

# Farzad Shafiei Dizaji

Engineering and Society, Department of Applied Mathematics and Science Division, Albert H. Small Building, Room 113. Resilient and Advanced Infrastructure Laboratory, 151 Engineer's Way, University of Virginia, Charlottesville, Virginia 22904

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## Bio

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Academic General Faculty/Researcher developed a strong background in structural and mechanical engineering, and applied mathematics. Currently developed a Multi-hazard passive structural control device using high performance Shape Memory Alloy material. Strong excitation might lead to structural damage. The design and characterization of high-performance smart alloys in multi-hazard response mitigation systems was my research which led to my M.Sc. thesis. Developed a strong background in applied mathematics and optimal structural analysis to solve multi-objective optimization of structural matrices by proposing seven graph-theoretical optimization algorithms which led to my first M.Sc. thesis. Beside my research experiences, I have years of teaching experiences, from being Graduate Research Assistant during my graduate program in the University of Virginia to being a lecturer in the department of Applied Mathematics and Sciences in the University of Virginia in the last five semesters during which I am/was responsible to teach more than five courses.

## Objective

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- I received Graduate degree in the field of Civil (Structural) Engineering from the University of Virginia in the Department of Engineering Systems and Environmental in May 2019. To continue my research and work in the U.S., I wish to obtain permanent residency under the classification of EB-1B.

## Research Interests

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- Smart Structures
- Energy conversion materials and structures
- Structural Health Monitoring
- Additive Manufacturing
- Advanced composite materials and infrastructural materials
- Digital Image Correlation
- Artificial Neural Networks
- Structural Applications of Smart and Advanced Materials
- Advanced Energy Absorption Materials and Structures
- Energy Dissipation Systems
- Optimization Models and Methods
- Computational Mechanics
- Machine Learning
- Damage detection and System Identification
- Finite Element Methods
- Earthquake Engineering & Structural Dynamics
- Seismic Resilience & Sustainability
- Intelligent Materials and Structures
- Phase-field Models

## Selected Courses

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- Stochastic Modeling: A
- Nondestructive Evaluation: A
- Risk Analysis: A+
- Smart Structures: A-
- Advanced Reinforced Concrete Design: A+
- Advanced Mechanics of Materials: A+
- Non-Linear Structural Systems: A+
- Computational Methods in Civil Engineering: A+
- Matrix Structural Analysis: A+
- Optimal Structural Analysis: A
- Mechanics of Composite Materials: A+

# Education

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## University of Virginia (UVa)

Charlottesville, VA, US

M.Sc. IN STRUCTURAL ENGINEERING FROM THE DEPARTMENT OF ENGINEERING SYSTEMS AND ENVIRONMENT (CIVIL ENGINEERING) - ADVISOR: PROF. O. E. OZBULUT

2016 - Present

- Thesis: Multi-Level Seismic Response Mitigation Using Shape Memory Alloy-Based Self-Centering Control Devices
- GPA: 3.97/4.0

## University of Central Florida (UCF)

Orlando, FL, US

GRADUATE RESEARCHER IN STRUCTURAL ENGINEERING FROM THE DEPARTMENT OF CIVIL, ENVIRONMENTAL AND, CONSTRUCTION ENGINEERING - ADVISOR: PROF. NICOS MAKRIS

2015 - 2016

- Research Topic: Mathematical Processing of Earthquake records using wavelet analysis and Empirical Mode Decomposition (EMD) method
- GPA: 4.0/4.0

## Iran University of Science and Technology (IUST) (Centre of Excellence for Fundamental Studies in Structural Engineering)

Tehran, Iran

M.Sc. IN EARTHQUAKE ENGINEERING FROM THE DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING - ADVISOR: PROF. ALI KAVEH

2005 - 2008

- Thesis: Graph Theoretical Methods and Algebra Methods for Improving Well-Conditioning of Structure Flexibility Matrix (Multi-objective optimization of structural matrices, developed seven graph-theoretical optimization algorithms and wrote programming code for four of the algorithms)
- Thesis Grade - 4/4 (rank: excellent)

## University of Tabriz (UT)

Tabriz, Iran

B.S. IN CIVIL ENGINEERING FROM THE DEPARTMENT OF CIVIL ENGINEERING - ADVISOR: PROF. ALI DAVARAN

2000 - 2005

- Thesis: Seismic Behavior of Low-Ductility Concentrically Braced Frames
- Thesis Grade - 4/4 (rank: excellent)

# Publications

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- *Shafiei Dizaji, F.*, Shafiei Dizaji, M., 2022 Seismic Performance Assessment of Steel Frames Upgraded with Shape Memory Alloy Re-centering Dampers for Passive Protection of Structures Subjected to Seismic Excitations Using High-Performance NiTiHfPd Material Smart Mater. *Struc.* 31 065004
- *Shafiei Dizaji, F.*, Shafiei Dizaji, M., Novel computational mathematical algorithms for structural optimization using graph-theoretical methods. *Engineering Computations.* 2022 Mar 30, volume 39, issue 6.
- Farrokh, M., *Shafiei Dizaji, F.*, Shafiei Dizaji, M., 2022 Hysteresis Identification Using Extended Preisach Neural Network. *Neural Processing Letters.* 2022 Jan 15:1-25.
- *Shafiei Dizaji, F.*, (2022). "A novel passive structural control device using high-performance NiTiHfPd material." *Proceeding Volume 12043, Active and Passive Smart Structures and Integrated Systems XVI; 120430WP, SPIE Smart Structures + Nondestructive Evaluation, 6-10 March 2022.*
- *Shafiei Dizaji, F.*, "Impact of COVID-19 on Applied Mathematics Courses for Engineering Students." Jun 26-29, 2022, ASEE Annual Conference Exposition.
- F. Shi, G. P. Toker, *F. S. Dizaji*, O. E. Ozbulut, and H. E. Karaca, "Experimental and Numerical Investigations on Seismic Applications of High Damping SMAs," Eleventh U.S. National Conference on Earthquake Engineering Integrating Science, Engineering & Policy June 25-29, 2018 Los Angeles, California.
- Soheil Saedi, *Farzad S. Dizaji*, Osman E. Ozbulut, Haluk E. Karaca., "Structural Vibration Control Using High Strength and Damping Capacity Shape Memory Alloys," *Proceeding in Structural Dynamics Challenges in Next Generation Aerospace Systems, (IMAC XXXV), Jan. 30-Feb. 2, 2017, Hyatt Regency Orange Country, Garden Grove, California USA.*
- *Shafiei Dizaji F.*, Khanzadi M., "Graph Theoretical Methods For Improving The Well-conditioning of Structures Flexibility Matrix," *Journal of Civil Engineering, Ferdowsi University of Mashhad, Vol. 22, No 1, pp.27-44, 2011.*

- Shafiei Dizaji, M., *Shafiei Dizaji, F.*, and Taghizadeh E. (2018). "Nonlinear Adaptive Simulation of concrete gravity dams using generalized Prandtl neural networks and damage detection," International Research Journal of Engineering and Technology, Volume: 05, Issue: 06, June.
- Shafiei Dizaji, M. and *Shafiei Dizaji, F.*, (2017). "Artificial Neural Networks to Determine Source of Acoustic Emission and Damage Detection," International Research Journal of Engineering and Technology, Volume: 04 Issue: 06, June.
- Joghataie A., Shafiei Dizaji, M., *Shafiei Dizaji F.*, "Neural Network Software for Dam-Reservoir Foundation Interaction," Proceeding in International Conference on Mechanical, Automotive and Materials Engineering (ICMAME'2012)7-8 Jan 2012, Dubai UAE.
- Kaveh A., *Shafiei Dizaji F.*, Khanzadi M., "Using Graph Theoretical Methods for Improving The Conditioning of Structures Flexibility Matrix in Structural Optimization Analysis," Proceeding in 8th International Congress on Civil Engineering, Presented Oral, 11-13 May 2009, University of Shiraz, Iran.
- *Shafiei Dizaji F.*, Khanzadi M., "Comparison of Different Nonlinear Models for Simulating Nonlinear Behavior of Concrete Gravity Dams," Proceeding in 2th International Conference on Seismic Retrofitting with The Focus on Concrete Technology, 6-7 November 2009, Tabriz, Iran.
- *Shafiei Dizaji F.*, Khanzadi M., Shafiei Dizaji M., "Using ESO Method for Topology Optimization of Structures" Proceeding in 3th International Conference on Seismic Retrofitting with The Focus on Bridges, Lifeline Engineering & Concrete Technology, 20-22 October 2010, Tabriz, Iran.
- *Shafiei Dizaji F.*, Khanzadi M., Shafiei Dizaji M., "Structural Topology Optimization With Frequency Dynamic Constraints," Proceeding in 3th International Conference on Seismic Retrofitting with the Focus on Bridges, Lifeline Engineering & Concrete Technology, 20-22 October 2010, Tabriz, Iran.
- Kaveh A., *Shafiei Dizaji F.*, "Optimization of the Conditioning of Structural Matrices in Force Method," Proceeding in 1th International Conference on Seismic Retrofitting, Presented Oral, 21-23 October 2008, Tabriz, Iran.

## Research Papers accepted, Submitted to the Journals or under writing \_\_\_\_\_

- *Shafiei Dizaji, F.*, (2022). "A Novel Seismic Resisting System Based on Mechanical Characteristics of Carbon Nano-Structures. "In the preparing of writing and submission to the Journal of Earthquake Engineering and Structural Dynamics.

## Presentation, Poster & Workshops \_\_\_\_\_

- *Shafiei Dizaji F.*, "High-Performance Superelastic Materials for Seismic Applications," Master Thesis, Oral Presented in the University of Virginia, 09 April 2019, Charlottesville, VA. (Supervisor: Dr. Osman Ozbulut)
- *Shafiei Dizaji F.*, "Using Graph Theoretical Methods and Algebraic Methods for Improving (optimizing) Well-conditioning of Structural Matrices," Master Thesis, Oral Presented in Iran University of Science & Technology, 16 July 2008, Tehran, Iran. (Supervisor: Prof. Ali Kaveh, Dr. Mostafa Khanzadi)
- *Shafiei Dizaji F.*, "Topology Optimization of Structures," Master Seminar, Oral Presented in Iran University of Science & Technology, 19 February 2008, Tehran, Iran. (Supervisor: Prof. Ali. Kaveh).
- International Congress on Civil Engineering, "Using Graph Theoretical Methods for Improving the Conditioning of Structures Flexibility Matrix in Structural Optimization Analysis," 11-13 May 2009, University of Shiraz, Iran.
- International Conference on Seismic Retrofitting, "Optimization of the Conditioning of Structural Matrices in Force Method," 21-23 October 2008, Tabriz, Iran.
- Symposium on New Technology and Industrialization of Building, held in the Building & Housing Research Center, December 2011, Tehran, Iran.
- Analysis and Design of Space Structures, held in the University of Tehran, Jun 2008, Tehran, Iran.

- Analysis of Space Structures using FORMIAN Programming Language Presented by Professor H. Noshin, Faculty Member of Surrey University, for two weeks (86 Hour), (GPA: 4/4), Held in Kerman, May 2008, University of Kerman, Kerman, Iran.

## Honors & Awards

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- 2019~20 **Recognized for my remarkable contribution to UVa community by the P.R.I society**, Department of Applied Mathematics and Science, University of Virginia
- 2016~19 **M.Sc. Awarded Scholarship**, Engineering Systems and Environment (Civil and Environmental Engineering), University of Virginia
- 2015~16 **Awarded Scholarship Teacher and Research Assistant**, Civil, Environmental and Construction Engineering, University of Central Florida
- 2010 **Awarded member of National Elites Foundation**, society of prominent students of IRAN
- 2016 **Awarded Grant**, I am awarded the only recipient of Geotechnical and environmental endowed scholarship for 2016-2017 in the University of Central Florida
- 2005~8 **M.Sc. Awarded Scholarship**, Civil and Environmental Engineering, Iran University of Science and Technology
- 2005 **Ranked 192th**, Nationwide Universities Exam for Civil Engineering M.Sc. program among over 70'000 B.Sc. participants
- 2000~5 **B.Sc. Awarded Scholarship**, Civil Engineering, University of Tabriz
- 2000 **Ranked among top 0.6%**, Nationwide Universities Entrance Exam among over 450'000 participants

## Academic Teaching Experience

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### Teaching Professor (Lecturer): the University of Virginia in the Department of Engineering and Society (Applied Mathematics and Science)

2019-Current

- **Fall 2019:** Applied Mathematics (APMA) 2130-005 (43 Students): Ordinary Differential Equations (ODE), Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Fall 2019:** Applied Mathematics (APMA) 1110-005, (47 Students): Single variable Calculus II, Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Spring 2020:** Applied Mathematics (APMA) 2130-001, (46 students): Ordinary Differential Equations (ODE), Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Spring 2020:** Applied Mathematics (APMA) 2130-006 (33 students): Ordinary Differential Equations (ODE), Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Spring 2020:** Applied Mathematics (APMA) 3100-006 (44 students): Probability, Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Summer 2020:** Applied Mathematics (APMA) 2130-001 (26 students): Ordinary Differential Equations (ODE), Supervising one Undergraduate Teaching Assistant (UTA)
- **Fall 2020:** Applied Mathematics (APMA) 1110-005 (49 students): Single variable Calculus II, Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Fall 2020:** Applied Mathematics (APMA) 1110-006 (50 students): Single variable Calculus II, Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Spring 2021:** Applied Mathematics (APMA) 3080-001 (39 students): Linear Algebra, Supervising one Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Fall 2021:** Applied Mathematics (APMA) 1110-005 (51 students): Single variable Calculus II, Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Fall 2021:** Applied Mathematics (APMA) 1110-006 (55 students): Single variable Calculus II, Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Spring 2022:** Applied Mathematics (APMA) 2120-002 (45 students): Multi variable Calculus III, Supervising two Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)
- **Spring 2022:** Applied Mathematics (APMA) 2130-005 (30 students): Ordinary Differential Equations (ODE), Supervising one Undergraduate Teaching Assistant (UTA), and one Graduate Teaching Assistant (GTA)

## Graduate Teaching Fellow: University of Virginia

2017-2019

- **Fall 2017:** CEE 2300: Engineering Analysis-Statics (85 students)
- **Spring 2018:** CEE 2310: Strength of Materials (56 students)
- **Fall 2018:** Applied Mathematics (APMA) 3140: Partial Differential Equations (PDE) (65 students)
- **Spring 2019:** Applied Mathematics (APMA) 2120: Multivariable Calculus (143 students)
- **Spring 2019:** Applied Mathematics (APMA) 3410: Engineering Mathematics (55 students)
- **Summer 2019:** Applied Mathematics (APMA) 3100: Introduction to Probability (23 students)
- **Summer 2019:** Applied Mathematics (APMA) 3080: Linear Algebra (14 students)

## Graduate Teaching Fellow: University of Central Florida

2015-2016

- **Fall 2015:** CES 3310-Engineering Analysis-Statics (140 students)
- **Fall 2015:** CES 4100: Structural Analysis (Lab Instructor) Lab (80 students)
- **Spring 2016:** CES 4702: Design of Reinforced Concrete (60 students)
- **Spring 2016:** CES 4205: Structural Mechanics (65 students)

## Teaching Instructor: Islamic Azad University of Tabriz (Department of Civil Engineering)

2011-2012

- **Fall 2011:** Mechanics of Materials
- **Fall 2011:** Structural Analysis, Static
- **Spring 2012:** Selected Topics in Civil Engineering

## Instructor (lecturer): University of Maraghe (Public University, One of the branches of The University of Tabriz)

2012-2014

- **Fall 2012, Spring 2013:** Selected Topics in Civil Engineering
- **Fall 2013:** Solid Mechanics, Structural Analysis
- **Spring 2014:** Design of Steel and Concrete Structures
- **Spring 2014:** Seismic Design of Masonry Structures

## Pedagogical and Career Training

2017-2019

- Fellow, Tomorrow's Professor Today (TPT) Program, UVA.
- Research Communication Training program (RCTP), UVA
- Foundations of Scholarly Teaching (FOSTer) Six-Week Program, UVA
- Active Learning Techniques for a More Engaged Engineering Class Workshop, UVA
- Strategic Career Design for the Peak Performing Professor Workshop, UVA
- Center for Teaching Excellence (CTE) Supports Eight Units Undertaking Curriculum (Re)Design, UVA

## Service And Activities

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### Membership in a Professional Association

- **Iranian Organization for Engineering Order of Building**, P.E. in Tabriz
- **Member of IEEA**, Iranian Earthquake Engineering Association
- **Member of ASCE**, American Society of civil engineers (ASCE)
- **Member of ACI**, American Concrete Institute (ACI)
- **Member of ISCE**, Iranian Society of Civil Engineers

### Academic and Diversity

- **Vice President**, American Concrete Institute Student Chapter at the University of Virginia, 2018-2019.
- **Volunteer**, BRIDGE summer program for college students from underrepresented backgrounds, 2018.
- **Mentor**, VA-NC Alliance for Minority Participation and Diversity summer research program, 2018.
- **Student member**, Advanced Research Computing Services Focus Group, UVA, 2018.
- **Graduate Student Team Leader**, Jefferson's Public Citizen Program, UVA, 2018.

## Journal and Conference Review

- Journal of Smart Materials and Structures
- Journal of Probabilistic Engineering Mechanics
- Journal of Intelligent Material Systems and Structures
- International Journal of Civil Engineering
- Smart Structures and Systems
- Journal of Earthquake Engineering
- Journal of Advances in Civil Engineering

## Academic Research Experience

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### Research Assistant: the University of Virginia in the Department of Material Science

2019

- **Summer 2019, part a:** Experimental, laboratory research involving materials characterization using microscopy, x-ray diffraction, and mechanical testing. Perform sample preparation, characterization experiments, analyze the resulting data, and report findings.
- **Summer 2019, part b:** Model optimization studies, participate in discussions with current researchers in Professor Sean Agnew's research group to identify opportunities to employ modern optimization in research and demonstrate how to implement these strategies.

### Graduate Research Fellow: University of Virginia

2016-present

- **Aug 2016 - 2019:** (Defined Project: Multi-Level Seismic Response Mitigation Using Shape Memory Alloy-Based Self-Centering Control Devices). The major concern for civil engineers is to design structures to withstand dynamic natural hazards such as earthquakes, strong winds, and hurricanes. Thanks to the recent advancements in various structural systems and high-performance materials, designing very slender and lightweight structures is possible. Consequently, flexible structures are susceptible to high vibrations under strong excitations (wind or earthquakes). Strong excitations might lead to structural damage. Design and characterization of high-performance smart alloys in multi-hazard response mitigation systems were investigating (NSF Funded Project).

### Graduate Research Assistant: Iran University of Science and Technology (Centre of Excellence for Fundamental Studies in Structural Engineering)

2005-2008

- **Aug 2005 - Jun 2006:** Topology Optimization of Structures (Seminar Thesis Topic)
- **Jun 2006 - May 2008:** Graph Theoretical Methods and Algebra Methods for Improving (Optimizing) Well-Conditioning of Structural Flexibility Matrix (Primary Thesis Topic)

## Industry Work Experience

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### Employed in State Organization of Schools Renovation, Development, and Mobilization (NOSAZI MADARES), Full-time, Tabriz, Iran.

2009-2014

- Supervisor Engineer in controlling school building during the renovation process.
- Developed an excel spreadsheet for the design review of schools, saving time, increasing efficiencies, and standardizing the review process.
- Developed engineering plans for the school construction works, retrofit, maintenance, and rehabilitation of multiple school structures.
- Reviewed and supervised the analysis and design calculations of reinforced concrete and steel schools, foundation design, and recommended for approval of school projects in the decision-making process.

### Employed in the Department of Road and Transportation, part-time, Tabriz, Iran.

2011-2015

- Developed engineering plans for the bridge construction works, repair, maintenance, and rehabilitation of multiple bridge and roadway structures.
- Reviewed and supervised the analysis and design calculations of reinforced concrete and steel bridges, foundation design, and recommended for approval of bridge projects in the decision-making process.
- Investigated, presented, and submitted the technical research reports of the collapse study of two bridges after gathering the relevant field data, including data analysis, and recommended the action to take in risk management and communicate in teamwork.

## Work Experience in "AZAR ABADEGAN NAHAND" Construction Company, BOLOR Tower Building, 25 Floor Building, Tabriz, Iran.), Part-time, Tabriz, Iran.

2004-2005

- Supervisor engineer in controlling building during the construction process.
- Attend meetings and discuss project details with clients, contractors, asset owners, and stakeholders.
- Research and interpret old drawings for existing structures.
- Preparing progress reports.

## Work Experience in the "Aras Pey," Consulting Engineers Company, Part-time, Tabriz, Iran.), Part-time, Tabriz, Iran.

2005-2009

- Supervisor engineer in controlling building during the construction process.
- Planned and performed required inspections on time.
- Perform drafting according to specifications.
- Working closely with all levels of management, engineers, and field operations staff.

## Performing seismic risk analysis for different buildings (school or residential buildings) in Tabriz, Iran.

2008-2013

- Design engineer of buildings with a consideration of safety, lifetime performance, and environmental aspects.

## Other Researches and Projects

2003-2005

- **Jun 2003:** Structural Design of an 8-Floored Concrete Building in Full Detail Using ETABS & SAFE Software (Concrete Structures Project in the University of Tabriz, Supervisor: Dr. Hadidi).
- **Aug 2003:** Structural Design of a 12-Floored Steel Building in Full Detail Using ETABS & SAFE Software (Steel Structures Project in the University of Tabriz, Supervisor: Dr. Veladi).
- **December 2003:** Architectural Design of a 2-Floored 8-Unit Apartment. (Supervisor: Dr. Niyazi).
- **Feb 2004:** Cost Estimation of a Construction Project Including Details of Measurements and Calculation of Quantities in the University of Tabriz. (Supervisor: Hayat Rohi)
- **May 2004:** Site Surveying of the University of Tabriz Including Measurements, Features, Calculation and Plotting in Precision (Surveying Course, Supervisor: Akbar Bastani).
- **July 2004:** Design of a 50Km Route in Full Details (Optimizing The Choice Considering Factors Such as Cost, Topography), (Highway Project in the University of Tabriz, Supervisor: Akbar Bastani).

## Languages

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- **Azerbaijani:** Native
- **Farsi:** Native
- **English:** Fluent
- **Turkish:** Good
- **Arabic:** Basic

## Computer Skills

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**Programming Language:**, Matlab (Professional Skills), Formian (Programming Language for Designing & Analyzing of Space Structures), Fortran, Basic, Python

**Engineering Software:**, Sap, Safe, Perform 3D, Autocad, Abaqus, Massir, Ansys, Risa, Revit, Rhino

**Simulation Software:**, OpenSees, FRAC-DAM, Seismosignal, Kijko2001, Seisrisk III, Duhamel, Structural Dynamic Analysis v1.0.

**Other Software:**, Solid Knowledge of Microsoft Windows (98, 2000, XP, WIN7, WIN10), Microsoft Office (Word, Powerpoint, Excel)

**Networking:**, Proficient in Using Personal Computer Skills and Internet Applications and Familiar with Hardware and Concepts of Networking

## General Skills

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- Excellent Communicating Skills
- Ability to Handle Critical Situation
- Willingness to learn things
- Good Team Player