Date	2016-07-15
Job Title	Materials Characterization Specialist
Reports To (title)	Laboratory Director
Jobs Reporting (titles)	none
Department	Mechanical and Mechatronics Engineering
Location	Main Campus
Grade	USG 10

Primary Purpose:

The Materials Characterization Specialist supervises the operation of the Materials Engineering and Processing Group and Centre for Advanced Materials Joining - CAMJ laboratories. Technical support is provided for the research and teaching needs of faculty, post-doctoral fellows, research associates, graduate and undergraduate students. The Specialist independently manages the daily laboratory operations, training and maintenance, repair of advanced apparatus including setup, alignment and calibration. Equipment reservations, billing and accounting, data interpretation and analysis are also integral responsibilities.

Key Accountabilities:

The key activities and responsibilities in these laboratories are based on both teaching and research activities.

Provide technical support for research activities

- Research support is principally for the Materials Engineering and Processing Group and the Centre for Advanced Materials Joining.
- Research topics comprise the properties and microstructure of traditional materials, advanced materials and nanomaterials; advanced material processing and joining techniques that encompass welding, microjoining, friction stir welding, surface treatments, materials for hydrogen storage, and superconductivity.
- Laboratory equipment includes: scanning electron microscopes (SEMs), nano electron beam welder (attached with the SEM), a nanoindentation system, 2D-X-Ray diffracractromer, surface profiler, micro-hardness testers, thermal analysis equipment, calorimeters, vacuum system and optical and stereo microscopes with image analysis, and many computers and software packages.
- The Specialist has extensive input to all levels of research up to published work in per-reviewed journals. They participate in supervising graduate thesis or undergraduate projects independently or in guidance with faculty.
- Participation with faculty members in preparation of research or equipment grant application including equipment assessment from various vendors and negotiating competitive tenders for equipment procurement.

Provide laboratory management:

- The Specialist is responsible for ensuring the effective, efficient and safe operation of these laboratories. This includes supervising undergraduate and graduate students, post-doctoral and research fellows while they work in the labs. Technical support is required by most users and ranges from designing experimental procedures for faculty to guiding undergraduate students through hands-on tutorials.
- This senior position independently managers and supervises the daily laboratory operation, maintenance and repairing, including equipment booking, accounting, billing activities, data interpretation and analyses.

- Provides the Materials Engineering Faculty with extensive input with respect to the purchase, rehabilitation and modernization of laboratory equipment and independently designs, constructs and modifies new and existing test measurement equipment.

The Materials Engineering and Processing Group, CAMJ and MME are continuously evolving and changing to keep pace with current technology and institutional requirements. As a result, the nature and scope of this position must also evolve. The Specialist is expected to be flexibly responsive to the changing needs of the MME's teaching and research requirements.

Specific technical accountabilities

As mentioned, the specific accountabilities of this position evolve over time. The principal current specifics include:

- Provide proficient supervision and training for all user levels of the laboratory equipment.
- Responsible for all equipment set ups and daily/monthly calibration, including:
  - Scanning Electron Microscopes (SEMs)
  - Nanoindentation System
  - Two-Dimensional X-Ray Diffractionmeter with software (Clear, micro-Area, Jade, PDF database)
  - INCA200 and INCA 350 EDS Microanalysis System
  - Wavelength Dispersive Spectrometer (WDS)
  - Electron Beam Welder attached with the Scanning Electron Microscope
  - Thermal analysis equipment (DSC, DIL, Calorimeter)
  - Computerized optical microscopes with Image-Pro Plus, Scope-pro, Materials-Pro Analysis Systems
  - Microhardness testers etc.
  - Wyko Surface Profile tester
- Sample preparation for materials characterization
- Vacuum systems
- Engineering materials
- Conduct multiple researcher projects independently or in collaboration with faculty, graduate students and other research staff.
- Designing testing methods to characterize materials microstructure, chemical composition analysis, quantitative image analysis and mechanical properties.
- Scientific data interpretation and analyses
- Safety standards and procedures
- Supervising or co-supervising graduate thesis or undergraduate projects
- Participation with faculty members in preparation of research or equipment grant application
- Apparatus assessment from various vendors and negotiating competitive tenders for procurement.
- Equipment reservations, billing and accounting
- Maintenance and repair of the equipment.

Position Requirements

Education A degree in mechanical engineering or similar engineering program is required. An advanced degree is preferred. Candidates with a B.Sc in Materials Science and Engineering/Physical Sciences plus advanced degrees in Materials or Metallurgical Engineering will be considered. Must be a Professional Engineer in Ontario or a registered Engineer in Training.

Experience: Several years of relevant experience are required; the candidate should have expert knowledge and significant experience in most if not all of the following areas:

1) Excellent teaching, research, and industrial experience required.
2) Excellent theoretical and practical knowledge of materials engineering courses. Through knowledge of the theory and practice of qualitative and quantitative materials characterization equipment, as well as other materials testing equipment, as they apply to extensive materials, such as metals, alloys, ceramics, intermetallics, thin films/surface coatings, powder metallurgy, polymers and composites. Proven ability to present lectures and teach laboratory courses. Experience with the preparation and delivery of instructional courses.
3) An expert experience in designing testing methods used to characterize materials microstructure, chemical composition analysis, quantitative image analysis and mechanical property testing. Proven ability to conduct multiple research projects independently or in collaboration with faculty, graduate students and other research staff. Also provides consulting work, including writing formal technical reports independently.
4) Broad experience in PC/MS Windows-based applications along with very good knowledge of PC/Windows environments. Excellent, knowledge and skills of hardware and software for high technology computerizes instruments, including updates of MS Windows systems and instruments software/ hardware.
5) Proven ability to interact effectively with faculty, post-doctoral researches, visiting scholars/scientists, undergraduate, graduate students and staff along with academic/industrial users. Consulting for projects of undergraduate and graduate students and post-doctoral and high level experienced researchers and industrial partners.
6) Excellent problems-solving, judgment and analytical abilities. Excellent interpersonal, communication, analytical and organizational skills. Ability to write proposals, technical reports and academic papers.
7) Able to provide the maintenance and repair of the equipment, generally with no service contract.

Technical: A strong aptitude for mechanical technologies and systems is essential. Must have good knowledge and operational experience in many of the following areas:

- multidisciplinary design of consumer products
- engineering tools (e.g., Labview, MatLab)
- computer aided design and solid modelling
- commercialization of products and technologies
- product sourcing
- electro-mechanical systems
- thermal and fluids test and measurement techniques
- material properties and materials testing
- hydraulic, pneumatic, and electric control systems
- mechanical testing equipment
- digital data acquisition, monitoring, and control systems
- analog and digital circuit design
- systems maintenance and calibration
- software development and programming
- safety standards and procedures

Nature and Scope:

Interpersonal Skills	Provides technical support for undergraduate students, faculty, and other technical staff. Must be able to effectively communicate with people at all levels of expertise
Level of Responsibility	Independently advises and instructs students. Manages laboratories and equipment inventory.
Decision-Making Authority	Advises students in conjunction with supervising faculty
Physical Demands	Most of the work is light and clean however the specialist can occasionally be expected to move and handle large and awkward equipment.
Working Environment	Working conditions are similar to those found in a typical materials lab. Some of the equipment in this lab can be very dangerous if not handled properly. Working outside of normal hours might be occasionally required to deal with emergencies, maintenance, or extended run experiments..