

**GLOBAL EXISTENCE FOR
VOLTERRA–FREDHOLM TYPE NEUTRAL
IMPULSIVE FUNCTIONAL
INTEGRODIFFERENTIAL EQUATIONS**

V. Vijayakumar, S. Sivasankaran and M. Mallika Arjunan

Abstract. In this paper, we study the global existence of solutions for the initial value problems for Volterra-Fredholm type neutral impulsive functional integrodifferential equations. Using the Leray-Schauder's Alternative theorem, we derive conditions under which a solution exists globally. An application is provided to illustrate the theory.

[Full text](#)

References

- [1] D.D. Bainov and P.S. Simeonov, *Impulsive Differential Equations: Periodic Solutions and Applications*, Longman Scientific and Technical Group, England, 1993. [MR1266625](#)(95b:34012). [Zbl 0815.34001](#).
- [2] D.D. Bainov and V.C. Covachev, *Impulsive Differential Equations with a Small Parameter*, World Scientific, New Jersey, 1994. [MR1430569](#)(97i:34001). [Zbl 0828.34001](#).
- [3] K. Balachandran, J.Y. Park and M. Chandrasekaran, *Nonlocal Cauchy problem for delay integrodifferential equations of Sobolev type in Banach spaces*, Appl. Math. Lett. **15**(7) (2002), 845-854. [MR1920985](#)(2003d:34162). [Zbl 1028.45006](#).
- [4] K. Balachandran, D.G. Park and S.M. Anthoni, *Existence of solutions of abstract nonlinear second order neutral functional integrodifferential equations*, Comput. Math. Appl. **46** (2003), 1313-1324. [MR2019686](#)(2005b:45006). [Zbl 1054.45006](#).

2010 Mathematics Subject Classification: 34A60, 34K05, 34K10, 45N05, 45J05.

Keywords: A priori bounds; Neutral impulsive functional integrodifferential equations; Global existence.

<http://www.utgjiu.ro/math/sma>

- [5] M. Benchohra, J. Henderson and S.K. Ntouyas, *Impulsive differential equations and inclusions*, Hindawi Publishing Corporation, New York, 2006. xiv+366 pp. ISBN: 977-5945-50-X. [MR2322133](#)(2008f:34001). [Zbl 1130.34003](#).
- [6] Y.K. Chang, V. Kavitha and M. Mallika Arjunan, *Existence results for a second order impulsive functional differential equation with state-dependent delay*, Diff. Equ. Appl. **1**(3) (2009), 325-339. [MR2554970](#)(2010k:34223). [Zbl 1192.34091](#).
- [7] Y.K. Chang, A. Anguraj and M. Mallika Arjunan, *Existence results for impulsive neutral functional differential equations with infinite delay*, Nonlinear Anal. Hybrid Syst. **2**(1) (2008), 209-218. [MR2382006](#)(2008k:34027). [Zbl 1170.35467](#).
- [8] Y.K. Chang, V. Kavitha and M. Mallika Arjunan, *Existence results for impulsive neutral differential and integrodifferential equations with nonlocal conditions via fractional operators*, Nonlinear Anal. Hybrid Syst. **4**(1) (2010), 32-43. [MR2570180](#)(2010m:34151). [Zbl 1200.34095](#).
- [9] M. B. Dhakne and S. D. Kendre, *On abstract Nonlinear Mixed Volterra-Fredholm Integrodifferential equations*, Comm. Appl. Nonlinear Anal. **13**(4) (2006), 101-112. [MR2286408](#)(2008d:45008). [Zbl 1119.45005](#).
- [10] J. Dugundji and A. Granas, *Fixed point theory*, Vol. 1, Matematyczne, PNW Warsawa, 1982. [MR0660439](#)(83j:54038). [Zbl 0483.47038](#).
- [11] E. Hernández, *A second order impulsive Cauchy problem*, Int. J. Math. Math. Sci. **31**(8) (2002), 451-461. [MR1930085](#)(2003g:34021). [Zbl 1013.34061](#).
- [12] E. Hernández, H.R. Henríquez and M.A. McKibben, *Existence results for abstract impulsive second-order neutral functional differential equations*, Nonlinear Anal. TMA, **70** (2009), 2736-2751. [MR2499742](#)(2010a:34190). [Zbl 1173.34049](#).
- [13] E. Hernández and S.M. Tanaka Aki, *Global solutions for abstract functional differential equations with nonlocal conditions*, Electron. J. Qual. Theory Differ. Equ. **50** (2009), 1-8. [MR2535075](#)(2010i:34191). [Zbl 1196.34102](#).
- [14] E. Hernández, S.M. Tanaka Aki and H.R. Henríquez, *Global solutions for impulsive abstract partial differential equations*, Comput. Math. Appl. **56** (2008), 1206-1215. [MR2437288](#)(2009h:35432). [Zbl 1155.35481](#).
- [15] E. Hernández, *Global solutions for abstract impulsive neutral differential equations*, Math. Comput. Model. **53** (2011), 196-204. [MR2739257](#). [Zbl 1211.34098](#).

- [16] E. Hernández and S.M. Tanaka Aki, *Global solutions for abstract impulsive differential equations*, Nonlinear Anal. TMA. **72** (2010), 1280-1290. [MR2577529](#). [Zbl 1183.34083](#).
- [17] E. Hernández and H.R. Henríquez, *Global solutions for a functional second order abstract Cauchy problem with nonlocal conditions*, Ann. Pol. Math. **83** (2004), 149-170. [MR2111405](#)(2005j:34087). [Zbl 1113.47309](#).
- [18] E. Hernández, M. Rabello and H.R. Henríquez, *Existence of solutions for impulsive partial neutral functional differential equations*, J. Math. Anal. Appl. **331** (2007), 1135-1158. [MR2313705](#)(2008m:35356). [Zbl 1123.34062](#).
- [19] V. Kavitha, M. Mallika Arjunan and C. Ravichandran, *Existence results for impulsive systems with nonlocal conditions in Banach spaces*, J. Nonlinear Sci. Appl. **4(2)** (2011), 138-151. [MR2783840](#). [Zbl pre05902649](#).
- [20] V. Lakshmikantham, D. Bainov and P.S. Simeonov, *Theory of impulsive differential equations*, Series in Modern Applied Mathematics, 6. World Scientific Publishing Co., Inc., Teaneck, NJ, 1989. [MR1082551](#)(91m:34013). [Zbl 0719.34002](#).
- [21] S.K. Ntouyas, *Global existence for neutral functional integrodifferential equations*, Nonlinear Anal. TMA, **30** (4) (1997), 2133-2142. [MR1490335](#)(99b:34132). [Zbl 0890.45004](#).
- [22] S.K. Ntouyas and P. Tsamatos, *Global existence for functional integrodifferential equations of delay and neutral type*, Appl. Anal. **54** (1994), 251-262. [MR1379636](#)(96j:45005). [Zbl 0838.34078](#).
- [23] S.K. Ntouyas and P. Tsamatos, *Global existence for semilinear evolution integrodifferential equations with delay and nonlocal conditions*, Appl. Anal. **64**, (1997), 99-105. [MR1460074](#)(98e:45008). [Zbl 0874.35126](#).
- [24] S.K. Ntouyas and P. Tsamatos, *Global existence for second order semilinear ordinary and delay integrodifferential equations with nonlocal conditions*, Appl. Anal. **67** (1997), 245-257. [MR1614061](#)(98k:34103). [Zbl 0906.35110](#).
- [25] B. Pachpatte, *Applications of the Leray-Schauder Alternative to some Volterra integral and integrodifferential equations*, Indian J. pure appl. Math. **26** (1995), 1161-1168. [MR1364736](#)(96m:45003). [Zbl 0852.45012](#).
- [26] A.M. Samoilenko and N.A. Perestyuk; *Impulsive Differential Equations*, World Scientific, Singapore, 1995. [MR1355787](#)(97i:34002). [Zbl 0837.34003](#).
- [27] S. Sivasankaran, M. Mallika Arjunan and V. Vijayakumar, *Existence of global solutions for impulsive functional differential equations with nonlocal conditions*, J. Nonlinear Sci. Appl. **4(2)** (2011), 102-114. [MR2783836](#). [Zbl pre05902645](#).

- [28] S. Sivasankaran, M. Mallika Arjunan and V. Vijayakumar, *Existence of global solutions for second order impulsive abstract partial differential equations*, Nonlinear Anal. TMA. **74(17)** (2011), 6747-6757.
- [29] H.L. Tidke and M.B. Dhakne, *Global existence of mild solutions of second order nonlinear Volterra integrodifferential quations in Banach spaces*, Differ. Equ. Dyn. Syst. **17(4)** (2009), 331-342. [MR2610901](#)(2011c:34198). [Zbl 1206.35176](#).
- [30] H.L. Tidke, *Existence of global solutions to nonlinear mixed volterra-fredholm integrodifferential equations with nonlocal conditions*, Elect. J. Diff. Equ. **55** (2009), 1–7. [MR2505113](#)(2010b:34139). [Zbl 1165.45010](#).
- [31] H.L. Tidke and M.B. Dhakne, *Existence of solutions for nonlinear mixed type integrodifferential equation of second order*, Surv. Math. Appl. **5** (2010), 61-72. [MR2639727](#)(2011g:34187). [Zbl 1204.45015](#).

V. Vijayakumar
 Department of Mathematics,
 Info Institute of Engineering,
 Kovilpalayam, Coimbatore-641 107,
 Tamilnadu, India.
 e-mail: vijaysarovel@gmail.com

S. Sivasankaran
 Department of Mathematics,
 University College,
 Sungkyunkwan University,
 Suwon 440-746, South Korea.
 e-mail: sdsiva@gmail.com.

M. Mallika Arjunan
 Department of Mathematics,
 Karunya University,
 Karunya Nagar, Coimbatore-641 114,
 Tamilnadu, India.
 e-mail: arjunphd07@yahoo.co.in

Surveys in Mathematics and its Applications **7** (2012), 49 – 68
<http://www.utgjiu.ro/math/sma>