ISSN: 1947-3931 Volume 13, Number 4, April 2021



Engineering



Journal Editorial Board

ISSN Print: 1947-3931 ISSN Online: 1947-394X

https://www.scirp.org/journal/eng

Editor-in-Chief

Prof. David L. Carroll Wake Forest University, USA

Editorial Board

Dr. Murad Y. Abu-FarsakhLouisiana State University, USAProf. Sheeraz AhmedIqra National University, PakistanProf. Nadhir Al-AnsariLulea University of Technology, Sweden

Prof. Moh'd A. M. Al-Nimr Jordan University of Science and Technology, Jordan

Dr. Wisam S. Al-Rekabi University of Basrah, Iraq

Prof. Abbas AminiWestern Sydney University, AustraliaProf. Michael BankJerusalem College of Technology, Israel

Prof. Shahnor Basri Putra University, Malaysia

Prof. Roberto CapataUniversity of Roma Sapienza, ItalyProf. Bin ChenXi'an Jiaotong University, ChinaProf. Luisa DurãesUniversity of Coimbra, Portugal

Dr. Adinel Gavrus European University of Brittany, France

Dr. Aritra Ghosh University of Exeter, UK

Dr. Krzysztof GórskiTechnical University of Radom, PolandDr. Sung-Cheon HanDaewon University College, South Korea

Prof. David HuiUniversity of New Orleans, USAProf. Yunho HwangUniversity of Maryland, USAProf. Nagwa Ahmed Abdelhalim IbrahimHelwan University, Egypt

Dr. Renjie Ji China University of Petroleum, China

Prof. Sathiyasekar K Anna University, India

Prof. Jayanna KanchikereSt. Peter's Engineering College, IndiaDr. Yi-Yang LiThe Chinese University of Hong Kong, China

Dr. Vandna Luthra University of Delhi, India

Prof. Elzbieta Macioszek Silesian University of Technology, Poland

Prof. Magdi Mahmoud King Fahd University for Petroleum and Minerals, Saudi Arabia

Prof. Andrzej S. Nowak Auburn University, USA

Prof. Kaveh Ostad-Ali-Askari Isfahan University of Technology, Iran

Prof. Reinaldo Rodriguez Ramos University of Havana, Cuba

Prof. Yuri Ribakov Ariel University Center of Samaria, Israel

Dr. P. Sanjeevikumar Department of Electrical and Electronics Engineering, South Africa

Prof. Marcelo Silva SthelNorth Fluminense State University, BrazilProf. Kune Y. SuhSeoul National University, South Korea

Prof. Hongbin SunTsinghua University, ChinaProf. Gui-Hua TangXi'an Jiaotong University, ChinaProf. Costin D. UntaroiuUniversity of Virginia, USA

Prof. Vijayakumar Varadarajan The University of New South Wales, Australia

Prof. Jung-Chang Wang National Taiwan Ocean University (NTOU), Chinese Taipei

Dr. Rodrigo Sérgio WiederkehrUniversity of Louisville, USADr. Yufei WuCity University of Hong Kong, China

Prof. Wei ZhanTexas A&M University, USAProf. Lei ZhangUniversity of Maryland, USA





Table of Contents

Engineering (ENG)

Journal Information

SUBSCRIPTIONS

The *Engineering* (Online at Scientific Research Publishing, https://www.scirp.org/) is published monthly by Scientific Research Publishing, Inc., USA.

Subscription rates:

Print: \$89 per issue.

To subscribe, please contact Journals Subscriptions Department, E-mail: sub@scirp.org

SERVICES

Advertisements

Advertisement Sales Department, E-mail: service@scirp.org

Reprints (minimum quantity 100 copies)

Reprints Co-ordinator, Scientific Research Publishing, Inc., USA.

E-mail: sub@scirp.org

COPYRIGHT

Copyright and reuse rights for the front matter of the journal:

Copyright © 2021 by Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY).

http://creativecommons.org/licenses/by/4.0/

Copyright for individual papers of the journal:

Copyright © 2021 by author(s) and Scientific Research Publishing Inc.

Reuse rights for individual papers:

Note: At SCIRP authors can choose between CC BY and CC BY-NC. Please consult each paper for its reuse rights.

Disclaimer of liability

Statements and opinions expressed in the articles and communications are those of the individual contributors and not the statements and opinion of Scientific Research Publishing, Inc. We assume no responsibility or liability for any damage or injury to persons or property arising out of the use of any materials, instructions, methods or ideas contained herein. We expressly disclaim any implied warranties of merchantability or fitness for a particular purpose. If expert assistance is required, the services of a competent professional person should be sought.

PRODUCTION INFORMATION

For manuscripts that have been accepted for publication, please contact:

E-mail: eng@scirp.org



Engineering (ENG)

ISSN Print: 1947-3931 ISSN Online: 1947-394X https://www.scirp.org/journal/eng

Engineering is an international journal dedicated to the latest advancement of engineering. The goal of this journal is to provide a platform for engineers and academicians all over the world to promote, share, and discuss various new issues and developments in different areas of engineering. All manuscripts must be prepared in English, and are subject to a rigorous and fair peer-review process. Accepted papers will immediately appear online followed by printed hard copy. The journal publishes original papers including but not limited to the following fields:

- Aerospace Engineering
- · Agricultural Engineering
- Applied Thermal Engineering
- Aquacultural Engineering
- Architecture and Civil Engineering
- · Automobile Engineering
- Bioengineering
- Biological Engineering
- Biomedical Engineering
- Biomolecular Engineering
- Bionic Engineering
- Bioprocess and Biosystems Engineering
- Biotechnology and Bioengineering
- Building Services Engineering
- Business & Information Systems Engineering
- Cardiovascular Engineering and Technology
- Cellular and Molecular Bioengineering
- Chemical Engineering & Technology
- Civil Engineering
- Coal Science and Engineering
- Coastal Engineering Communication Engineering
- Computational Methods in Engineering
- Computer Aided Engineering
- Computer Applications in Engineering Education
- · Computer Engineering
- Computer Methods in Applied Mechanics and Engineering
- Computer-Aided Civil and Infrastructure Engineering
- Crystal Engineering
- Data and Knowledge Engineering
- Earthquake Engineering & Structural Dynamics
- Ecological Engineering
- Electrical and Electronic Engineering
- Energy and Power Engineering
- Energy Engineering
- Energy Systems Engineering
- Engine Engineering
- Engineering Analysis with Boundary Elements
- Engineering and Technology Management
- Engineering Applications of Artificial Intelligence
- Engineering Cybernetics
- Engineering Economy
- Engineering Education

- Engineering Failure Analysis
- Engineering for Sustainability
- Engineering Fracture Mechanics
- Engineering Geology and the Environment
- Engineering in Life Sciences
- Engineering in Medicine
- Engineering Manufacture
- Engineering Materials
- Engineering Mathematics
- Engineering Physics and Thermophysics
- Engineering Science in Medicine
- Engineering Structures
- Engineering Tribology
- Engineering with Computers Environmental Engineering
- Environmental Science & Engineering
- Fire Protection Engineering
- Food Engineering
- Food Process Engineering
- Fusion Engineering and Design
- Fuzzy Information and Engineering
- Geophysics and Engineering
- Geotechnical and Geological Engineering
- Green Energy Engineering
- Industrial Engineering Landscape and Ecological Engineering
- Macromolecular Materials and Engineering
- Macromolecular Reaction Engineering
- Magnetic Resonance Engineering
- Maintenance Engineering
- Management Engineering
- Maritime Engineering
- Materials Science and Engineering
- Mechanical Engineering
- Mechatronics Engineering
- Medical Engineering & Technology
- Metabolic Engineering
- · Metallurgical Engineering
- Microelectronic Engineering
- · Micromechanics and Microengineering
- Military Engineering
- Mineral Resources Engineering
- Mining Engineering
- Molecular Engineering
- Nanoengineering

- Natural Gas Science and Engineering
- NeuroEngineering and Rehabilitation
- Nuclear Engineering and Design
- Numerical Methods in Engineering
- Ocean Engineering
- Oil Engineering
- Optics and Lasers in Engineering
- Optimization and Engineering
- Particle Engineering
- Petroleum Engineering
- Petroleum Science and Engineering
- Polymer Engineering and Science
- Power Engineering
- Precision Engineering and Manufacturing
- Probabilistic Engineering Mechanics
- Process Engineering
- Production Engineering
- Protein Engineering, Design and Selection
- Public Safety Information
- Radar Engineering
- Rare Metal Materials and Engineering
- Reliability, Quality and Safety Engineering
- Renewable Energy Engineering
- Requirements Engineering
- RF and Microwave Engineering
- Rock Mechanics and Rock Engineering
- Safety Systems Engineering
- Science and Engineering Ethics
- Social and Environmental Impact of Engineering Innovation
- Software and Knowledge Engineering
- Soil Dynamics and Earthquake Engineering
- Sports Engineering
 Strain Analysis for Engineering Design
- Structural Engineering and Materials
- Surface Engineering and Applied Electrochemistry
- Systems and Control Engineering
- Systems and Software Engineering
- Systems Assurance Engineering and Management
- Test Engineering Tissue Engineering and Regenerative Medicine
- Transportation Engineering Wind Engineering and Industrial Aerodynamics

We are also interested in: 1) Short Reports—2-5 page papers where an author can either present an idea with theoretical background but has not yet completed the research needed for a complete paper or preliminary data; 2) Book Reviews—Comments and critiques.



Notes for Intending Authors

Submitted papers should not be previously published nor be currently under consideration for publication elsewhere. Paper submission will be handled electronically through the website. For more details, please access the website.



Website and E-Mail

https://www.scirp.org/journal/eng

Email: eng@scirp.org

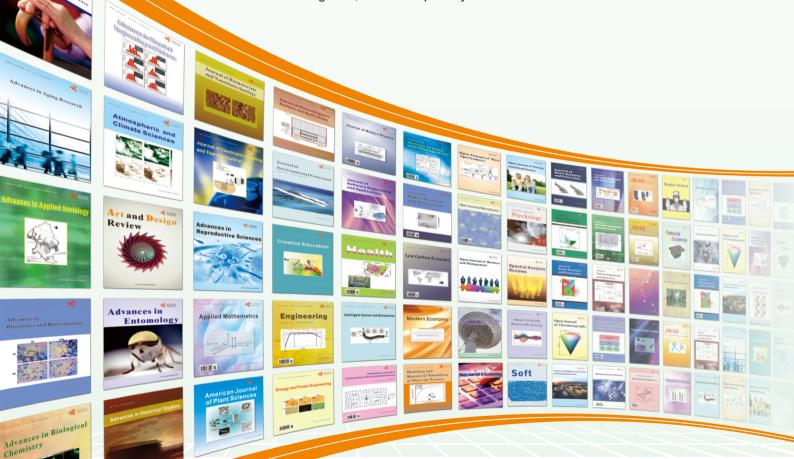
What is SCIRP?

Scientific Research Publishing (SCIRP) is one of the largest Open Access journal publishers. It is currently publishing more than 200 open access, online, peer-reviewed journals covering a wide range of academic disciplines. SCIRP serves the worldwide academic communities and contributes to the progress and application of science with its publication.

What is Open Access?

All original research papers published by SCIRP are made freely and permanently accessible online immediately upon publication. To be able to provide open access journals, SCIRP defrays operation costs from authors and subscription charges only for its printed version. Open access publishing allows an immediate, worldwide, barrier-free, open access to the full text of research papers, which is in the best interests of the scientific community.

- High visibility for maximum global exposure with open access publishing model
- Rigorous peer review of research papers
- Prompt faster publication with less cost
- · Guaranteed targeted, multidisciplinary audience





Website: https://www.scirp.org Subscription: sub@scirp.org Advertisement: service@scirp.org