

MEE2006: Introduction to Mechanical Design

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--Example 1: Turbocharger design engineer ----

Position Summary:

- Completes moderate to complex Design Engineering assignments by following prescribed procedures, when applicable.
- Executes projects by using off-the-shelf (existing, released technology) in addition to conceptualizing and developing new and innovative solutions, with minimum guidance.

Key Accountabilities:

- Participates as a key member of program team to execute new customer design projects. Maintains existing designs.
- Designs turbocharger components and assemblies by following established Design Engineering standards as required. Works through engineering challenges using tools such as CAD layouts, stack-ups, kinematic programs, as well as various internal applications and techniques to perform basic analyses of new designs. Proficient in solid modeling (surfacing skills preferred), creating assemblies, and creating and modifying associated drawings.
- Updates and maintain electronic CAD data, adheres to established CMS processes and works within the established PDM system.
- Leads design and drawing reviews for new components and turbochargers on assigned projects. Enforces established product release processes and standards . Participates/presents in product gate reviews.
- Using the Change Management System, initiates and coordinates critical design changes with Manufacturing Engineering and Supplier Management teams while adhering to departmental standards.
- Participates with Applications Engineering in customer design reviews, ensuring the turbocharger adheres to all customer requirements.

Technical Acumen:

- Performs engineering calculations of moderate complexity and executes dimensional analysis including tolerance stackups.
- Demonstrates the ability to calculate required tolerances to meet design requirements.
- Familiar with and able to properly apply GD&T to casting, machining, and assembly models and drawings.
- Understands and can accurately apply various technical specifications, including both internal and external industry standards.

Tracking Work/Tasks, Priority Setting, and Group Communication:

- Monitors and tracks all design-related tasks associated with assigned projects.
- Leads moderate to complex projects, sets priorities, communicates effectively, and completes required tasks to key dates.

Autonomy (Self-Motivated, Knowledge of Systems & Processes, Organizational Agility, etc.):

- Familiar with department systems and processes. Proficient at identifying the correct person or procedure to consult when faced with a new or unique situation. This may involve seeking assistance

outside the department. Is aware of external processes that influence the design process.

- Self-motivated. Communicates with direct supervisor when all assigned tasks are complete.
- Ability to multitask and assist on special projects as needed. Identifies and removes roadblocks to success. Informs direct supervisor if assistance is needed.

Quality & Quantity of Results:

- Consistently delivers quality results on moderate to complex design tasks. Spends sufficient time in checking work output to ensure tasks are completed correctly.

• Ability to investigate root causes, document findings, and learn from mistakes. Cross-Functional Interaction and Design Engineering Group Representation:

- Interacts primarily with Design Engineering, Applications Engineering, Product Development, Manufacturing, Quality, Supply Chain, Vendors, and Customers.
- Demonstrates effective communication, in written and oral forms, including project updates, BOM maintenance, and project change communication.
- Represents Design Engineering in cross-functional teams.
- Be aware of other group functions and responsibilities

Self-Improvement (Gap Analysis, Soft Skills, Training, etc.):

- Interacts professionally with other team members. Effective member of a team.
- Capable of identifying required training needs as well as following HR and supervisor guidance.
- Self-aware of personal strengths and weaknesses. Ability to seek advice when required.

Qualifications-

Education and Experience:

- Bachelor's Degree in an Engineering or technical discipline.
- Must have strong technical math skills, especially trigonometry and descriptive geometry.
- Proficient with Microsoft Office software (Word, Excel, PowerPoint, and Outlook)
- 2000 hours Pro/E experience or an equivalent 3D solids package (SolidWorks, UG, Catia etc.).
- Casting design experience or equivalent manufacturing design experience is strongly preferred. Understanding of the relationship between casting and machining of various components.
- Be familiar with current tooling, pattern making and casting practices as related to sand, permanent mold and investment casting design requirements.
- Understand the cost drivers associated with various materials, design features and manufacturing processes.
- Knowledge of fundamentals of internal combustion engines.
- Experience in engine or automotive component design.
- Knowledge of turbochargers.

---Example 2: Rocket Engines Design Engineer ----

Overview

As part of a small, passionate and accomplished team of experts, you will help design and develop rocket engines and propulsion systems that meet Blue Origin's launch vehicle program requirements for various spaceflight systems. This position will directly impact the history of space exploration and will require your dedicated commitment and detailed attention towards safe and repeatable spaceflight.

Responsibilities

Design, build, and test of launch vehicle systems including engines, pumps, propellant feed systems, pressurization systems, reaction control systems

Develop 3-D models, assembly & detail drawings, and interface control documents

Specify and procure components and materials

Manage subcontractors

Provide technical guidance for integration and perform testing activities

Assist with schedule and cost estimation

Identify opportunities for safety improvements and cost savings

Qualifications

Minimum of a B.S. degree in mechanical or aerospace engineering

7+ years' experience in the detail design of aerospace fluid systems and components

Experience with Creo (Pro/E) Wildfire 5 or greater, Windchill 10

Experience with GD&T analysis (ASME Y14.5)

Knowledge of fabrication, integration processes and quality control

Working knowledge of components such as valves, regulators, bellows and fittings

Working knowledge of materials and treatments

Must be a U.S. citizen or permanent resident (current Green Card holder)

Desired

Knowledge in the use of FEA analysis tools (ANSYS is preferred)

-- Example 3: Satellite Development: Senior Mechanical Design Engineer--

SpaceX was founded under the belief that a future where humanity is out exploring the stars is fundamentally more exciting than one where we are not. Today SpaceX is actively developing the technologies to make this possible, with the ultimate goal of enabling human life on Mars.

SENIOR MECHANICAL DESIGN ENGINEER

RESPONSIBILITIES:

Spacecraft subsystem integration design.

Incorporate all Avionics components, harnessing and Payload/RF interconnect sub-systems into spacecraft bus design.

Support trade space investigations for structural optimization with finite element models and hand calculations.

Interface with other subsystems owners for design interface requirements, identify and implement design solutions.

Detail design for spacecraft composite panels, brackets, hardware, machined parts, tcs integration components, and various mechanical components.

Create detailed design documentation for component manufacture, assembly and test.

Conduct detailed tolerance analyses, clearance/interference checks.

Provide ongoing manufacturing support during spacecraft build for assembly, integration, and test.

Support detailed tracking spreadsheet for system mass properties (mass, CG, MOIs).

Research options for appropriate materials and surface treatments for mechanical component design to comply with mission performance requirements.

Support qualification plans (acoustic, vibration, shock, static load tests, thermal tests) to verify structural and thermal margins of safety, and correlation to analysis models.

BASIC QUALIFICATIONS:

8+ years of work experience.

Bachelor of Science in aerospace or mechanical engineering.

8+ years of experience with 3D CAD modelling and 2D drawing specifications.

PREFERRED SKILLS AND EXPERIENCE:

Knowledge of NX.

Demonstrated FEA skills for structural analysis (FEMAP/Nastran, Ansys, or others), and excellent knowledge of mechanical design principles.

Experienced with carbon fiber/ aluminum composite honeycomb design / manufacturing techniques.

Experienced in troubleshooting issues and finding solutions.

Experienced with structural and/or thermal testing and correlation of test data to predictions.

Innovative, driven, out of the box thinker, self-motivated to investigate and implement new ideas, and proactive in overcoming obstacles.

Very strong communication, teamwork and organizational skills.

ADDITIONAL REQUIREMENTS:

Must be available to work extended hours and weekends as needed.