**Node Class Constructor**

**Arguments**

* node\_coord: 1x3 vector
* node\_number: double

**Computes/Stores**

* node\_coord: 1x3 vector
* node\_number: double

**Calls**

* AssignDOF()

**Returns**

* N/A

**GetNodeCoord()**

**Arguments**

* N/A

**Computes/Stores**

* N/A

**Returns**

* node\_coord: 1x3 vector

**Node Class**

**Properties**

* node\_coord: 1x3 vector
* node\_dof: 6x1 vector
* node\_number: double

**Public Methods**

* Constructor
* GetNodeCoord()
* GetNodeDOF()

**Private Methods**

* AssignDOF()

**AssignDOF()**

**Arguments**

* node\_number: double

**Computes/Stores**

* node\_dof: 6x1 vector

**Returns**

* N/A

**GetNodeDOF()**

**Arguments**

* N/A

**Computes/Stores**

* N/A

**Returns**

* node\_dof: 6x1 vector

**ComputeForces()**

**Arguments**

eleDelta: 1x12 vector

**Computes/Stores**

elementForces: 12x1 vector

**Returns**

elementForces: 12x1 vector

**GetElementDOF()**

**Arguments**

N/A

**Computes/Stores**

N/A

**Returns**

element\_dof: 12x1 vector

**GetGlobalStiffness ()**

**Arguments**

N/A

**Computes/Stores**

N/A

**Returns**

globalStiffness: 12x12 matrix

**Element Class Constructor**

**Arguments**

elementNodes: 1x2 vector

A: double

Izz: double

Iyy: double

J: double

Zzz: double

Zyy: double

E: double

v: double

webdir: 1x3 vector

w: 1x3 vector

**Computes/Stores**

elementNodes: 1x2 vector

A: double

Izz: double

Iyy: double

J: double

Zzz: double

Zyy: double

E: double

v: double

webdir: 1x3 vector

distribLoad: 1x3 vector

length: double

gamma: 12x12 matrix

localStiffness: 12x12 matrix

globalStiffness: 12x12 matrix

element\_dof: 12x1 vector

fixedEndForcesLocal: 12x1 vector

fixedEndForcesGlobal: 12x1 vector

**Calls**

ComputeLength

ComputeTransformationMatrix

ComputeElasticStiffnessMatrix

RetrieveDOF

ComputeFixedEndForces

**Returns**

N/A

**Element Class**

**Properties**

elementNodes: 1x2 vector

A: double

Izz: double

Iyy: double

J: double

Zzz: double

Zyy: double

E: double

v: double

webdir: 1x3 vector

distribLoad: 1x3 vector

length: double

gamma: 12x12 matrix

localStiffness: 12x12 matrix

globalStiffness: 12x12 matrix

element\_dof: 12x1 vector

fixedEndForcesLocal: 12x1 vector

fixedEndForcesGlobal: 12x1 vector

**Public Methods**

Constructor

GetGlobalStiffness

GetElementDOF

GetFixedEndForcesGlobal

ComputeForces

**Private Methods**

ComputeLength

ComputeTransformationMatrix

ComputeElasticStiffnessMatrix

RetrieveDOF

ComputeFixedEndForces

**GetFixedEndForcesGlobal()**

**Arguments**

N/A

**Computes/Stores**

N/A

**Returns**

fixedEndForcesGlobal: 12x1 vector

**ComputeTransformationMatrix()**

**Arguments**

N/A

**Computes/Stores**

Local-

etay: double

etaz: double

twoy: double

twoz: double

foury: double

fourz: double

sixy: double

sixz: double

twelvey: double

torsion: double

Global-

globalStiffness: 12x12 matrix

localStiffness: 12x12 matrix

**Calls**

N/A

**Returns**

globalStiffness: 12x12 matrix

localStiffness: 12x12 matrix

**ComputeTransformationMatrix()**

**Arguments**

N/A

**Computes/Stores**

Local-

firstNode: 1x3 vector

secondNode: 1x3 vector

xprime: 1x3 vector

zprime: 1x3 vector

Global-

transformationMatrixGamma: 12x12 matrix

(Stored as- gamma: 12x12 matrix

**Calls**

GetNodeCoord

**Returns**

transformationMatrixGamma: 12x12 matrix

**ComputeLength()**

**Arguments**

N/A

**Computes/Stores**

Local-

firstNode: 1x3 vector

secondNode: 1x3 vector

Global-

length: double

**Calls**

GetNodeCoord

**Returns**

length: double

**ComputeFixedEndForces()**

**Arguments**

N/A

**Computes/Stores**

fixedEndForcesLocal: 12x1 vector

fixedEndForcesGlobal: 12x1 vector

**Calls**

N/A

**Returns**

fixedEndForcesLocal: 12x1 vector

fixedEndForcesGlobal: 12x1 vector

**RetrieveDOF()**

**Arguments**

N/A

**Computes/Stores**

elementDOF: 12x1 vector

**Calls**

GetNodeDOF

**Returns**

elementDOF: 12x1 vector