
ebbef2p Documentation

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EBBEF2p (Euler-Bernoulli Beams on Two-Parameter Elastic Foundations) can handle a wide range of static loading problems involving a one-dimensional beam supported by elastic foundation.

Note: Ebbef2p has no build-in system of units. All input data must be specified in consistent units.

CHAPTER 1

Installation

EBBEF2p for Python is available on the Python Package Index (PyPI), and it can be installed using the Python package installer `pip`. If you have `pip` installed, you can open a terminal and run:

```
pip install ebbef2p-python
```

See also:

How to get started with `pip`:

- <https://pip.pypa.io/en/stable/quickstart/>

CHAPTER 2

Introduction

The concept of beams on elastic foundations it is extensively used by geotechnical, pavement and railroad engineers for foundation design and analysis.

Currently, the analysis of beams on elastic foundation is performed by using special computer programs based on numerical methods, such as Finite Difference Method (FDM) and Finite Element Method (FEM). However, these programs are limited in their application, most of them being developed only for a very simple subgrade model, Winkler's Hypothesis. They cannot be used for other soil models such as Two-Parameter, Elastic Half-Space or Elastic Layer and others.

This paper describes a finite element computer program, as a toolbox to MATLAB, developed to analyse the interaction between a beam and its two-parameter elastic foundation. By considering a linear variation of both foundation parameter, EBBEF2p can account in a consistent way for the bearing soil inhomogeneity. It can be used for any practical static loading and support condition including prescribed displacement.

The numerical model uses a cubic Hermitian polynomial to interpolate nodal values of the displacements field for a two-node beam elements. The elemental stiffness matrix and load vector are obtained by using Galerkin's Residual Method with adding the contribution of the foundation as element foundation stiffness matrices to the regular flexure beam element.

Finite Element Modelling

All foundation models shown foregoing lead to the same differential equation. Basically, all these models are equivalent and differ only in the definition of its parameters [6].

The various two-parameter elastic foundation models define the reactive pressure of the foundation $p(x)$, as [6]

$$p(x) = kw(x) - t \frac{d^2 w(x)}{dx^2} \quad (3.1)$$

4.1 ebbef2p package

4.1.1 Submodules

4.1.2 ebbef2p.beam module

4.1.3 ebbef2p.distributed_load module

4.1.4 ebbef2p.elastic_foundation_support module

4.1.5 ebbef2p.element module

4.1.6 ebbef2p.helpers module

4.1.7 ebbef2p.nodal_load module

4.1.8 ebbef2p.nodal_support module

4.1.9 ebbef2p.soil_conditions module

4.1.10 ebbef2p.structure module

4.1.11 ebbef2p.vlasov_foundation_parameters module

4.1.12 Module contents

CHAPTER 5

Indices and tables

- `genindex`
- `modindex`
- `search`