Open Journal of Mathematical Sciences

PSR Press

*Corrigenda*

# Corrigenda to "The Galerkin method and hinged beam dynamics"

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Communicated by: Mujahid Abbas
Received: 9 November 2023; Published: 29 December 2023.

**Abstract:** This corrigenda makes seven corrections to D. Raske, "The Galerkin method and hinged beam dynamics," *Open J. Math. Sci.* 2023, 7, 236-247.

**Keywords:** Nonlinear partial differential equations; Galerkin method; Continuum mechanics.

**MSC:** Primary 35L35; Secondary 35Q99; 35L76.

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## 1. Introduction

When [1] was published, it contained errors. Because of this, Theorem One (the sole theorem stated in [1]) was not proven when [1] was published. To remedy this situation the author has made several changes to [1]. Once these changes have been made, Theorem One becomes proven. A list of these changes is as follows. In the first paragraph, the following mix of text and mathematical symbols appears:

"Let $y = y(x)$ and $z = z(x)$ be two real-valued functions that are defined on $\Omega$." This should read:

"Let $u_0 = u_0(x)$ and $u_1 = u_1(x)$ be two real-valued functions that are defined on $\Omega$."

In the first paragraph, the following mix of text and mathematical symbols appears:

"The initial/boundary value problem

$$
\begin{aligned}
&u_{tt} + F_1(u_t) + u_{xxxx} + F_2(u) = f \text{ on } \Omega \times (0,T),\\
&u(a,t) = u(b,t) = 0 \text{ for all } t \in (0,T),\\
&u_{xx}(a,t) = u_{xx}(b,t) = 0 \text{ for all } t \in (0,T),\\
&u(x,0) = y(x) \text{ for all } x \in \Omega,\\
&u_t(x,0) = z(x) \text{ for all } x \in \Omega,
\end{aligned}
$$

occurs naturally in the study of vibrations in beams that are hinged at both ends."

This should read:

"The initial/boundary value problem

$$
\begin{aligned}
&u_{tt} + F_1(u_t) + u_{xxxx} + F_2(u) = f \text{ on } \Omega \times (0,T),\\
&u(a,t) = u(b,t) = 0 \text{ for all } t \in (0,T),\\
&u_{xx}(a,t) = u_{xx}(b,t) = 0 \text{ for all } t \in (0,T),\\
&u(x,0) = u_0(x) \text{ for all } x \in \Omega,\\
&u_t(x,0) = u_1(x) \text{ for all } x \in \Omega,
\end{aligned}
$$

occurs naturally in the study of vibrations in beams that are hinged at both ends."

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In the statement of Theorem 1, the following mix of text and mathematical symbols appears:

"Furthermore, let $y$ be an element of $H^4_*(\Omega)$, and let $z$ be an element of $H^2_*(\Omega)$."

This should read:

"Furthermore, let $u_0$ be an element of $H^4_*(\Omega)$, and let $u_1$ be an element of $H^2_*(\Omega)$."

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In the second paragraph of step one of the proof of Theorem 1, the following mix of text and mathematical symbols appears:

"The goal of this step is to establish that for any $k \geq 1$ there exists a unique solution $u \in C^3([0,T];W_k)$ to the variational problem

$$(u''(t),v)_{L^2} + (u(t),v)_{H^2_*} + (F_1(u'(t)),v)_{L^2} + (F_2(u(t)),v)_{L^2} = (f(t),v)_{L^2},$$
$$u(0) = u_0^k, u'(0) = u_1^k,$$

for any $v \in W_k$ and $t \in (0,T)$."

This should read:

"The goal of this step is to establish that for any $k \geq 1$ there exists a unique solution $u_k \in C^3([0,T];W_k)$ to the variational problem

$$(u''(t),v)_{L^2} + (u(t),v)_{H^2_*} + (F_1(u'(t)),v)_{L^2} + (F_2(u(t)),v)_{L^2} = (f(t),v)_{L^2},$$
$$u(0) = u_0^k, u'(0) = u_1^k,$$

for any $v \in W_k$ and $t \in (0,T)$."

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In the second paragraph, the following mix of text and mathematical symbols appears:

"It follows that we can write

$$(u_k''(t),e_i)_{L^2} + (u_k(t),e_i)_{H^2_*} + (F_1(u_k'(t)),e_i)_{L^2} + (F_2(u_k(t)),e_i)_{L^2} = (f(t),e_i)_{L^2},$$
$$u(0) = u_0^k,$$
$$u'(0) = u_1^k,$$

for all $t \in (0,t_k)$ and for any $i \in \{1,2,3,...,k\}$."

This should read:

"It follows that we can write

$$(u_k''(t),e_i)_{L^2} + (u_k(t),e_i)_{H^2_*} + (F_1(u_k'(t)),e_i)_{L^2} + (F_2(u_k(t)),e_i)_{L^2} = (f(t),e_i)_{L^2},$$
$$u_k(0) = u_0^k,$$
$$u_k'(0) = u_1^k,$$

for all $t \in (0,t_k)$ and for any $i \in \{1,2,3,...,k\}$."

In the second paragraph, the following mix of text and mathematical symbols appears:

"An immediate consequence of the above is that

$$(u_k''(t),v)_{L^2} + (u_k(t),v)_{H^2_*} + (F_1(u_k'(t)),v)_{L^2} + (F_2(u_k(t)),v)_{L^2} = (f(t),v)_{L^2},$$
$$u(0) = u_0^k,$$
$$u'(0) = u_1^k,$$

for all $v \in W_k$ and $t \in (0,t_k)$."

This should read:

"An immediate consequence of the above is that

$$(u_k''(t),v)_{L^2} + (u_k(t),v)_{H^2_*} + (F_1(u_k'(t)),v)_{L^2} + (F_2(u_k(t)),v)_{L^2} = (f(t),v)_{L^2},$$
$$u_k(0) = u_0^k,$$
$$u_k'(0) = u_1^k,$$

for all $v \in W_k$ and $t \in (0,t_k)$."

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In the first paragraph of Step six, the following mix of text and mathematical symbols appears:

"Proceeding as in section 7.2 of [2], we fix a positive integer $N$ and choose a function $v \in C^1([0,T];H^2_*(\Omega)$ of the form $v(t) = \Sigma_{i=1}^N d_i(t)e_i$, where $\{d_i\}_{i=1}^N$ are smooth functions."

This should read:

"Proceeding as in section 7.2 of [2], we fix a positive integer $N$ and choose a function $v \in C^1([0,T]; H^2_*(\Omega))$ of the form $v(t) = \Sigma_{i=1}^N d_i(t) e_i$, where $\{d_i\}_{i=1}^N$ are smooth functions."

This concludes the corrigenda to "The Galerkin method and hinged beam dynamics."

## References

[1] D. Raske, The Galerkin method and hinged beam dynamics, *Open J. Math. Sci.* 2023, 7, 236-247.

[2] L.C. Evans, *Partial Differential Equations*, Graduate Studies in Mathematics, Volume 19, American Mathematical Society, 2002.