

COMPETENCY PROFILE:

MECHANICAL ENGINEER

ROLE OVERVIEW

Mechanical engineers research, plan, and design mechanical products and systems. Their primary focus is creating different and reliable machines, equipment, and systems for various purposes, from power generation to consumer products. They are essential in concept design, prototyping, testing, and product production. They use computer-aided design software to create detailed models, conduct simulations, and evaluate their designs' performance and structural integrity. They work in interdisciplinary teams to integrate mechanical components into larger systems seamlessly.

ALSO KNOWN AS:

- Mechanical Engineering Specialist
- Machinery Engineer
- Mechanical Technology Engineer
- Mechanical Design Engineer
- Mechatronics Engineer
- Structural Engineer
- Robotics Engineer
- Nuclear Engineer

NATIONAL OCCUPATIONAL CLASSIFICATION:

- 21301 – Mechanical engineers

EDUCATION AND EXPERIENCE

- A bachelor's degree in mechanical engineering is essential. The degree encompasses thermodynamics, fluid mechanics, materials science, and mechanical design, offering a comprehensive introduction to mechanical engineering principles and practices.
- Practical experience is critical for applying theoretical knowledge. Internships, co-op programs, or entry-level positions provide hands-on experience with projects, helping to understand mechanical systems' complexities and enhancing problem-solving skills.
- Registration with a professional engineering association is encouraged or required in many areas. It typically involves passing an exam and accumulating work experience. Holding a Professional Engineer (P.Eng.) designation boosts credibility and may be required for roles with public safety responsibilities.
- Mechanical engineering is a diverse and evolving field. Engineers may focus on renewable energy systems, environmental fluid mechanics, green building technologies, or sustainable manufacturing. Advanced degrees or certifications aid in specialization and staying updated with technological progress.
- Mechanical engineers should possess strong analytical abilities and creativity and thrive in multidisciplinary teams. Practical communication skills are crucial for conveying complex technical information to a broader audience.

TECHNICAL



Computer-aided Design Modelling and Drafting

Produces 2D and 3D computer-aided design (CAD) models and drafts consistently with high accuracy and precision to minimize errors and ensure compliance with design specifications.

- Creates designs based on engineering analyses to display technical specifications and models of the proposed final products.
- Review detailed elements in creating CAD models to ensure all aspects are represented accurately and dimensions correctly applied.
- Ensures that all CAD models and drafts comply with industry standards, company guidelines, and relevant regulations to contribute to a consistent and standardized design approach.
- Maintains organized and well-documented CAD files to facilitate team members' access to and understanding of the design history and revisions.
- Produces CAD models and drafts that match the client's vision, integrating their feedback to create a final product that meets or surpasses expectations.
- Conducts thorough reviews of own work to identify and rectify any discrepancies or omissions in CAD models and drafts, ensuring the highest level of quality.

Engineering Design

Coordinates technical planning and design for engineering projects to ensure safe, efficient, and practical construction.

- Effectively translates conceptual ideas into tangible engineering designs, demonstrating a creative and innovative approach and producing well-defined concepts that align with project requirements and objectives.

- Prepares designs to fit the existing budget to create possible and practical solutions within existing constraints.
- Proposes multiple designs to create feasible options for the project's needs.
- Conducts site-specific risk assessment of the work area, identifying the hazards and implementing the control measures required to complete engineering work.
- Prepares complete technical drawings with sufficient details and specifications to ensure the effective and safe construction of mechanical products, structures, systems, or facilities.
- Considers information from multidisciplinary assessments to design and test effective mechanical engineering solutions.
- Propose technical design or process changes to improve product, structure, system efficiency, quality, or performance.

Engineering Review and Analysis

Reviews and analyzes relevant technical design and complex system information to develop appropriate solutions.

- Evaluates technical data to assess mechanical systems' performance and identify improvement areas.
- Assesses the functionality, replicability, costs, and other factors to be considered to develop appropriate technical solutions to engineering-related problems.
- Assesses the accuracy and reliability of mechanical equipment, facilities, structures, and systems to identify possible enhancements.
- Works with other technical staff to adjust designs of products, parts, or systems to ensure that they meet the industry standards and specifications for operations.

Mechanical Systems

Contributes to designing, assembling, and commissioning mechanical assemblies, equipment, and systems to fulfill project requirements and ensure operational functionality.

- Applies engineering principles to analyze and test mechanical engineering projects to identify and address complex problems.
- Services, repairs, adjusts, and tests machines, devices, moving parts, and equipment primarily based on mechanical principles to ensure continued functionality.
- Utilizes computer applications to support the testing and analysis of mechanical engineering projects.
- Applies appropriate knowledge of mechanics, fluid mechanics, thermodynamics, hydraulics, and pneumatics to analyze and develop mechanical systems.
- Research and identify appropriate materials, components, and practices to develop appropriate mechanical system solutions.

Project Management

Oversees a team of professionals to effectively and efficiently produce the required output to ensure projects are completed on time and within budget.

- Develop project plans and set milestones to facilitate successful project completion.
- Takes corrective measures to address technical issues when projects deviate from their planned path, ensuring timely completion.
- Allocates resources effectively to maximize their utilization.
- Documents insights gained from project execution to improve risk mitigation strategies in future projects.
- Manages tasks according to the approved scope of work to deliver quality reports on schedule and within budget.

Project Management

Oversees a team of professionals to effectively and efficiently produce the required output to ensure projects are completed on time and within budget.

- Develops project plans and budgets, with milestones, risk mitigation plans, and financial projections that align with project requirements.
- Determines project requirements, objectives, and deliverables to lay a solid foundation for successful projection.
- Implements corrective actions when projects veer off course by providing technical solutions to deliver projects on time.
- Follow up with customers, vendors, and colleagues during and after project completion to address customer concerns, comments, or objections on time.
- Manages tasks according to the approved scope of work to deliver quality reports on schedule and within budget.

Quality Assurance and Quality Control

Follows appropriate processes directed by global engineering standards and industry best practices to maintain quality throughout operations.

- Directs testing activities for mechanical components and equipment under designated conditions to ensure operational performance that meets health and safety standards and is proven reliable.
- Regularly tests the efficacy of designed solutions to ensure they continue to work overtime.
- Analyzes operational data to evaluate operations, processes, or products to ensure efficiency.
- Maintains historical information on operational data to reference and corresponding sources.
- Applies appropriate processes to trace and record the data to understand its movements within the organization.

Troubleshooting

Identifies operating problems and inefficiencies in current equipment, processes, or systems and reports issues to determine effective solutions.

- Addresses issues in new or existing products related to design, materials, or processes to streamline manufacturing.
- Designs, installs, or troubleshoots manufacturing equipment for reliability and maintenance.
- Troubleshoots problems in the manufacturing process and provides solutions to rectify build issues.
- Identifies and analyzes manufacturing process issues to develop effective troubleshooting strategies to minimize downtime and improve efficiency.



Attention to Detail

Review completed work by monitoring and checking information, organizing tasks and resources efficiently, and assessing all areas involved in achieving an objective.

- Identifies and corrects errors or omissions, where applicable, to reduce future performance issues so that mechanical products, systems, or applications operate as expected.
- Verifies the precision of all information to ensure work is accurate and consistent.
- Establishes procedures or processes to validate information to minimize disruptions to ensure the project meets deliverables.
- Checks in with team members to consider changing priorities or expectations to produce results that improve relationships and business objectives.

Communication

Positively directs outcomes by delivering communication that better understands goals and objectives, captures interest, and gains support for immediate action.

- Explain novel or complex engineering concepts and related facts appropriately to an audience to explain aspects of the design process and proposal.
- Actively listens to team members to address concerns and integrate ideas, values, and new information, where appropriate.
- Communicates manufacturing capabilities, product development schedules, or other information to facilitate production processes.
- Utilizes unambiguous language for communication to aid team members in accomplishing their objectives more efficiently or effectively.
- Ensures clear communication with clients to grasp their needs and offer regular updates on progress.

Problem-Solving

Identifies problems and uses logic, judgment, and evidence to evaluate alternative scenarios and recommend solutions to achieve a desired goal.

- Conducts root cause analyses to identify issues or failures to develop innovative solutions.
- Analyzes data to evaluate operational challenges to prevent recurrence.
- Considers several possible explanations or alternatives for a situation that anticipates potential obstacles and develops plans to overcome them.
- Uses a mix of logical reasoning and creative thinking to develop innovative and well-thought-out solutions.



Regulatory Compliance

Adheres to specific regulations, codes, and legislation within a defined jurisdiction to ensure the health and safety of others.

- Ensures project compliance by adhering to applicable regulations, legislation, and standards.
- Participates in developing internal policy and procedures to ensure assessments are conducted as per all legal requirements.
- Applies engineering codes and statutes of a defined jurisdiction in designing mechanical or software solutions to ensure the safety standards of designs are met.
- Ensures that products comply with safety and environmental requirements.
- Integrates environmental and safety features into mechanical designs to ensure the well-being of end-users and the environment.

This profile is a living document. If you have any feedback or would like to help us improve the profile, please reach out to research@eco.ca.