Goethals was born in Brooklyn and, at 14, he entered the College of the City of New York. He won a cadetship to West Point where he graduated second in his class in 1880. He was commissioned as second lieutenant in the Army Corps of Engineers.

After four years working in the Northwest, he married Effie Rodman, and from 1885 to 1889 he taught at West Point. He then returned to the field, and in 1891 Goethals was placed in charge of the completion of the Muscle Shoals Canal along the Tennessee River near Chattanooga. This was his first independent command, and his responsibilities included the design and construction of the Riverton Lock at Colbert Shoals. Goethals’s recommendation of a single lock with an unprecedented lift of twenty-six feet was initially opposed by his superiors, but he persuaded the conservative army engineers of the merits of his design. The success of the Riverton Lock inspired the eventual adoption of high-lift locks elsewhere, including those for the Panama Canal.

During the Spanish-American War he was lieutenant colonel and chief of engineers of the U.S. Volunteers. In 1907, President THEODORE ROOSEVELT appointed Goethals chief engineer of the daunting Panama Canal construction, a project that had defeated French efforts in 1880. While plagued with problems such as disease and landslides, the canal was opened in August 1914, almost two years ahead of the target date. A total of 27,500 workmen are estimated to have died in the French and American efforts, but Goethals received unstinted praise from visiting engineers and from the technical press. President WOODROW WILSON appointed him the first Civil Governor of the Panama Canal Zone.

In 1919, he requested his release from his active service. Later on, he headed an engineering and construction firm. The Goethals Bridge between New York and New Jersey was named for him.