine vibrations and stability. Cost analysis and performance evaluation of machines. | |  |  |  |  |
| **04-Agric-B5 Power Units for Agricultural, Biosystems, and Food Industries:** Internal combustion engines, fuels and combustion, engine design, energy conversion. Thermal efficiency, supercharging, and turbocharging. Power transmission systems, traction mechanics, concepts of motion resistance, sinkage, and slip. Theories of tractive propulsion and soil/vehicle mechanics, comparison of the performance of ground drive components, tractive efficiency, pull/weight ratios. Vehicle mechanics, equations of motion, force analysis, longitudinal and lateral stability. Implement hitch and control systems and their influence on tractor dynamics. Hydraulic power transmission systems, components and characteristics. Ergonomics of operator-controlled machines, human responses, sound, vibration, and comfort control. Pneumatic systems. Special requirements for power units for food processing systems. | |  |  |  |  |
| **04-Agric-B6 Irrigation, Drainage, and Erosion Control:** 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. | |  |  |  |  |
| **04-Agric-B7 Principles of Hydrology:** Fundamentals of hydrologic processes. Commonly used instrumentation. Collection, analysis, and interpretation of hydrologic data. Aerial depth and intensity/duration/frequency precipitation relationships, maximum probable precipitation and risk. Energy balance; estimation of amounts from land, lakes, and vegetative surfaces. Interception. Fundamentals of flow of water through saturated and partially saturated porous media, infiltration. Groundwater geology, well development and pump tests. Runoff hydrograph components and separation, prediction of peak flows, SCS curve number, runoff volume prediction, hydrograph synthesis, flood-routing, snow-melt. Effects of land management practices. Sedimentation. Hydrologic models. | |  |  |  |  |
| **04-Agric-B8 Food Process Engineering (Part 1):** Heating and cooling processes for foods: Steady-state heating and cooling of foods. Unsteady-state heating and cooling of foods. Heat exchangers used in the food process industry. Heat transfer in agitated vessels. Effects of heat on foods. Heat sources: steam, microwave, RF. Thermal processes: Thermal inactivation kinetics. Thermal death time relationships. Process sterilizing value. Heat transfer in canned foods. Process calculations: general methods, Ball formula method. Commercial sterilization systems: batch and, continuous retort systems. Aseptic processing.  Food freezing and freeze concentration: Thermodynamics of food freezing. Phase diagrams. Properties of frozen foods. Freezing-time calculations. Freezing systems. Transport phenomena in freeze concentration. Economics of freeze concentration. Evaporation and freeze concentration: Thermodynamics of food evaporation. Thermal sensitivity of foods. Physical and chemical properties of foods related to evaporation. Types of evaporators. Evaporator calculations: single and multiple effect evaporators. Vapor recompression. Transport phenomena in evaporation. Instrumentation, control, automation. Economics of evaporation. | |  |  |  |  |
| **04-Agric-B9 Food Process Engineering (Part 2):** Food dehydration: Equilibrium moisture content and water activity. Water sorption isotherms of foods. Drying rates. Transport phenomena in food dehydration. Quality changes in food during drying. Types of dryers. Dryer design and calculations. Microwave drying. Infrared radiation drying. Electric and magnetic field drying. Sun drying.  Filtration, sedimentation and centrifugation: Constant and falling rate filtration. Continuous filtration. Effects of compaction and of fouling. Filtration agents. Equipment. Sedimentation in air and in liquids. Centrifugation: equations, effects of concentration, equipment.  Membrane processes: Classification of pressure-driven membrane processes: microfiltration, ultrafiltration, and reverse osmosis. Membrane types and selection. Mechanisms of transport. Equipment.  Extrusion: Rheology of foods. Single and multiple screw extruders. Newtonian and non-Newtonian models for extruders. Dies. Power consumption. Residence-time distributions. Heat transfer in extruders.  Cleaning and sanitation: Types of soil. Cleanliness criteria. Cleaning procedures and techniques. CIP systems. Cleaning agents. Cleaning kinetics and mechanisms.  Practices to ensure food quality & safety: practices such as HACCP to ensure food quality and safety during handling, processing, storage and distribution.  Principles of food packaging: mass transfer in packaging materials, properties of packaging materials, aseptic processing and packaging. | |  |  |  |  |
| **04-Agric-B10 Biochemical Engineering:** Basic microbiology and chemistry of cells, biochemical kinetics, enzymes and metabolic pathways, energetics, transport phenomena, and reactor design as applied to biochemical reactors, scale-up, fermentation technology. | |  |  |  |  |
| **04-Agric-B11 Principles of Waste Management:** Characterization of solid and liquid biological waste streams (e.g., C:N ratio, solids/moisture content, suspended solids, COD, BOD, pathogens, etc.). Sampling and analysis protocols. The potential to pollute and impact of waste streams on the environment (soil, air and water). Processes by which waste stream pollutants enter the environment and how their impact can be minimized through proper management and treatment. Site selection for farms, aquacultural facilities and agro-food industries. Handling and storage systems for waste management. Land application of organic wastes. Relevant guidelines and regulatory requirements for such design. Responsibility and role of the engineer in providing solutions and environmental impact analysis. | |  |  |  |  |
| **04-Agric-B12 Principles of Biological Waste Treatment:** Microbiological, biochemical and physical principles underlying the design, specification, and operation of aerobic and anaerobic processes for treating solid and liquid wastes: Aeration, activated sludge, biological contactors (RBCs and trickling filters), composting systems, anaerobic digesters, constructed wetlands, and biofilters. Batch and continuous processes. Relevant guidelines and regulatory requirements for the siting, design and operation of the above. Water, soil and air quality parameters and how biological treatment processes must be designed to have a positive impact on these resources. | |  |  |  |  |
| **04-Agric-B13 Control and Monitoring:** Control theory. Proportional, integral and derivative control. Transducers for biological applications. Analog monitoring systems. Microcomputer interface of transducers. Advantages and disadvantages of different types of transducers for heat, temperature, humidity, flow, pressure, level measurement, and seed counting. Special requirements for transducers and instrumentation in the biological environment. | |  |  |  |  |
| **04-Agric-B14 Aquacultural Engineering:** Physiology of main species of finfish and shellfish. Water requirements. Filtering of fresh and salt water using passive and biological filters. Temperature, pH, ammonia, and oxygen/carbon dioxide, and suspended-solids control. Site selection. Design of on-land, recirculating and once through systems. Cage design for offshore systems. Feeding and monitoring of fish. Harvesting, handling and/or primary processing. | |  |  |  |  |
| **04-Agric-B15 Design of Building for Agricultural, Biosystems, and Food Industries:** Types of structures and their insulation and vapour barrier requirements. Building codes and their applications. Site location and design requirements for greenhouse facilities, livestock shelters, fruit and vegetable storage, grain handling and storage, slaughter houses and milling facilities. Accessories required for such buildings: ventilation, waste management, roads, water supply, power and snow and wind protection. | |  |  |  |  |