



**Colegio de San Juan de Letran**  
Dominican Avenue, Abucay, Bataan  
Library and Media Services

## **RESEARCH GUIDE: NUMERICAL METHODS**

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## RESEARCH GUIDES

### NUMERICAL METHODS

#### I. SCOPE NOTE

*Numerical methods are methods designed for the constructive solution of mathematical problems requiring particular numerical results, usually on a computer. [encyclopedia.com](https://encyclopedia.com)*

#### II. SEARCH AIDS (BT: Broader Term, RT: Related Term, NT: Narrow Term)

##### BT:

- Numerical Methods

##### RT:

- Approximation and errors in computing
- Linear equations
- Difference operators
- Interpolation
- Numerical differentiation
- Integration
- Differential equations

##### NT:

- Significant digits
- Inherent error
- Rounding error
- Truncation error
- Absolute and relative error
- Error propagation
- Bisection method
- False position method
- Newton-Raphson Method
- Fixed– point method
- Muller’s method for complex and multiple roots
- Convergence of bisection
- Newton- Raphson’s and false position methods
- Gauss Elimination method by pivoting
- Gauss–Jordan method
- Gauss–Seidel method
- Relaxation method
- Convergence of iteration methods
- Interpolation with equidistant point
- Lagrange Interpolation Polynomial
- Newton Interpolating Polynomial

### III. INFORMATION RESOURCES

#### A. LIBRARY RESOURCES

*Note: For the appropriate access credentials, please contact the Letran Bataan Library*

#### ➤ E-JOURNALS

- The American Mathematical Monthly.  
[https://www.proquest.com/central/publication/publications\\_47349](https://www.proquest.com/central/publication/publications_47349)
- Journal of Applied Econometrics.  
[https://www.proquest.com/central/publication/publications\\_37371](https://www.proquest.com/central/publication/publications_37371)
- SIAM Review. [https://www.proquest.com/central/publication/publications\\_30748](https://www.proquest.com/central/publication/publications_30748)
- IMA Journal of Numerical Analysis.  
[https://www.proquest.com/central/publication/publications\\_30664](https://www.proquest.com/central/publication/publications_30664)
- IEEE Transactions on Systems, Man, and Cybernetics: Systems.  
[https://www.proquest.com/central/publication/publications\\_75739](https://www.proquest.com/central/publication/publications_75739)
- Theoretical and Computational Fluid Dynamics.  
[https://www.proquest.com/central/publication/publications\\_30636](https://www.proquest.com/central/publication/publications_30636)
- International Journal of Modern Physics. A, Particles and Fields, Gravitation, Cosmology.  
[https://www.proquest.com/central/publication/publications\\_2049857](https://www.proquest.com/central/publication/publications_2049857)
- Mathematical Problems in Engineering.  
[https://www.proquest.com/central/publication/publications\\_237775](https://www.proquest.com/central/publication/publications_237775)
- Science China. Technological Sciences.  
[https://www.proquest.com/central/publication/publications\\_2043625](https://www.proquest.com/central/publication/publications_2043625)
- Computational Methods in Applied Mathematics.  
[https://search.proquest.com/central/publication/publications\\_2038872](https://search.proquest.com/central/publication/publications_2038872)
- International Journal of Modern Physics.  
[https://search.proquest.com/central/publication/publications\\_2049857](https://search.proquest.com/central/publication/publications_2049857)
- Computer Modeling in Engineering & Sciences.  
[https://search.proquest.com/central/publication/publications\\_2048798](https://search.proquest.com/central/publication/publications_2048798)
- Computational Mechanics.  
[https://search.proquest.com/central/publication/publications\\_2043755](https://search.proquest.com/central/publication/publications_2043755)
- Journal of Mathematical Chemistry.  
[https://search.proquest.com/central/publication/publications\\_2043851](https://search.proquest.com/central/publication/publications_2043851)

#### ➤ E-THESES

- Zhou, H. (2012). Numerical methods for interest rate derivatives (Order No. 3528716). Available from ProQuest Central. (1095341618). Retrieved from <https://www.proquest.com/dissertations-theses/numerical-methods-interest-rate-derivatives/docview/1095341618/se-2?accountid=190548>
- Tifenbach, B. D. (2001). Numerical methods for modeling energy spot prices (Order No. MQ64984). Available from ProQuest Central. (304684289). Retrieved from <https://www.proquest.com/dissertations-theses/numerical-methods-modeling-energy-spot-prices/docview/304684289/se-2?accountid=190548>

- Mikelsons, K. (2009). Extensions of numerical methods for strongly correlated electron systems (Order No. 3389709). Available from ProQuest Central. (304851308). Retrieved from <https://www.proquest.com/dissertations-theses/extensions-numerical-methods-strongly-correlated/docview/304851308/se-2?accountid=190548>
- Chu, Q. (2013). Mathematical models and numerical methods for wavefront reconstruction (Order No. 3614311). Available from ProQuest Central. (1512641146). Retrieved from <https://www.proquest.com/dissertations-theses/mathematical-models-numerical-methods-wavefront/docview/1512641146/se-2?accountid=190548>
- Ambriz, F. (2011). Application of numerical methods for soil-structure interaction problems (Order No. 1504424). Available from ProQuest Central. (904583194). Retrieved from <https://www.proquest.com/dissertations-theses/application-numerical-methods-soil-structure/docview/904583194/se-2?accountid=190548>
- Grooms, I. G. (2011). Asymptotic and numerical methods for rapidly rotating buoyant flow (Order No. 3453719). Available from ProQuest Central. (867846814). Retrieved from <https://www.proquest.com/dissertations-theses/asymptotic-numerical-methods-rapidly-rotating/docview/867846814/se-2?accountid=190548>
- Kaye, J. (2020). Integral equation-based numerical methods for the time-dependent schrödinger equation (Order No. 27666347). Available from ProQuest Central. (2394293355). Retrieved from <https://www.proquest.com/dissertations-theses/integral-equation-based-numerical-methods-time/docview/2394293355/se-2?accountid=190548>
- Bishop, J. L. (2013). A controlled study of the flipped classroom with numerical methods for engineers (Order No. 3606852). Available from ProQuest Central. (1492991096). Retrieved from <https://www.proquest.com/dissertations-theses/controlled-study-flipped-classroom-with-numerical/docview/1492991096/se-2?accountid=190548>
- Eldred, C. (2015). Linear and nonlinear properties of numerical methods for the rotating shallow water equations (Order No. 3720474). Available from ProQuest Central. (1717084986). Retrieved from <https://www.proquest.com/dissertations-theses/linear-nonlinear-properties-numerical-methods/docview/1717084986/se-2?accountid=190548>
- Seaman, T. L. (2007). Models of selected problems in mathematical finance and numerical methods for stochastic differential equations (Order No. 3240839). Available from ProQuest Central. (304741217). Retrieved from <https://www.proquest.com/dissertations-theses/models-selected-problems-mathematical-finance/docview/304741217/se-2?accountid=190548>
- Lacour, M. (2018). Stochastic numerical methods applied to probabilistic seismic hazard analysis and to the non-linear finite elements method (Order No. 10978947). Available from ProQuest Central. (2191603297). Retrieved from <https://www.proquest.com/dissertations-theses/stochastic-numerical-methods-applied/docview/2191603297/se-2?accountid=190548>
- Robertson, E. D. (2015). Verification, validation, and implementation of numerical methods and models for OpenFOAM 2.0 for incompressible flow (Order No. 1596091). Available from ProQuest Central. (1710050045). Retrieved from <https://www.proquest.com/dissertations-theses/verification-validation-implementation-numerical/docview/1710050045/se-2?accountid=190548>

- Castillo, A. (2000). Essays on event studies and on numerical methods (Order No. 9973215). Available from ProQuest Central. (304582758). Retrieved from <https://search.proquest.com/docview/304582758?accountid=190548>
- Mikelsons, K. (2009). Extensions of numerical methods for strongly correlated electron systems (Order No. 3389709). Available from ProQuest Central. (304851308). Retrieved from <https://search.proquest.com/docview/304851308?accountid=190548>
- Bishop, J. L. (2013). A controlled study of the flipped classroom with numerical methods for engineers (Order No. 3606852). Available from ProQuest Central. (1492991096). Retrieved from <https://search.proquest.com/docview/1492991096?accountid=190548>
- Chellamuthu, V. K. (2015). Structured population models: Numerical methods and application to frogs infected with chytridiomycosis (Order No. 10002410). Available from ProQuest Central. (1762155695). Retrieved from <https://search.proquest.com/docview/1762155695?accountid=190548>
- Seaman, T. L. (2007). Models of selected problems in mathematical finance and numerical methods for stochastic differential equations (Order No. 3240839). Available from ProQuest Central. (304741217). Retrieved from <https://search.proquest.com/docview/304741217?accountid=190548>

## B. OPEN ACCESS

### ➤ FREE E-BOOKS

- Epperson, James F. (2013). An introduction to numerical methods and analysis, 2<sup>nd</sup> edition. New Jersey: John Wiley & Sons, Inc. <https://www.pdfdrive.com/anintroduction-to-numerical-methods-and-analysis-d33474269.html>
- Allaire, Grégoire. (2007). Numerical Analysis and Optimization An introduction to mathematical modelling and numerical simulation. New York: Oxford Press. <https://www.pdfdrive.com/numerical-analysis-and-optimization-an-introduction-to-mathematical-modelling-and-numerical-simulation-numerical-mathematics-and-scientific-computation-d160298524.html>
- Babuska, Ivo. (2002). Mathematical Modeling and Numerical Simulation in Continuum Mechanics. New York: Springer. <https://www.pdfdrive.com/mathematical-modeling-and-numerical-simulation-in-continuum-mechanics-proceedings-of-the-international-symposium-on-mathematical-modeling-and-numerical-simulation-in-continuum-mechanics-september-29-october-3-2000-yamaguchi-japan-d161979833.html>
- Linge, Svein. (2016). Programming for Computations – MATLAB/Octave: A Gentle Introduction to Numerical Simulations with MATLAB/Octave <https://www.pdfdrive.com/programming-for-computations-matlab-octave-a-gentle-introduction-to-numerical-simulations-with-matlab-octave-d158042368.html>

### ➤ FREE E-JOURNALS

- International Journal for Numerical Methods in Fluids. <https://onlinelibrary.wiley.com/journal/10970363>
- American Journal of Numerical Analysis. <http://www.sciepub.com/journal/ajna>

- Numerical Analysis and Applications. <https://www.springer.com/journal/12258>
- The Open Numerical Methods Journal. <https://benthamopen.com/TONUMJ/home/>
- International Journal of Numerical Methods in Engineering. <https://onlinelibrary.wiley.com/journal/10970207>
- IMA Journal of Numerical Analysis. <https://academic.oup.com/imajna>
- Journal of Numerical Mathematics. <https://www.degruyter.com/view/journals/jnma/jnma-overview.xml>

#### ➤ FREE E-THESES

- Ortan, A. (2017). Efficient numerical algorithms for virtual design in nanoplasmonics. (Doctoral Dissertation). University of Minnesota. Retrieved from <http://hdl.handle.net/11299/188915>
- Liu, R. (2014). Numerical and parallel algorithms for the CMKdV equation. (Thesis). University of Georgia. Retrieved from <http://hdl.handle.net/10724/20227>
- Cockayne, J. (2019). Bayesian probabilistic numerical methods. (Doctoral Dissertation). University of Warwick. Retrieved from <http://wrap.warwick.ac.uk/146107/>
- Yu, W. (2014). Numerical method for two dimensional nonlinear schrödiger equation. (Thesis). University of Georgia. Retrieved from <http://hdl.handle.net/10724/27039>
- Rehurek, A. (2011). Stable Numerical Methods for PDE Models of Asian Options. (Thesis). Halmstad University. Retrieved from <http://urn.kb.se/resolve?urn=urn:nbn:se:hh:diva-16367>
- Pavelka, O. (2019). Numerická analýza tuhých systémů diferenciálních rovnic: Numerical analysis of stiff differential equations. (Thesis). Brno University of Technology. Retrieved from <http://hdl.handle.net/11012/179326>
- Kim, T. (2012). Asymptotic and numerical methods for high-frequency scattering problems. (Doctoral Dissertation). University of Bath. Retrieved from [https://researchportal.bath.ac.uk/en/studentthesis/asymptotic-and-numerical-methods-for-highfrequency-scattering-problems\(f118863e-34de-4c49-a4b8-5bd1e697d561\).html](https://researchportal.bath.ac.uk/en/studentthesis/asymptotic-and-numerical-methods-for-highfrequency-scattering-problems(f118863e-34de-4c49-a4b8-5bd1e697d561).html)
- Oti, V. B. (2021). Numerické metody pro řešení počátečních úloh zlomkových diferenciálních rovnic: Numerical Methods for Fractional Differential Equations Initial Value Problems. (Thesis). Brno University of Technology. Retrieved from <http://hdl.handle.net/11012/200086>
- Franco de Leon, M. C. (2016). Numerical methods for curve evolution under dispersive geometric dynamics. (Thesis). University of California – Irvine. Retrieved from <http://www.escholarship.org/uc/item/35p1915m>
- Pavel, S. (2012). Analysis and Application of Numerical Methods for Solving Nonlinear Reaction-Diffusion Equations. (Thesis). Czech University of Technology. Retrieved from <http://hdl.handle.net/10467/13881>
- He., J. (2021). Numerical spectral methods for nonlinear wave equations. (Thesis). Monash University. Retrieved from <https://doi.org/10.26180/14966838.v1>
- Lans, P. (2016). Numerical Methods for Simulating Separation in a Vacuum Cleaner Cyclone. (Thesis). KTH. Retrieved from <http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-194498>

- Chenoweth, M. E. (2012). A Local Radial Basis Function Method for the Numerical Solution of Partial Differential Equations. (Thesis). Marshall University. Retrieved from <https://mds.marshall.edu/etd/243>
- CHENG, H. M. (2019). Design and Analysis of Numerical Schemes with Characteristic Methods on Generic Grids for Flows in Porous Media. (Thesis). Monash University. Retrieved from <http://hdl.handle.net/10.26180/5d55f8031cdb8>
- Yevik, A. (2011). Numerical approximations to the stationary solutions of stochastic differential equations. (Doctoral Dissertation). Loughborough University. Retrieved from <http://hdl.handle.net/2134/7777>
- Lin, J. (2017). Security Proofs for Quantum Key Distribution Protocols by Numerical Approaches. (Thesis). University of Waterloo. Retrieved from <http://hdl.handle.net/10012/12589>
- Maclean, J. (2014). Numerical multiscale methods for ordinary differential equations. (Thesis). University of Sydney. Retrieved from <http://hdl.handle.net/2123/12818>
- Kim, T. (2012). Asymptotic and numerical methods for high-frequency scattering problems. (Doctoral Dissertation). University of Bath. Retrieved from <https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.557826>

### C. PROFESSIONAL ORGANIZATIONS

- Mathematical Institute. <http://www.maths.ox.ac.uk/groups/numerical-analysis>
- Society for Industrial & Applied Mathematics. <https://www.siam.org/>
- IDEA. <https://www.ideaedu.org/idea-notes-on-learning/learning-appropriate-methods-for-collecting-analyzing-and-interpreting-numerical-information/>
- Numerical Analysis & Scientific Computing Group. <http://www.cs.toronto.edu/NA/>
- American Mathematical Society. <https://www.ams.org/home/page>
- Association for Computing Machinery. <https://www.acm.org/>
- IEEE Computer Society. <https://www.computer.org/>
- The Center for Research on Parallel Computation. <http://www.crpc.rice.edu/CRPC/>

### D. OTHER RELATED WEB PORTALS

- Numerical analysis. <https://www.britannica.com/science/numerical-analysis>
- Wolfram Alpha. <https://www.wolframalpha.com/examples/mathematics/applied-mathematics/numerical-analysis/>
- Numerical Methods at Work. [http://www.hvks.com/Numerical/related\\_sites.html](http://www.hvks.com/Numerical/related_sites.html)
- Numerical Analysis. <https://epsrc.ukri.org/research/ourportfolio/researchareas/numanalysis/>
- Holistic Numerical Methods. [http://nm.mathforcollege.com/topics/textbook\\_index.html](http://nm.mathforcollege.com/topics/textbook_index.html)
- Atoz Math. <https://atozmath.com/Menu/ConmMenu.aspx>
- Numerical Mathematics. [https://www.numericalmathematics.com/numerical\\_methods.htm](https://www.numericalmathematics.com/numerical_methods.htm)
- Wolfram Alpha. <https://www.wolframalpha.com/examples/mathematics/appliedmathematics/numerical-analysis/>

### E. RELATED RESEARCH GUIDES

- Duke University Libraries. <https://guides.library.duke.edu/c.php?g=717834&p=5110579>

- Miami University. [https://libguides.lib.miamioh.edu/mechanical\\_manufacturing\\_engin/mme202](https://libguides.lib.miamioh.edu/mechanical_manufacturing_engin/mme202)
- QUT Library Subject Guides. <https://libguides.library.qut.edu.au/tools4eng/dbs>
- The Ohio State University. <https://guides.osu.edu/engineering>

#### IV. TUTORIALS

- Core 3- Numerical Methods (2)- Iteration Full tutorial. <https://www.youtube.com/watch?v=vL-yB2fvUcw>
- Numerical Methods Using Python- Tutorial #01- Hands on tutorial series. <https://www.youtube.com/watch?v=pmkkZwqJk-U>
- Introduction to Numerical Methods and Errors. <https://www.youtube.com/watch?v=O3U8fomrAug>
- Numerical Analysis. <https://www.youtube.com/playlist?list=PLhSp9OSVmeyJdYAhtIbDlkBLGOG1wuosk>
- Mod-01 Lec-01 Introduction to Numerical Methods. <https://www.youtube.com/watch?v=QqhSmdkqgjQ>
- Tutorials Point. [https://www.tutorialspoint.com/engineering\\_mathematics\\_numerical\\_analysis\\_and\\_more/index.asp](https://www.tutorialspoint.com/engineering_mathematics_numerical_analysis_and_more/index.asp)
- Oxford University Press. [https://global.oup.com/uk/orc/biosciences/maths/reed/01student/numerical\\_tutorials/](https://global.oup.com/uk/orc/biosciences/maths/reed/01student/numerical_tutorials/)
- YouTube. <https://www.youtube.com/playlist?list=PLHGJFOxCJ5Iwm8kTk52LAQ-T0IMwZZHD>
- FNB. [https://www.fnb.tu-darmstadt.de/lehre\\_fnb/fnb\\_tutorien/fnb\\_nbv\\_t/fnb\\_nbv\\_tut.en.jsp](https://www.fnb.tu-darmstadt.de/lehre_fnb/fnb_tutorien/fnb_nbv_t/fnb_nbv_tut.en.jsp)

#### Prepared by:

**Mr. Marvin A. Milla**

Layout

[mamilla@letranbataan.edu.ph](mailto:mamilla@letranbataan.edu.ph)

**Ms. Maria Rosiel C. Ordenes**

Subject Librarian

[mrcordenes@letranbataan.edu.ph](mailto:mrcordenes@letranbataan.edu.ph)

**Asst. Prof. Norady Mercado Pere**

Chief Librarian

[ndmercado@letranbataan.edu.ph](mailto:ndmercado@letranbataan.edu.ph)

For more inquiries, kindly e-mail, us at [library@letranbataan.edu.ph](mailto:library@letranbataan.edu.ph)