
ICMR 2017 & QR2MSE 2017

2017 International Conference on
Materials and Reliability
& 2017 International Conference on
Quality, Reliability, Risk, Maintenance, and Safety Engineering
October 24-27, 2017, Chengdu, Sichuan, China

Sponsored by

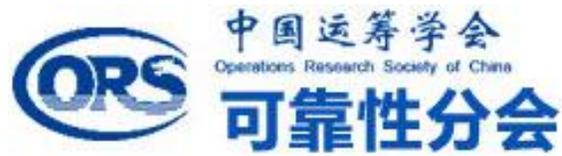
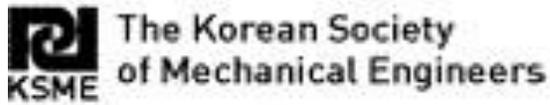
- European Safety and Reliability Association (ESRA)
- European Federation of National Maintenance Societies (EFNMS)
- International Society of Engineering Asset Management (ISEAM)
- The Korean Society of Mechanical Engineers (KSME)
- The Korean Reliability Society (KORAS)
- Reliability Engineering Association of Japan (REAJ)
- Reliability Committee of Operations Research Society of China (RORSC)
- Reliability Committee of Sichuan Provincial Mechanical Engineering Society

Organized by

- Sichuan Provincial Key Laboratory of Reliability Engineering, UESTC
- College of Mechanical Engineering, IMUT
- National Collaborative Innovation Center of Major Machine Manufacturing in Liaoning, DUT
- State Key Laboratory of Mining Equipment and Intelligent Manufacturing,
Taiyuan Heavy Machinery Group Co., Ltd., China

Co-Organized by

- Sichuan GoYo Intelligence Technology Co., Ltd.



ICMR 2017 & QR2MSE 2017

Table of Contents

I. Welcome	P. 3
II. ICMR 2017 & QR2MSE 2017 Organizing Committee	P. 4
III. Sponsors & Organizers	P.10
IV. Keynote Speeches	P.11
V. Program Information	P.19
A. Conference Topic	P.19
B. Program at A Glance	P.20
C. Detailed Timetable	P.21
VI. Technical Program	P.27
VII. Conference Information	P.52
A. Conference Floor	P.52
B. Registration	P.53
C. Transportation	P.53
D. General Information	P.55

I. Welcome



Professor Hong-Zhong Huang

General Chair of ICMR 2017 & QR2MSE 2017
Director of Center for System Reliability and Safety
University of Electronic Science and Technology of China
No. 2006, Xiyuan Avenue, West Hi-Tech Zone
Chengdu, Sichuan, 611731, P. R. China

On behalf of the Organizing Committee, I would like to welcome each one of you to the 2017 International Conference on Materials and Reliability (ICMR 2017) & 2017 International Conference on Quality, Reliability, Risk, Maintenance, and Safety Engineering (QR2MSE 2017), in Chengdu, Sichuan, China, October 24-27, 2017. It is truly our pleasure to see so many colleagues and friends participating in this conference.

Technology advances on cyber-physics system and Internet of things are pushing us into the adventure of "Industry 4.0". Modern products and infrastructures are getting highly complex and extremely crucial. Fatal accidents, such as the Italy Apulia train crash happened on 12 July 2016 with 25 people killed, are strongly calling us to further strength the research and application of Quality, Reliability, Risk, Maintenance, and Safety Engineering and Materials on critical infrastructures. The ICMR 2017 & QR2MSE 2017 aims to provide a premier international forum where leading experts and engineers with various backgrounds and experiences in Quality, Reliability, Risk, Maintenance, and Safety Engineering and Materials can share their newest ideas, cutting-edge research results, and methodologies and tools with their peers.

Almost 500 papers have been submitted to the conference and 160 papers have been selected and included in the conference proceedings this year. The conference program includes 8 keynote speeches from world-renowned scholars, 3 special sessions, and 13 regular technical paper oral sessions. It offers great opportunities for exchanging academic ideas and reinforcing professional networking.

A successful conference relies on many dedicated individuals serving as conference chairs, members of the advisory committee, program committee, and organizing committee, and/or secretariat, as well as many colleagues and volunteers. Supports from European Safety and Reliability Association (ESRA), European Federation of National Maintenance Societies (EMNFS), International Society of Engineering Asset Management (ISEAM), The Korean Society of Mechanical Engineers (KSME), The Korean Reliability Society (KORAS), Reliability Engineering Association of Japan (REAJ), Reliability Committee of Operations Research Society of China, Reliability Committee of Sichuan Provincial Mechanical Engineering Society, College of Mechanical Engineering, IMUT, National Collaborative Innovation Center of Major Machine Manufacturing in Liaoning, DUT, State Key Laboratory of Mining Equipment and Intelligent Manufacturing, Taiyuan Heavy Machinery Group Co., Ltd., China.

I am confident that this conference will meet your highest expectations and you will have a wonderful experience in Chengdu. We also look forward to your attending our future conferences.



II. ICMR 2017 & QR2MSE 2017 Organizing Committee

Honorary Chair

[Yan-Rong Li](#), President, University of Electronic Science and Technology of China, China

[Dong Ho Park](#), Hallym University, Korea

General Chair

[Hong-Zhong Huang](#), University of Electronic Science and Technology of China, China

General Co-Chairs

[Dong Ho Bae](#), Sungkyunkwan University, Korea

[Carlos Guedes Soares](#), University of Lisbon, Portugal

International Advisory Committee Members

[John Andrews](#), University of Nottingham, UK

[Narayanaswamy Balakrishnan](#), McMaster University, Canada

[Snehashish Chakraverty](#), National Institute of Technology Rourkela, India

[Joo-Ho Choi](#), Korea Aerospace University, Korea

[Stefanka Chukova](#), Victoria University of Wellington, New Zealand

[Balbir S. Dhillon](#), University of Ottawa, Canada

[Bo Guo](#), National University of Defense Technology, China

[Yong-Hak Huh](#), Korea Research Institute of Standards and Science, Korea

[Joong-Sun Jang](#), Ajou University, Korea

[Won Jung](#), Daegu University, Korea

[Krzysztof Kołowrocki](#), Gdynia Maritime University, Poland

[Jay Lee](#), University of Cincinnati, USA

[Ali Mosleh](#), University of California, USA

[Hoang Pham](#), Rutgers University, USA

[Edward Pohl](#), University of Arkansas, USA



[Shey-Huei Sheu](#), Providence University, Taiwan

[Kazuyuki Suzuki](#), University of Electro-Communications, Japan

[Loon Ching Tang](#), National University of Singapore, Singapore

[Kishor Trivedi](#), Duke University, USA

[Sheng-Tsaing Tseng](#), National Tsing-Hua University, Taiwan

[Shaoping Wang](#), Beihang University, China

[Xiaoyue Wu](#), National University of Defense Technology, China

[Min Xie](#), City University of Hong Kong, Hong Kong

[Won Young Yun](#), Pusan National University, Korea

[Ming J. Zuo](#), University of Alberta, Canada

Program Committee Chair

[Wei Sun](#), Dalian University of Technology, China

Program Committee Co-Chairs

[Lirong Cui](#), Beijing Institute of Technology, China

[Yu Liu](#), University of Electronic Science and Technology of China, China

[Yi-Kuei Lin](#), National Taiwan University of Science & Technology, Taiwan

Program Committee Members

[Zongwen An](#), Lanzhou University of Technology, China

[Suk Joo Bae](#), Hanyang University, Korea

[Joanna Soszyńska-Budny](#), Gdynia Maritime University, Poland

[Baoping Cai](#), China University of Petroleum, China

[In Hong Chang](#), Chosun University, Korea

[Ming-Chih Chen](#), Fu Jen Catholic University, Taiwan

[David W. Coit](#), Rutgers University, USA

[Yi Ding](#), Zhejiang University, China

[ILia B. Frenkel](#), Sami Shamoon College of Engineering, Israel



[Thalles Garcez](#), Federal University of Pernambuco, Brazil
[Olivier Gaudoin](#), Ensimag Laboratoire Jean Kuntzmann, France
[Antoine Grall](#), Troyes University of Technology, France
[Yingkui Gu](#), Jiangxi University of Science and Technology, China
[Yu Hayakawa](#), Waseda University, Japan
[Liping He](#), University of Electronic Science and Technology of China, China
[Qingpei Hu](#), Chinese Academy of Sciences, China
[Nam-Su Huh](#), Seoul National University of Science and Technology, Korea
[Junzhou Huo](#), Dalian University of Technology, China
[Shinji Inoue](#), Tottori University, Japan
[Myong Kee Jeong](#), Rutgers University, USA
[Guangjun Jiang](#), Inner Mongolia University of Technology, China
[Renyan Jiang](#), Changsha University of Science and Technology, China
[Tongdan Jin](#), Texas State University, USA
[M. Rezaul Karim](#), University of Rajshahi, Bangladesh
[Grzegorz Koszalka](#), Lublin University of Technology, Poland
[Yaguo Lei](#), Xi'an Jiaotong University, China
[Gregory Levitin](#), Israel Electric Corporation Limited, Israel
[Haibin Li](#), Inner Mongolia University of Technology, China
[Yanfu Li](#), Tsinghua University, China
[Yonghua Li](#), Dalian University of Technology, China
[Zhaojun Li](#), Western New England University, USA
[Jae-Hak Lim](#), Hanbat National University, Korea
[Terry Lin](#), Qingdao Technological University, China
[Anatoly Lisnianski](#), Israel Electric Corporation Limited, Israel
[Zhijie Liu](#), Dalian Maritime University, China
[Tariq Maqbool](#), National Engineering and Scientific Commission, Pakistan
[Dariusz Mazurkiewicz](#), Lublin University of Technology, Poland



Jinhua Mi, University of Electronic Science and Technology of China, China

Yuchang Mo, Huaqiao University, China

Gang Niu, Tongji University, China

Fumio Ohi, Nagoya Institute of Technology, Japan

Rong Pan, Arizona State University, USA

Weiwen Peng, University of Electronic Science and Technology of China, China

Rui Peng, University of Science & Technology Beijing, China

Christian Preyszl, European Space Agency ESA - ESTEC, Netherlands

Shubin Si, Northwestern Polytechnical University, China

S. B. Singh, G B Pant University of Agriculture & Technology, India

Frank Sun, Tesla Motors, USA

Yong Sun, The Commonwealth Scientific and Industrial Research Organisation, Australia

Zhigang Tian, University of Alberta, Canada

Peter W. Tse, City University of Hong Kong, Hong Kong

Lev V. Utkin, St.Petersburg State Forest Technical University, Russia

Zdenek Vintř, University of Defence, Czech Republic

Jin Wang, Liverpool John Moores University, UK

Jinting Wang, Beijing Jiaotong University, China

Wendai Wang, Green Volts, USA

Zhonglai Wang, University of Electronic Science and Technology of China, China

Shaomin Wu, University of Kent, UK

Zhimin Xi, University of Michigan – Dearborn, USA

Hui Xiao, Southwestern University of Finance and Economics, China

Xiao Xiao, Tokyo Metropolitan University, Japan

Liyang Xie, Northeastern University, China

Liudong Xing, University of Massachusetts, USA

Yuanjian Yang, Chongqing University of Science and Technology, China

Zaili Yang, Liverpool John Moores University, UK



[Elena Zaitseva](#), University of Žilina, Slovakia

[Tieling Zhang](#), University of Wollongong, Australia

[Wenjuan Zhang](#), University of Warwick, UK

[Xi Zhang](#), Peking University, China

[Xiancheng Zhang](#), East China University of Science and Technology, China

[Ming Zhao](#), University of Gävle, Sweden

[Shun-Peng Zhu](#), University of Electronic Science and Technology of China, China

Organizing Committee Chair

[Yan-Feng Li](#), University of Electronic Science and Technology of China, China

Organizing Committee Co-Chairs

[Xueguan Song](#), Dalian University of Technology, China

[Jianxin Wu](#), Inner Mongolia University of Technology, China

Organizing Committee Members

[Diptiranjana Behera](#), University of Electronic Science and Technology of China, China

[Huiying Gao](#), Xihua University, China

[Zheng Liu](#), Guangzhou University, China

[Xiaojuan Song](#), Inner Mongolia University of Technology, China

[Zhangchun Tang](#), University of Electronic Science and Technology of China, China

[Haikun Wang](#), Chongqing University, China

[Lintao Wang](#), Dalian University of Technology, China

[Jianping Yang](#), University of Electronic Science and Technology of China, China

Conference Secretary General

[Huanwei Xu](#), University of Electronic Science and Technology of China, China

Conference Secretariat Members

[Guozhong Fu](#), University of Electronic Science and Technology of China, China



[Yichao Yin](#), University of Electronic Science and Technology of China, China
[Xiaoqiang Zhang](#), University of Electronic Science and Technology of China, China
[Junyu Guo](#), University of Electronic Science and Technology of China, China
[Jie Zhou](#), University of Electronic Science and Technology of China, China
[He Li](#), University of Electronic Science and Technology of China, China
[Junming Hu](#), University of Electronic Science and Technology of China, China
[Qingzhu Wang](#), University of Electronic Science and Technology of China, China
[Yifan Li](#), University of Electronic Science and Technology of China, China
[Kaiyan Zhang](#), University of Electronic Science and Technology of China, China
[Laixiao Guo](#), University of Electronic Science and Technology of China, China
[Huaming Qian](#), University of Electronic Science and Technology of China, China
[Peng Huang](#), University of Electronic Science and Technology of China, China
[Sisi Huang](#), University of Electronic Science and Technology of China, China
[Yixian Huang](#), University of Electronic Science and Technology of China, China
[Bin Ren](#), University of Electronic Science and Technology of China, China
[Bo Zhong](#), University of Electronic Science and Technology of China, China
[Guohuan Zeng](#), University of Electronic Science and Technology of China, China
[Jun Cai](#), University of Electronic Science and Technology of China, China
[Ming Huang](#), University of Electronic Science and Technology of China, China
[Dingwei Liu](#), University of Electronic Science and Technology of China, China
[Ying Zeng](#), University of Electronic Science and Technology of China, China
[Qirui Wang](#), University of Electronic Science and Technology of China, China
[Aodi Yu](#), University of Electronic Science and Technology of China, China
[Yang Liu](#), University of Electronic Science and Technology of China, China
[Kang Yu](#), University of Electronic Science and Technology of China, China
[Bin Yang](#), University of Electronic Science and Technology of China, China
[Ruchang Ding](#), University of Electronic Science and Technology of China, China



III. Sponsors & Organizers

1) Sponsors

- European Safety and Reliability Association (ESRA)
- European Federation of National Maintenance Societies (EFNMS)
- International Society of Engineering Asset Management (ISEAM)
- The Korean Society of Mechanical Engineers (KSME)
- The Korean Reliability Society (KORAS)
- Reliability Engineering Association of Japan (REAJ)
- Reliability Committee of Operations Research Society of China (RORSC)
- Reliability Committee of Sichuan Provincial Mechanical Engineering Society

2) Organizers

- Sichuan Provincial Key Laboratory of Reliability Engineering, UESTC
- College of Mechanical Engineering, IMUT
- National Collaborative Innovation Center of Major Machine Manufacturing in Liaoning, DUT
- State Key Laboratory of Mining Equipment and Intelligent Manufacturing, Taiyuan Heavy Machinery Group Co., Ltd., China

3) Co-Organizers

- Sichuan GoYo Intelligence Technology Co., Ltd.

IV. Keynote Speeches

A. Keynote Speech 1



Wednesday, October 25 / 09:00-09:40, Diamond Ballroom

Title: Degradation Models: Inference and Optimal Design

Professor Narayanaswamy Balakrishnan

McMaster University

Ontario, Canada

Abstract: In this talk, I will first give a brief introduction about degradation models and the need for them. After that, a brief description will be given about Wiener process for non-monotone degradation and a gamma process for monotone degradation. I will then describe the likelihood estimation of model parameters and the corresponding fitting method for fixed-effects model as well as random effects model. I will then illustrate the differences in fit of these models to a well-known laser data. Next, I will consider the optimal design of a degradation test when there are budget constraints, and will present some numerical illustrative examples for this. In the final part of the talk, I will discuss the effects of model mis-specification between these two degradation models (with the use of Kullback-Leibler measure) and assess the effects specifically on relative bias and relative mean square error, and finally conclude the talk with some open problems and further issues of interest.

Speaker Bio: Professor Balakrishnan has been actively involved in research work in diverse areas of Statistics, and has made significant contributions to many areas including Models and Analysis of Medical and Lifetime Data, Life-Testing and Reliability, Distribution Theory, Multivariate Distribution Theory, Inferential Methods, Industrial Statistics, Nonparametric Inference, Bayesian and Empirical Bayesian Inference, and Statistics in Finance. He has published more than 240 research papers in many journals. In addition, he has authored and edited several books and volumes, including 24 books, 11 handbooks and 28 volumes. Over the years, these have received good reviews and several citations in the literature. Prof. Balakrishnan has been extremely active in editorial work. He is the editor-in-chief for Communications in Statistics, and associate editor for Metrika and Methodology and Computing in Applied Probability. Prof. Balakrishnan has organized numerous International Conferences and sessions, and also been invited as contributed talks in various scientific conferences and meetings. He has received numerous awards to honor his excellent research. He was elected a fellow of the American Statistical Association in 1995, and a fellow of the Institute of Mathematical Statistics in 2006 etc. Prof. Balakrishnan has supervised over 40 PhD students and they are holding various positions in academia, industry and financial institutions.

B. Keynote Speech 2



Wednesday, October 25 / 09:40-10:20, Diamond Ballroom

Title: Maintenance Planning for Offshore Wind Turbines Using Stochastic Petri Nets

Professor Carlos Guedes Soares

Universidade de Lisboa

Lisboa, Portugal

Abstract: The status of development of wind energy offshore is described, bringing attention to the important developments in this sector. Analysis of accidents and of failure data will indicate the components that are more prone to failure and which will require more often corrective maintenance. The general problem of maintenance of these turbines will be presented and the specific problems associated with the need of using ships to assess the platform and their dependency on the weather windows is discussed, as it influences the maintenance and repair planning. Petri nets will be introduced as the main tool adopted to model and analyse this problem together with Monte Carlo Simulation. An example of application will be provided to illustrate the capabilities of these modelling techniques.

Speaker Bio: Carlos Guedes Soares received the M.S. and Ocean Engineer degrees from the Massachusetts Institute of Technology, USA in 1976, the Ph.D. degree from the Norwegian Institute of Technology, in Trondheim, in 1984, and the Doctor of Science degree from the Technical University of Lisbon, Portugal, in 1991. He is a Professor at the Engineering Faculty (Instituto Superior Tecnico) of the University of Lisbon and the Head of the Centre for Marine Technology and Ocean Engineering (CENTEC), which is a research center of the University of Lisbon that is recognized and funded by the Portuguese Foundation for Science and Technology. He has supervised 35 concluded Phd thesis and 38 Pos-doc Researchers. He has coauthored more than 450 journal papers and has been involved in more than 70 international research projects and 30 national projects. He has received Doctor Honoris Causa degrees from the Technical University of Varna in 2003 and the University "Dunarea de Jos" Galati, in 2004. He has received Awards from the University of Lisbon, the Brazilian Association of Naval Architects and Marine Engineers and the Confederation of European Maritime Technology Societies for the excellence of his work. He was founding member and has been General Secretary and Chairman of the European Safety and Reliability Association (ESRA), was Chairman of the International Maritime Association of the Mediterranean (IMAM) and is currently Chairman of the International Ship and Offshore Structures Congress (ISSC). He is Editor in Chief of Reliability Engineering and System Safety and member of the Editorial Board of about 15 Journals.

C. Keynote Speech 3



Wednesday, October 25 / 10:40-11:20, Diamond Ballroom

Title: Dissimilar Material Welding and Assessing Reliability of Super Alloy for Green and High Efficiency Thermal Power Plant

Professor Dong Ho Bae
SungKyunKwan University
Seoul, Korea

Abstract: The most currently, reducing environmental pollution is being raised important issue in thermal power-plant system. The most effective methodology is improving efficient of steam turbine. To improve the performance, increasing operating temperature of system above 700°C is good way to solve. Then it is necessary to develop suitable materials in this extreme condition. Among the materials developed so far, Ni-based super alloys have been good candidates due to their excellent properties such as creep strength, corrosion resistance, heat resistance, and oxidation resistance. However, in order to apply these Ni-based alloys to the steam turbine, it is necessary to develop the welding technology for similar and dissimilar materials, welding residual stress analysis, post-weld heat treatment technology and mechanical property tests under real operating conditions. In low pressure and temperature stage of steam turbine, damages of the rotors and blades are mainly caused by corrosion and corrosion fatigue. Therefore 12Cr steel is also desirable replacement for its corrosion resistance property and in terms of economical prime cost. In this presentation, 1. Reliable dissimilar material welding technology between super heat and corrosion resistant Alloy 617 and 12Cr steel, 2. A numerical welding residual stress analysis method simulated actual welding process, and 3. Corrosion fatigue life prediction and reliability assessment based on fatigue data including and not including the welding residual stresses will be introduced.

Speaker Bio:

Education

1988 Ph.D. Nihon University, Tokyo, Japan
1980 B Sc. Sungkyunkwan University, Seoul, Korea

Research Interests

IT Based Welding Design, Micro-Joining, Design Expert System, Environmental Strength Evaluation & Fracture Mechanics, On-Line Monitoring System

Recent Careers

- 2015 General Chairman of ICMR2015, Korea
- 2013 Co-chairman of QR2MSE& ICMR2013, China
- 2012 Award: Achievement Award by KSME
- 2011 Award: The Marquis Who's Who in the World
- 2011 General Chairman of ICMR2011, Korea
- 2010 Award: Academic Award on Reliability by KSME
- 2009 President of Reliability Division, KSME
- 2008 Award: Top 100 Engineers (IBC), U.K
- 2007 Visiting Scientist of the University of Washington, U.S.A
- 2007 Committee Member, Institute of Korean Industrial and Technology Assessment, Korea
- 2007 Professor in School of Mechanical Engineering, Sungkyunkwan University, Seoul, Korea
- 2004 General Secretary of Asian Pacific Conference for Fracture and Strength (APCFS), Jeju, Korea

D. Keynote Speech 4

Wednesday, October 25 / 11:20-12:00, Diamond Ballroom



Title: Critical Infrastructure Impact Assessment Models for Operation Threats and Climate-Weather Hazards Critical Infrastructure Safety and Resilience Indicators

Professor Krzysztof Kołowrocki
Maritime University
Gdynia, Poland

Abstract: Comprehensive modelling of the operation process and the climate-weather change process influence on the safety of a critical infrastructure is presented. Particular models of critical infrastructure safety influenced by its inside among its assets and subsystems dependences and by its outside operating environment threats and climate-weather hazards are created. Safety and resilience indicators for a critical infrastructure are proposed and the simplified procedures of their determination in the case of the created models of critical infrastructure safety are proposed.

Speaker Bio: Krzysztof Kołowrocki is a Full Professor and the Head of Mathematics Department at the Faculty of Navigation in Gdynia Maritime University. His field of interest is mathematical modeling of safety and reliability of complex systems and processes. He has published several books and over 400 scientific articles and papers. He is the President of Polish Safety and Reliability Association. His home site can be found at: <http://www.am.gdynia.pl/~katmatkk/>

E. Keynote Speech 5

Thursday, October 26 / 09:00-09:40, Diamond Ballroom



Title: Advancements in Physics-Based Reliability and Its Integration with Statistics-Based Methodologies

Professor Xiaoping Du

Missouri University of Science and Technology

Missouri, USA

Abstract: Reliability is a major driving factor of product performance and life cycle cost. It thus needs to be treated as a core element for the design of many engineering systems. There are two major kinds of reliability methodologies. Statics-based reliability methodologies use life-related reliability data from experiments, fields, and users. On the other hand, physics-based reliability methodologies are based on computational models that are derived from physics principles. This presentation focuses on physics-based reliability methodologies and demonstrates how reliability could be directly linked to design variables, such as the dimensions of components, structures of systems, material properties, and loading. New developments in time-dependent physics-based reliability are discussed. Examples are also given, including those in structural, alternative energy, and commercial product design applications. Although the two types of reliability methodologies are usually implemented independently in most engineering practices, it is possible to integrate both types of methodologies. Research on such an integration has been recently conducted, and the promising preliminary results have demonstrated that the integrated methodologies can produce more accurate system reliability predictions, make full use of information available, and better suit system designs with outsourced components.

Speaker Bio: Dr. Xiaoping Du is the Professor of Mechanical Engineering at Missouri University of Science and Technology. As an engineer, researcher, and educator in engineering design, he has been involved in many projects in optimization, structural reliability, and reliability engineering. As a principal investigator, he received seven grants from the National Science Foundation (NSF) and also served as PI and Co-PI for many other research projects. He has published over 100 journal and conference papers. He is currently serving as Associate Editor of ASME Journal of Mechanical Design, Review Editor of Structural and Multidisciplinary Optimization, and Associate Editor of IISE Transactions. He is Fellow of ASME and a recipient of Governor's Award for Excellence in Education. He also holds the title of Curator's Distinguished Teaching Professor, the highest and most prestigious academic rank in the University of Missouri system.

F. Keynote Speech 6

Thursday, October 26 / 09:40-10:20, Diamond Ballroom



Title: Time-Variant Reliability Methods for Dynamic Uncertain Structures

Professor Zhonglai Wang

University of Electronic Science and Technology of China
Sichuan, China

Abstract: Time-varying and nonlinearity are essential characteristics of complicated structures' performance because of the time-varying and correlation of various loadings, working conditions and stress, which bring new challenges for conducting reliability analysis and design. In this presentation, the definition and art of the state of time-variant reliability for dynamic uncertain structures will be first introduced. A time-variant reliability analysis method based on failure processes decomposition is then presented and the time-variant reliability problem is transformed to the time-invariant one through the two-stage failure processes decomposition. The effectiveness in both the computational efficiency and accuracy of the presented method will be finally testified by a case of the lower extremity exoskeleton.

Speaker Bio: Dr. Zhonglai Wang is the Professor of Mechatronics Engineering at University of Electronic Science and Technology of China. He has served as PI or Co-PI for over ten research projects including National Science Foundation of China (NSFC). He has published over 50 journal and conference papers, and has 6 authorized patents. He is a recipient of the ministry of education of Natural Science Award and National Defense Science and Technology Progress Award. He has been selected as "the Most Cited Chinese Researchers" in safety, risk, reliability and quality field for three times from the year 2014 to 2016 by Elsevier. His research interests mainly include system reliability modeling, reliability-based design optimization, robust design and model validation.

F. Keynote Speech 7

Thursday, October 26 / 10:40-11:20, Diamond Ballroom



Title: Convex-model-based Non-probabilistic Uncertainty Quantification and Reliability Analysis for Structures

Professor Chao Jiang
Hunan University
Hunan, China

Abstract: This work mainly introduces construction of non-probabilistic convex models and corresponding reliability analysis for structures with uncertainty. The convex model utilizes a convex set to represent the variation range of uncertain parameters, rather than their precise probability distributions; hence it generally requires much less information when dealing with the uncertainty. Several important issues on convex modeling are first investigated, including the parametric correlation, multi-source uncertainty, etc. Then based on the convex model, a non-probabilistic reliability model is presented for structural safety evaluation. For time-variant uncertain problems, a new analysis model, namely the interval process model, is also proposed for structural dynamic uncertainty quantification, with which a type of non-probability analysis method is developed to deal with the traditional non-random vibration problems.

Speaker Bio: Dr. Chao Jiang is the professor of College of Mechanical & Vehicle Engineering of Hunan University, China. He is holder of the National Science Fund for Distinguished Young Scholars, Young Scholar of Chang Jiang Scholars Program, National Excellent Doctoral Dissertation Award, etc. As a principal member, Prof. Jiang has won the Second Prize of National Science and Technology Progress Award of China, and three provincial and ministerial First Prizes for Progress in Science and Technology and Natural Science. His research interests are focused on structural uncertainty analysis, reliability analysis and design, fatigue, etc. He has presided over 20 national and provincial/ministerial level research projects, and has published more than 70 SCI-indexed papers with over 1000 SCI citations.

F. Keynote Speech 8



Thursday, October 26 / 11:20-12:00, Diamond Ballroom

Title: Comparative Studies of Four Kinds of Reliability Theory

Professor Zhiping Qiu
Beihang University
Beijing, China

Abstract: The presentation will present the comparative studies of four kinds of reliability theory including probability-statistical reliability, probability-interval reliability, fuzzy reliability and set-inference reliability. The using conditionals, relationship and difference of the four kinds of reliability theory will be elaborated and further the transformation methods among them will be provided.

Speaker Bio: Dr. Zhiping Qiu is the Professor of the School of Aeronautic Science and Engineering, Beihang University. He is the recipient of the national science Fund for Distinguished Young Scholars and the leader of Innovative Research Team in university. He has published over 200 journal papers, among which 85 papers are indexed in SCI, and 6 monographs. He has 8 authorized patents and 6 software copyrights. He is also the recipient of National Defense Technology Invention Award. His research interests include computational solid mechanics and computational dynamics, structural strength analysis and design optimization of aircrafts, uncertainty quantification and propagation, and structural health monitoring.



V. Program Information

A. Conference Topic

- I Reliability Modeling and Risk Analysis
- II Robust, Reliability-Based, and Lifecycle Design
- III Maintenance and Warranty Management
- IV Failure Physics, Material Science, Data Analysis, and Reliability Testing
- V Reliability, Maintainability, and Supportability
- VI Fault Diagnosis, Prognosis, Condition Monitoring and PHM
- VII System Analysis, Simulation and Optimization
- VIII Special Session on "Warranty and Maintenance Policy"
- IX Special Session on "Korean Programs in Reliability and Structural Integrity I"
- X Special Session on "Korean Programs in Reliability and Structural Integrity II"



B. Program at a Glance

TIME TABLE

Time \ Date	October 24 (Tuesday)	October 25 (Wednesday)	October 26 (Thursday)
08:00-08:30	Registration	Registration	Registration
08:30-09:00		Opening Ceremony	
09:00-09:40		Keynote Speech 1	Keynote Speech 5
09:40-10:20		Keynote Speech 2	Keynote Speech 6
10:20-10:40		Tea Break	Tea Break
10:40-11:20		Keynote Speech 3	Keynote Speech 7
11:20-12:00		Keynote Speech 4	Keynote Speech 8
12:00-13:30		Lunch	Lunch
13:30-15:15		Oral Session A	Oral Session C
15:15-15:30		Tea Break	Tea Break
15:30-18:00		Oral Session B	Oral Session D
18:00-		Dinner	Dinner



C. Detailed Timetable

October 25 [Wednesday] 08:00-12:00

Time \ Room	Diamond Ballroom	
08:00-08:30	Registration	
08:30-09:00	Opening Ceremony	
09:00-09:40	Chair: Prof. Xiaoping Du Missouri University of Science and Technology USA	Keynote Speech 1: Prof. Narayanaswamy Balakrishnan, McMaster University Degradation Models: Inference and Optimal Design
09:40-10:20	Chair: Prof. Xiaoping Du Missouri University of Science and Technology USA	Keynote Speech 2: Prof. Carlos Guedes Soares, Universidade de Lisboa Maintenance Planning for Offshore Wind Turbines Using Stochastic Petri Nets
10:20-10:40	Tea Break	
10:40-11:20	Chair: Prof. Suk Joo Bae Hanyang University Korea	Keynote Speech 3: Prof. Dong Ho Bae, SungKyunkwan University Dissimilar Material Welding and Assessing Reliability of Super Alloy for Green and High Efficiency Thermal Power Plant
11:20-12:00	Chair: Prof. Suk Joo Bae Hanyang University Korea	Keynote Speech 4: Prof. Krzysztof Kolowrocki, Maritime University Critical Infrastructure Impact Assessment Models for Operation Threats and Climate-Weather Hazards Critical Infrastructure Safety and Resilience Indicators
12:00-13:30	Lunch	



October 25 [Wednesday] 13:30-15:30

TIME TABLE

Room Name		Locust Room	Indus Room	Spruce Room	Banyan Room II	
Time						
Conference Topic		Fault Diagnosis, Prognosis, Condition Monitoring and PHM (VI)	Special Session on "Warranty and Maintenance Policy"(VIII)	System Analysis, Simulation and Optimization (VII)	Analysis and Design Optimization of Uncertain Structures	
Oral Session A	13:30-13:45	ICMR&QR2MSE2017-0006-0121	ICMR&QR2MSE2017-A-0143 (13:30-13:55)	ICMR&QR2MSE2017-0007-0005	<p>Zhan Kang Topology Optimization under Manufacturing Process Constraints or Uncertainty (13:30-14:20)</p> <p>Bin Liu What is the Optimal Crystal Structure of Two Dimensional Materials (14:20-15:10)</p>	
	13:45-14:00	ICMR&QR2MSE2017-0005-0080		ICMR&QR2MSE2017-0007-0156		
	14:00-14:15	ICMR&QR2MSE2017-0006-0014		ICMR&QR2MSE2017-0002-0111		
	14:15-14:30	ICMR&QR2MSE2017-0006-0050		ICMR&QR2MSE2017-A-0144 (13:55-14:20)		ICMR&QR2MSE2017-0007-0026
	14:30-14:45	ICMR&QR2MSE2017-0006-0127		ICMR&QR2MSE2017-0002-0112		
	14:45-15:00	ICMR&QR2MSE2017-0006-0016		ICMR&QR2MSE2017-A-0145 (14:20-14:45)		ICMR&QR2MSE2017-0007-0039
	15:00-15:15	ICMR&QR2MSE2017-0003-0149		ICMR&QR2MSE2017-0007-0054		
15:15-15:30		Tea Break				



October 25 [Wednesday] 15:30-18:00

TIME TABLE

Time \ Room Name		Locust Room	Indus Room	Spruce Room	Banyan Room II
Conference Topic		Reliability Modeling and Risk Analysis (I)	Special Session on "Korean Programs in Reliability and Structural Integrity I" (IX)	System Analysis, Simulation and Optimization (VII)	Analysis and Design Optimization of Uncertain Structures
Oral Session B	15:30-15:45	ICMR&QR2MSE2017-0001-0011	ICMR&QR2MSE2017-A-0135 (15:30-15:55)	ICMR&QR2MSE2017-0007-0060	<p>Yangjun Luo Analysis and Design Optimization of Folded Structure of Thin Film (15:30-16:20)</p> <p>Jianbing Chen Structural Random Response and Optimization Control Considering The Dependence of Parameters (16:20-17:10)</p>
	15:45-16:00	ICMR&QR2MSE2017-0001-0113		ICMR&QR2MSE2017-0007-0073	
	16:00-16:15	ICMR&QR2MSE2017-0001-0130		ICMR&QR2MSE2017-0007-0088	
	16:15-16:30	ICMR&QR2MSE2017-0001-0120	ICMR&QR2MSE2017-0007-0114		
	16:30-16:45	ICMR&QR2MSE2017-0001-0001	ICMR&QR2MSE2017-0007-0116		
	16:45-17:00	ICMR&QR2MSE2017-0001-0033	ICMR&QR2MSE2017-0002-0169		
	17:00-17:15	ICMR&QR2MSE2017-0001-0038	ICMR&QR2MSE2017-0004-0137 (16:20-16:45)	ICMR&QR2MSE2017-0004-0117	
	17:15-17:30	ICMR&QR2MSE2017-0001-0069	ICMR&QR2MSE2017-A-0138 (16:45-17:10)	ICMR&QR2MSE2017-0005-0049	
	17:30-17:45	ICMR&QR2MSE2017-0001-0070		ICMR&QR2MSE2017-0007-0124	
	17:45-18:00	ICMR&QR2MSE2017-0002-0119		ICMR&QR2MSE2017-0007-0043	
18:00		Dinner			


October 26 [Thursday] 08:00-12:00

Time \ Room	Diamond Ballroom	
08:00-09:00	Registration	
09:00-09:40	<p>Chair: Prof. Andy C.C. Tan Universiti Tunku Abdul Rahman Malaysia</p>	<p>Keynote Speech 5: Prof. Xiaoping Du, Missouri University of Science and Technology Advancements in Physics-Based Reliability and Its Integration with Statistics-Based Methodologies</p>
09:40-10:20	<p>Chair: Prof. Andy C.C. Tan Universiti Tunku Abdul Rahman Malaysia</p>	<p>Keynote Speech 6: Prof. Zhonglai Wang, University of Electronic Science and Technology of China Time-Variant Reliability Methods for Dynamic Uncertain Structures</p>
10:20-10:40	Tea Break	
10:40-11:20	<p>Chair: Prof. Zhan Kang Dalian University of Technology China</p>	<p>Keynote Speech 7: Prof. Chao Jiang, Hunan University Convex-model-based Non-probabilistic Uncertainty Quantification and Reliability Analysis for Structures</p>
11:20-12:00	<p>Chair: Prof. Zhan Kang Dalian University of Technology China</p>	<p>Keynote Speech 8: Prof. Zhiping Qiu, Beihang University Comparative Studies of Four Kinds of Reliability Theory</p>
12:00-13:30	Lunch	



October 26 [Thursday] 13:30-15:30

TIME TABLE

Time \ Room Name		Locust Room	Indus Room	Spruce Room	Banyan Room II
Conference Topic		System Analysis, Simulation and Optimization (VII)	Failure Physics, Material Science, Data Analysis, and Reliability Testing (IV)	Reliability, Maintainability, and Supportability (V)	Analysis and Design Optimization of Uncertain Structures
Oral Session C	13:30-13:45	ICMR&QR2MSE2017-0004-0168	ICMR&QR2MSE2017-0004-0021	ICMR&QR2MSE2017-0005-0081	<p>Dagang Lv Structural Uncertainty Processing Methods in Seismic Vulnerability and Risk Analysis (13:30-14:20)</p> <p>Jitao Yao New Method in Reliability Design of Engineering Structure (14:20-15:10)</p>
	13:45-14:00	ICMR&QR2MSE2017-0001-0091	ICMR&QR2MSE2017-0004-0074	ICMR&QR2MSE2017-0005-0051	
	14:00-14:15	ICMR&QR2MSE2017-0007-0077	ICMR&QR2MSE2017-A-0151	ICMR&QR2MSE2017-0005-0004	
	14:15-14:30	ICMR&QR2MSE2017-0007-0096	ICMR&QR2MSE2017-0004-0018	ICMR&QR2MSE2017-0005-0165	
	14:30-14:45	ICMR&QR2MSE2017-0007-0147	ICMR&QR2MSE2017-0004-0166	ICMR&QR2MSE2017-0005-0061	
	14:45-15:00	ICMR&QR2MSE2017-0007-0013	ICMR&QR2MSE2017-0004-0129	ICMR&QR2MSE2017-0005-0064	
	15:00-15:15	ICMR&QR2MSE2017-0007-0131	ICMR&QR2MSE2017-0004-0052	ICMR&QR2MSE2017-0005-0076	
15:15-15:30	Tea Break				


October 26 [Thursday] 15:30-18:00

TIME TABLE

Time \ Room Name		Locust Room	Indus Room	Spruce Room	Banyan Room II
Conference Topic		Reliability Modeling and Risk Analysis (I)	Special Session on "Korean Programs in Reliability and Structural Integrity II" (X)	System Analysis, Simulation and Optimization (VII)	Analysis and Design Optimization of Uncertain Structures
Oral Session D	15:30-15:45	ICMR&QR2MSE2017-0001-0159	ICMR&QR2MSE2017-A-0078 (15:30-15:55)	ICMR&QR2MSE2017-0007-0007	Dixiong Yang Convergence Control in Iteration Algorithm of Structural Reliability Analysis and Design Optimization (15:30-16:20)
	15:45-16:00	ICMR&QR2MSE2017-0001-0171		ICMR&QR2MSE2017-0007-0125	
	16:00-16:15	ICMR&QR2MSE2017-0001-0110		ICMR&QR2MSE2017-0007-0164	
	16:15-16:30	ICMR&QR2MSE2017-0001-0098		ICMR&QR2MSE2017-0007-0034	
	16:30-16:45	ICMR&QR2MSE2017-0004-0089		ICMR&QR2MSE2017-0002-0048	
	16:45-17:00	ICMR&QR2MSE2017-0004-0019		ICMR&QR2MSE2017-0002-0087	
	17:00-17:15	ICMR&QR2MSE2017-0004-0084		ICMR&QR2MSE2017-0004-0085	
	17:15-17:30	ICMR&QR2MSE2017-0004-0170		ICMR&QR2MSE2017-0004-0090	
	17:30-17:45	ICMR&QR2MSE2017-0002-0115		ICMR&QR2MSE2017-0003-0126	
	17:45-18:00	ICMR&QR2MSE2017-0001-0109		ICMR&QR2MSE2017-0007-0167	
18:00		Banquet			



VI. Technical Program

October 25 [Wednesday] Oral Session A In Locust Room

13:30-15:15 Fault Diagnosis, Prognosis, Condition Monitoring and PHM (VI)

Moderators: Prof. R. Jiang, Changsha University of Science and Technology, China

Prof. Bo Guo, National University of Defence Technology, China

13:30-13:45 **ICMR&QR2MSE2017-0006-0121** An Overview of The Importance of Intelligent Approaches in Machinery Faults Diagnosis and Prediction Based on PHM/CBM / *Ali Omid* (*Dalian University of Technology, China*), *Shujie Liu*

In this paper, a review of intelligent approaches in machinery faults diagnosis and prediction based on “prognostic and health management” and “condition based maintenance” is proposed.

13:45-14:00 **ICMR&QR2MSE2017-0005-0080** A Sequential Condition Based Maintenance Decision with Prognostics Information / *Yu-Guo Xu* (*Academy of Armored Force Engineering, China*), *Shi-Xin Zhang*, *Yong Li*

In this paper, a sequential condition based maintenance decision with prognostics is discussed.

14:00-14:15 **ICMR&QR2MSE2017-0006-0014** Plant-wide Online Monitoring of a Process Industry System Based on Normalized Color-Spectrum / *Sun Kai* (*Xi'an University of Architecture and Technology, China*)

In this paper, normalized color-spectrum is proposed eliminates the impact of heterogeneous as well as non-linear, polymorphism, and non-equilibrium It realizes online monitoring of vast multivariable time series monitor data of process system by introducing the idea of scientific data visualization.



14:15-14:30 **ICMR&QR2MSE2017-0006-0050** Condition Monitoring Based Equipment Health Management/ *Shuang-Han Ling (Suzhou Nuclear Power Research Institute, China), Xiao-Guang Hun, Tian-Hao Wu, Gui-Tong Zhu*

In this paper, through monitoring and capturing condition parameters of equipment units, using deviation analysis technology to evaluate the parameters, condition monitoring based equipment health management can provide equipment current health condition and future development trend.

14:30-14:45 **ICMR&QR2MSE2017-0006-0127** Research on Time-varying Nonlinear Vibration Suppression of a Deploying Piezoelectric Laminated Composite Plate/ *Shu-Feng Lu (Inner Mongolia University of Technology, China), Yan-Hong Gao, Ting Ma, Xiao-Yan Zhang, Xiao-Juan Song*

In this paper, the complex nonlinear dynamic response of a rectangular deploying PLC (piezoelectric laminated composite) cantilever plate, which is subjected to several external excitations, is investigated.

14:45-15:00 **ICMR&QR2MSE2017-0006-0016** Research and Application of Temporal Related Reasoning Model for Fault Diagnosis in Nuclear Power Plant/ *Yan Cui (Suzhou Nuclear Power Research Institute, China), Shi-Jun Chen, Meng Qu*

In this paper, the research results can solve multi-parameter and time-delay uncertainty fault diagnosis.

15:00-15:15 **ICMR&QR2MSE2017-0003-0149** Rheological Behavior of Slurries Containing Short Carbon Fibers for Preparation of Silica Sol Shell/ *Zongxue Li (Inner Mongolia University of Technology, China), Xiangdong Liu, Ying Zhang, Hui Zhang*

In this paper, the short carbon fibers with $\phi 7.32\mu\text{m} \times 3\text{mm}$ were introduced into the silica sol slurries by 0~1.0% (mass percentage of refractory powders in slurry) for preparation of investment casting shell and the apparent viscosity, high shear viscosity, and the thixotropy of the slurries were measured by rheometer.

15:15-15:30 Tea Break

**October 25 [Wednesday] Oral Session A In Indus Room****13:30-14:45 Special Session on "Warranty and Maintenance Policy" (VIII)**

Moderators: Prof. Dae-Kyung Kim, Chonbuk National University, Korea

13:30-13:55 **ICMR&QR2MSE2017-A-0143** Partial Accelerated Degradation Test for Wiener Degradation Processes/
Suk Joo Bae (Hanyang University, Korea), Heongsang Lim, Yoo Soo Kim, Si Il Song

In this paper, a two-phase partially accelerated degradation test (PADT) is proposed to efficiently obtain product lifetime information in the development stage.

13:55-14:20 **ICMR&QR2MSE2017-A-0144** Age Repair-replacement Policy with Repair Time Threshold and Efficiency Evaluation/
Dong Ho Park (Hallym University, Korea), Minjae Park, Ki Mun Jung

In this paper, the optimal choice of the pre-determined preventive replacement age for a non-warrantied system is investigated and several properties of such an age repair-replacement policy in comparison with the traditional age replacement policy is discussed.

14:20-14:45 **ICMR&QR2MSE2017-A-0145** Optimal Maintenance Policy Following Periodic Inspection/Upgrade Warranty Period for Second-hand Product/
Dong Ho Park (Hallym University, Korea), Jae-Hak Lim, Dae-Kyung Kim

In this paper, the warranty strategy and maintenance policies after warranty period is investigated.

15:15-15:30 Tea Break



October 25 [Wednesday] Oral Session A In Spruce Room

13:30-15:15 System Analysis, Simulation and Optimization (VII)

Moderators: Prof. Zong-Wen An, Lanzhou University of Technology, China

Prof. Liping He, University of Electronic Science and Technology of China, China

13:30-13:45 **ICMR&QR2MSE2017-0007-0005** Numerical Simulation of Field Coupling Multiple Physical of Axisymmetric Vectoring Exhaust Nozzle/ *Zhi-Zhong Fu (Inner Mongolia University of Technology, China), Yi-Qing Qiu, Jian-Xin Wu, Peng Yin*

In this paper, the deformation of the main components of rocket nozzle is analyzed under the condition of high temperature, high pressure and the role of external force.

13:45-14:00 **ICMR&QR2MSE2017-0007-0156** The Reliability of Wind Multiplier with Augmented Analytical Wake Model for Wind Farm Layout Optimization/ *Andy C.C. Tan (Universiti Tunku Abdul Rahman, Malaysia), Longyan Wang, Michael E. Cholette*

In this paper, a computationally-efficient optimization scheme is proposed to account for the effect of wind speed variations over non-flat terrain and irregular land plot boundary.

14:00-14:15 **ICMR&QR2MSE2017-0002-0111** Reliability Design of an Electronic Cam Curve for Flying Shear Machine in Short Materials Cutting/ *Junxi Bi (Inner Mongolia University of Technology, China), Bin Liu, Hong-Zhong Huang*

In this paper, In this paper, it mainly analyzes the application of electronic cams on flying shear mechanism, which the research of the design for the cam curves is based on.

14:15-14:30 **ICMR&QR2MSE2017-0007-0026** Degradation Reliability Analysis Based on TOPSIS Model Selection Method/ *Ying-Kui Gu, Yan-Jun Shen (Jiangxi University of Science and Technology, China), Dong-Ping Yu*

In this paper, aiming at the problem of subjective selection of trajectory model in the process of degenerate data analysis based on degenerate trajectory model, and proposed a degenerate reliability analysis method based on TOPSIS model selection.

14:30-14:45 **ICMR&QR2MSE2017-0002-0112** Robust Optimization Design of Metro Handrails/ *Peng-Peng Zhi (Dalian Jiaotong University, China), Yong-Hua Li, Xiao-Dan Zhang*

In this paper, a robust design and finite element analysis-based response surface method is presented for metro handrails optimization design, which can improve the robustness of metro handrails structural performance and light the weight.

14:45-15:00 **ICMR&QR2MSE2017-0007-0039** Optimization of Linear Consecutive-k-out-of-n Systems with a Birnbaum Importance-based Ant Colony Optimization Algorithm/ *Wei Wang (Northwestern Polytechnical University, China), Zhi-Qiang Cai, Jiang-Bin Zhao, Shu-Bin Si*

In this paper, the authors propose the BIACO to solve the CAP in Lin/Con/k/n:F(G) systems.

15:00-15:15 **ICMR&QR2MSE2017-0007-0054** Reliability Sensitivity Analysis and Robust Optimization Design on the Equilibrium Elbow/ *Yun-Xian Jia, Jie Zhou (Mechanical Engineering College, China), Cheng-Cheng Liu, Zhi-Jian Li*

In this paper, the tracked vehicle equilibrium elbow model is established to analyze the reliability and sensitivity of arbitrary distribution parameters of the component.

15:15-15:30 Tea Break



October 25 [Wednesday] Oral Session A In Banyan Room II

13:30-15:10 Analysis and Design Optimization of Uncertain Structures

Moderators: Prof. Jianbing Chen, Tongji University, China

13:30-14:20 Topology Optimization under Manufacturing Process Constraints or Uncertainty / *Zhan Kang (Dalian University of Technology, China)*

14:20-15:10 What is The Optimal Crystal Structure of Two Dimensional Materials / *Bin Liu (Tsinghua University, China)*

15:15-15:30 Tea Break


October 25 [Wednesday] Oral Session B In Locust Room
15:30-18:00 Reliability Modeling and Risk Analysis (I)

Moderators: Prof. Rui Peng, University of Science & Technology Beijing, China
 Prof. Tian Ran Lin, Qingdao University of Technology, China

15:30-15:45 **ICMR&QR2MSE2017-0001-0011** Residual Storage Life Prediction For Product With Multiple Storage States/ *Xi-Wen Wu (National University of Defence Technology, China), Bo Guo, Xiao-Yue Wu, Yong Yang*

In this paper, the authors studied a storage lifetime with multiple states, where the switches of states are determined by the schedule.

15:45-16:00 **ICMR&QR2MSE2017-0001-0113** Bearing Degradation Feature Extraction Based on DTCWT-ISOMAP/ *Xin Zhang (Mechanical Engineering College, China), Jian-Min Zhao, Wei-Xing Song, Zhen-Dong Du, Yu-Tao Wu*

In this paper, a new technique about degradation index extraction based on DTCWT and ISOMAP is demonstrated.

16:00-16:15 **ICMR&QR2MSE2017-0001-0130** A New Reliability Assessment Method for Complex Pyrotechnic System Based on Goal Oriented Methodology/ *Yuan-Yuan Yang (Beijing Institute of Technology, China), Hui-Na Mu, Xiao-Jian Yi, Guang-Liang Chen, Li Li, Li Cheng*

In this paper, the authors provide a new approach for reliability lower confidence limit of complex systems by only using the unit life data.

16:15-16:30 **ICMR&QR2MSE2017-0001-0120** The Dynamic Model and Analysis of Ring Die Pellet Mill with Helical Gear Transmission/ *Jie Liu, Ri-Su Na (Inner Mongolia University of Technology, China), Hai-Feng Zhai, Hai-Tang Cen*

In this paper, the authors establish the dynamic model based on the Lagrange equations and the lump-mass method to solve the vibration problem of the ring die pellet mill.

16:30-16:45 **ICMR&QR2MSE2017-0001-0001** Multi-Criteria Decision Making Based on Correlation Coefficient of Triangular Intuitionistic Fuzzy Numbers/ *Xiaoyang Ma (University of Science & Technology Beijing, China), Di Wu, Xiangbin Yan, Rui Peng*

In this paper, a new way to obtain the criteria weights for fuzzy numbers with more information quantity is proposed, An illustrative example is also taken into concern to prove the effectiveness of the method.

16:45-17:00 **ICMR&QR2MSE2017-0001-0033** Predicting Distribution of Time to Degradation Limit Using a Weighted Approach/ *R. Jiang (Changsha University of Science and Technology, China), C. Huang*

In this paper, to appropriately specify the form of the weight function and its parameters, the Gaussian kernel function and a cross-validation approach are adopt. The appropriateness and usefulness of the proposed approach are illustrated by a real-world example.



17:00-17:15 **ICMR&QR2MSE2017-0001-0038** Statistical Inference of Reliability with Multivariate Accelerated Degradation Data/ *Hao-Wei Wang (Naval Aeronautical University of China, China), Yuan Zhou, Wei-Min Lv*

In this paper, a practical method of inferring reliability with multivariate accelerated degradation data was proposed, the results indicate that the proposed method provides a practical and feasible approach to reliability inference with multivariate accelerated degradation data.

17:15-17:30 **ICMR&QR2MSE2017-0001-0069** Reliability Evaluation of Multi-state Systems Based on Cloud Universal Generating Function/ *Long Gao (Academy of Army Armored Force, China), Jun-Hai Cao, Tai-Liang Song, Xu Yan*

In this paper, the problem of uncertainties in the reliability evaluation of multi-state systems is studied, and presents a method of reliability evaluation of the multi-state systems on the basic of the cloud model theory, in which both the aleatory uncertainties and epistemic uncertainties of the state probability are modeled to characterize their natures by the cloud model.

17:30-17:45 **ICMR&QR2MSE2017-0001-0070** Research on Uncertainty of Remaining Useful Life Prediction/ *Yong Li (Academy of Army Armored Force, China), Yu-Guo Xu*

In this paper, the authors classify RUL prediction as discrete type and cumulative type based on the analysis of RUL prediction process and characteristics.

17:45-18:00 **ICMR&QR2MSE2017-0002-0119** A Novel Design of Flexible Winding System for Composite Resin Prepreg Tape/ *Xiao-Dong He (Inner Mongolia University of Technology, China), Hua-Lian Li*

In this paper, a novel flexible winding system for composite tape winding is proposed, and a kinetic analysis of the novel system and its controller design is also introduced.

18:00 Dinner



October 25 [Wednesday] Oral Session B In Indus Room

15:30-17:10 Special Session on “Korean Programs in Reliability and Structural Integrity I” (IX)

Moderators: Prof. Nam-Su Huh, Seoul National University of Science and Technology, Korea

15:30-15:55 **ICMR&QR2MSE2017-A-0135** An Automated Experimental Modeling of Tensile Behavior with Polyjet 3D Printer Mix/ *Dong-Cheon Baek (Korea Institute of Machinery and Materials, Korea), Eduardo Salcedo, Jong Eun Ryu*

In this paper, a blending ratio model based on experimental data for two materials mixed in Stratasys' Connex3 equipment is developed.

15:55-16:20 **ICMR&QR2MSE2017-A-0136** Statistical Model Calibration and Validation of Pyrotechnically Actuated Devices based on Operating Mechanism/ *Hee-Seong Kim (Korea Aerospace University, Korea), Joo-Ho Choi*

In this paper, an age replacement model is introduced, the modified replacement policies combining planned time and random times are given, and different replacement costs are considered for models for further discussions.

16:20-16:45 **ICMR&QR2MSE2017-0004-0137** Research on Effect of Work Hardening Models for Low-Cycle Fatigue Evaluation of Coiled Tubing with CT-100 Steel/ *Tae-Young Ryu (Seoul National University of Science and Technology, Korea), Jae-Boong Choi, Nam-Su Huh, Soo-Chang Kang, Ki-Seok Kim*

In this paper, the fatigue life of CT is evaluated by simulating the fatigue test equipment with various hardening models and the fatigue life evaluation is conducted by using the strain history data.

16:45-17:10 **ICMR&QR2MSE2017-A-0138** Experimental Study on the Life Prediction of Servo Motors through Model-based System Degradation Assessment and Accelerated Degradation Testing/ *Bumsoo Park (Ulsan National Institute of Science and Technology, Korea), Haedong Jeong, Hyunseuk Huh, Seungchul Lee*

In this paper, by using an accelerated degradation testing method based on thermal stresses, the lifespan of a servo motor under operating stress conditions were predicted.

18:00 Dinner


October 25 [Wednesday] Oral Session B In Spruce Room
15:30-18:00 System Analysis, Simulation and Optimization (VII)

Moderators: Prof. Yu Liu, University of Electronic Science and Technology of China, China

Prof. Xueguan Song, Dalian University of Technology, China

15:30-15:45 **ICMR&QR2MSE2017-0007-0060** Reliability Analysis of Aero-engine Main Fuel System Based on GO Methodology/ *Chen-Hui Ren (Academy of Armored Force Engineering, China), Sheng Zhang, Li-Yong Wan, Xiao-Jian Yi, Hai-Ping Dong*

In this paper, the GO method is adopted to conduct quantitative and qualitative reliability analysis of an aero-engine main fuel system.

15:45-16:00 **ICMR&QR2MSE2017-0007-0073** A Direct-Integration-Based Structural Reliability Analysis Method by Using Non-Probability Convex Model/ *Xiaobo Nie (Inner Mongolia University of Technology, China), Hai-Bin Li*

In this paper, a novel fuzzy reliability calculation method is proposed to evaluate the fuzzy reliability of structures.

16:00-16:15 **ICMR&QR2MSE2017-0007-0088** Reliability Analysis of Excavator Boom in Continuous Operation/ *Jun-Yuan Li (Inner Mongolia University of Technology, China), Hai-Bin Li*

In this paper, the reliability evaluation of an excavator's boom structure is addressed by integration of FEM and Stress-Strength Interference.

16:15-16:30 **ICMR&QR2MSE2017-0007-0114** Estimation of Alpha Power Generalized Exponential Distribution Based on an Adaptive Progressively Type-II Censored Sample/ *Na Wang (Inner Mongolia University of Technology, China), Zai-Zai Yan*

In this paper, a comparison between MLE and Bayesian estimators is carried out in terms of the parameters, reliability and hazard functions of the alpha power generalized exponential distribution using the adaptive Type-II progressive censored scheme.

16:30-16:45 **ICMR&QR2MSE2017-0007-0116** Probabilistic Fatigue-Creep Life Reliability Assessment of Aircraft Turbine Disk/ *Kossi Mawuena Tomevenya (Dalian University of Technology, China), Shu Jie Liu*

In this paper, an evaluation of the reliability of low cycle fatigue creep analysis of turbine disk. Based on the turbine disk structural and thermal analysis, fatigue creep life is conducted by considering the probability effect of the structural geometry, load and material properties.

16:45-17:00 **ICMR&QR2MSE2017-0002-0169** Modeling and Evaluation Method for The Reliability of Two-terminal Connection of Command and Control Networks/ *Jun Liu (University of Electronic Science and Technology of China, China), Guo-Zhong Fu, Hong-Zhong Huang*

In this paper, the reliability modeling and evaluation method based on dynamic fault tree and Bayesian network is studied.



17:00-17:15 **ICMR&QR2MSE2017-0004-0117** Construction of Multiple Competing Failure Model for Cr-Ni Steel with Variable Stress Ratio/ *Hai-Long Deng (Inner Mongolia University of Technology, China), Huan Yu, Peng-Wen Sun, Rong-Bo Zhao, Peng-Yuan Lin*

In this paper, a uniform competition failure model with internal failure and surface failure is constructed to describe the competition failure mechanism of carburized Cr-Ni steel.

17:15-17:30 **ICMR&QR2MSE2017-0005-0049** Study on Optimal Periodic Group Maintenance Model Based on Economic Dependency of Complex Equipment System/ *Shenhu Ding (Army Engineering University, China), Yunxian Jia*

In this paper, it puts forward the group maintenance optimal model of the complex equipment system from the aspects of risk and economy.

17:30-17:45 **ICMR&QR2MSE2017-0007-0124** Influence of F Doping on the Photoelectric Properties of GaN/ *Zhanxin Ma (Inner Mongolia University of Technology, China), Siqingaowa Bao, Xiaohua Ma*

In this paper, the band gap, density of state and absorption spectrum of undoped wurtzium type GaN and $\text{Ga}_{36}\text{FN}_{36}$, $\text{Ga}_{32}\text{FN}_{32}$, $\text{Ga}_{24}\text{FN}_{24}$ and $\text{Ga}_{16}\text{FN}_{16}$ super-cell systems with four different F-gap concentration are calculated by using Ultrasoft Pseudopotential Plane Wave of the first principles under DFT.

17:45-18:00 **ICMR&QR2MSE2017-0007-0043** The Variance-based Importance Measure for the System Reliability Based on the Fault Tree Analysis/ *Gui-Jie Li (China Academy of Engineering Physics, China), Chao-Yang Xie, Feng-Jun Wang, Fa-Yuan Wei*

In this paper, based on FTA, the variance-based IM model for system reliability is developed to measure the effects of the uncertainties of the fault probabilities of the component on the system fault.

18:00 Dinner



October 25 [Wednesday] Oral Session B In Banyan Room II

15:30-17:10 Analysis and Design Optimization of Uncertain Structures

Moderators: Prof. Dagang Lv, Harbin Institute of Technology, China

15:30-16:20 Analysis and Design Optimization of Folded Structure of Thin Film/ *Yangjun Luo (Dalian University of Technology, China)*

16:20-17:10 Structural Random Response and Optimization Control Considering The Dependence of Parameters/
Jianbing Chen (Tongji University, China)

18:00 Dinner



October 26 [Thursday] Oral Session C In Locust Room

13:30-15:15 System Analysis, Simulation and Optimization (VII)

Moderators: Prof. Shu-Bin Si, Northwestern Polytechnical University, China

Prof. Ning Wang, Chang'an University, China

13:30-13:45 **ICMR&QR2MSE2017-0004-0168** Physics of Failure-Based Reliability Prediction of a Turbine Blade Using Multi-Source Information Fusion/ *He Li (University of Electronic Science and Technology of China, China), Ao-Di Yu, Hong-Zhong Huang*

In this paper, physics of failure-based reliability prediction method of a turbine blade using multi-source information fusion is introduced and, the results indicate that the proposed method is better in line with engineering practice and more flexible in decision making when compared with traditional methods.

13:45-14:00 **ICMR&QR2MSE2017-0001-0091** An Extended Inverse Gaussian Distribution: Properties and Application/ *Jun-Feng Lai (Inner Mongolia University of Technology, China), Dan-Dan Ji, Zai-Zai Yan*

In this paper, the authors suggest a new distribution, combining with the Weibull and inverse Gaussian distributions by using the method of T-X family, so-called extended inverse Gaussian (EIG) distribution.

14:00-14:15 **ICMR&QR2MSE2017-0007-0077** The Main Driving System Vibration Analysis under Different Rotating Speed of TBM Cutterhead/ *Xuan-Xuan Li (Dalian University of Technology, China), Han-Yang Wu, Zhi-Chao Meng, You-Neng Bao, Jun-Zhou Huo*

In this paper, based on the multi-degree of freedom coupling dynamic model of the main driving system, the influence of the cutterhead rotating speed on the external load excitation is considered.



14:15-14:30 **ICMR&QR2MSE2017-0007-0096** Finite Element Simulation Study of Blade Coating of Wind Turbine/ *Rui-Tao Wei (Inner Mongolia University of Technology, China), Hai-Tang Cen, Wen-Liang Tian, Na-Ri Su*

In this paper, the reliability evaluation of an excavator's boom structure is addressed by integration of FEM and Stress-Strength Interference.

14:30-14:45 **ICMR&QR2MSE2017-0007-0147** Low Speed Bearing Fault Diagnosis Based on EMD - CIIT Histogram Entropy and KFCM Clustering/ *Tian Ran Lin (Qingdao University of Technology, China), Ke Zhang, Xia Jin*

In this paper, a bearing fault diagnosis technique based on a combination of empirical mode decomposition (EMD), clear iterative interval threshold (CIIT) and the kernel-based fuzzy c-means (KFCM) eigenvalue extraction is proposed.

14:45-15:00 **ICMR&QR2MSE2017-0007-0013** A Simulation Method for Space Telemetry Tracking and Command System Mission Reliability Assessment with Dynamic Redundancy/ *Haiyue Yu (National University of Defense Technology, China), Xiaoyue Wu*

In this paper, a heuristic rule based on the system operation-principle to accomplish the resource scheduling and a reactive fault strategy to handle the failure mission is designed.

15:00-15:15 **ICMR&QR2MSE2017-0007-0131** Optimization of the Measurement Precision Consistency of Single-Phase Smart Electricity Meters in Full Temperature Range/ *Mingdong Lyu (Harbin Institute of Technology, China), Xuerong Ye, Lu Wang, Ruiming Yuan, Wenwen Li*

In this paper, an optimization method considering the effects of temperature is proposed for the consistency of electricity meters.

15:15-15:30 Tea Break



October 26 [Thursday] Oral Session C In Indus Room

13:30-15:15 Failure Physics, Material Science, Data Analysis, and Reliability Testing (IV)

Moderators: Prof. Zhonglai Wang, University of Electronic Science and Technology of China, China

13:30-13:45 **ICMR&QR2MSE2017-0004-0021** Research on The Damage of Fault Injection in Testability Test Based on Back-Driving Technology to Integrated Circuit/ *Chen Chen (China Aero Polytechnology Establishment, China), Cheng-Jun Song, Zhao-Yang Zeng*

In this paper, a test for confirming the impact of back-driving fault injection to integrated circuits is designed and a measurement for the impact of back-driving fault injection quantitatively is presented.

13:45-14:00 **ICMR&QR2MSE2017-0004-0074** Incorporation of Big Data Analytics into Railway Asset Management-A Review/ *Paul McMahon (University of Wollongong, Australia), Tie-Ling Zhang, Richard Dwight, Ming Zuo*

In this paper, an overview of the current challenges facing railway asset management when using big data in the asset life cycle is provided, research challenges in railway asset management via application of Big Data analytics are identified and the future research directions are also discussed.

14:00-14:15 **ICMR&QR2MSE2017-A-0151** Accelerated Degradation Analysis under Different Data Collection Methods/ *Lirong Hu (Chinese Academy of Sciences, China), Qingpei Hu*

In this paper, a linear regression model regarding product's resilience as a change parameter is built up for data collection method, and a linear regression model with measurement error is built up for data collection method.

14:15-14:30 **ICMR&QR2MSE2017-0004-0018** A Method of Determining Test Load for Full-Scale Wind Turbine Blade Fatigue Tests/ *Qiang Ma (Lanzhou University of Technology, China), Zong-Wen An, Jian-Xiong Gao, Hai-Xia Kou, Xue-Zong Bai*

In this paper, a simplified method is proposed to convert load spectrum into test load for blade full-scale fatigue test. The validity and efficiency of the proposed method compared to convention method is verified by an illustrative example and thus this method can be applied to fatigue tests load design.

14:30-14:45 **ICMR&QR2MSE2017-0004-0166** Probabilistic Fatigue Life Prediction for Low-pressure Turbine Blades/ *Jie Zhou (University of Electronic Science and Technology of China, China), Yan-Feng Li, Hong-Zhong Huang, He Li, Junyu Guo*

In this paper, a probabilistic framework for low-pressure turbines to estimate the fatigue life, damage accumulation and reliability is developed.

14:45-15:00 **ICMR&QR2MSE2017-0004-0129** Influence of Recycled Coarse Aggregate Replacement Ratio on Compressive Strength Reliability of Recycled Concrete/ *Ke-Yuan Liu (Inner Mongolia University of Technology, China), Hai-Bin Li, Yu-Feng Yao*

In this paper, probability distribution function fitting method and RBF neural network approximation method are both used to obtain the overall distribution functions, making a comparison for the engineering application of recycled coarse aggregate concrete.

15:00-15:15 **ICMR&QR2MSE2017-0004-0052** Explore One Factor of Affecting Software Reliability Demonstration Testing Result/ *Zhen-Yu Ma (Academy of Armored Force Engineering, China), Wei Wu, Wei Zhang, Fu-Sheng Liu, Jian-Ping Wang*

In this paper, a software reliability demonstration testing scheme based on hybrid Bayesian method is proposed, and the related correlation coefficient conception is introduced.

15:15-15:30 Tea Break



October 26 [Thursday] Oral Session C In Spruce Room

13:30-15:15 Reliability, Maintainability, and Supportability (V)

Moderators: Prof. Huanwei Xu, University of Electronic Science and Technology of China, China

Prof. Liping He, University of Electronic Science and Technology of China, China

13:30-13:45 **ICMR&QR2MSE2017-0005-0081** A New Preventive Maintenance Model with Adjustable Shape Parameter Based-Weibull Distribution/ *Yu Wang (Lanzhou University of Technology, China), Wenke Gao, Lei Zhang, Xinqiang Liu*

In this paper, a new PM model with adjustable shape parameter is proposed based on the Weibull distribution, and parameters estimation methods using MLE algorithm for 2-parameter Weibull model is also given.

13:45-14:00 **ICMR&QR2MSE2017-0005-0051** The Feature Recognition and Selection Method of the Equipment State based on an Improved Mahalanobis-Taguchi system/ *Zhuo Zhang (Northwestern Polytechnical University, China), Ning Wang*

In this paper, considering the influence of irregular distribution of the sample data and abnormal variation of the normal data on accuracy of MTS, a feature recognition and selection model of the equipment state based on the improved MTS is proposed, and two aspects of the model namely construction of the original Mahalanobis space and determination of the threshold are studied.

14:00-14:15 **ICMR&QR2MSE2017-0005-0004** A Partial Component Block Replacement Policy for a Multi-machine System under Finite Planning Horizon/ *R. Jiang (Changsha University of Science and Technology, China)*

In this paper, a partial block replacement policy with opportunity replacement is considered for a certain kind of components of the system, and an approximate method is proposed to determine the policy parameters.



14:15-14:30 **ICMR&QR2MSE2017-0005-0165** Bayesian Degradation Analysis with Gamma Process Mode Considering Individual Differences and Information Fusion/ *Junyu Guo (University of Electronic Science and Technology of China, China), Jie Zhou, He Li, Yan-Feng Li, Hong-Zhong Huang*

In this paper, the inverse Gaussian (IG) process has been introduced for degradation modeling, and the selection and comparison of the IG process model and the gamma process model is of interest.

14:30-14:45 **ICMR&QR2MSE2017-0005-0061** Method for Equipment Support Facility Location According to The Prescription Mission Conditions/ *Xiang Zan (Academy of Armored Force Engineering, China), Shi-Xin Zhang, Chun-Liang Chen, Wei-Long Chen, Tong-Han Wu*

In this paper, for the facility location problem of operations equipment support, a locating decision-making model of operations equipment support is proposed.

14:45-15:00 **ICMR&QR2MSE2017-0005-0064** On-condition Maintenance Decision Study on EMU Bogie/ *Xiao-Jia Liang (Dalian Jiaotong University, China), Yong-Hua Li, Hong-Jie Yu, Yue-Hua Gao*

In this paper, aiming at solving the problems that the current on-condition maintenance (OCM) time is not accurate, Weibull proportional intensity model (WPIM) is introduced.

15:00-15:15 **ICMR&QR2MSE2017-0005-0076** Optimum Consecutive Preventive Maintenance Scheduling Model Considering Reliability/ *Ge-Hui Liu (Beijing Jiaotong University, China), Xiang-Yu Long, Shuo Tong, Rui Zhang, Shao-Kuan Chen*

In this paper, a consecutive preventive maintenance plan model considering imperfect maintenance and reliability constrain is proposed, which is compared with age-based model.

15:15-15:30 Tea Break



October 26 [Thursday] Oral Session C In Banyan Room II

13:30-15:10 Analysis and Design Optimization of Uncertain Structures

Moderators: Prof. Chao Jiang, Hunan University, China

13:30-14:20 Structural Uncertainty Processing Methods in Seismic Vulnerability and Risk Analysis/ *Dagang Lv (Harbin Institute of Technology, China)*

14:20-15:10 New Methods in Reliability Design of Engineering Structures/ *Jitao Yao (Xi'an University of Architecture and Technology, China)*

15:15-15:30 Tea Break



October 26 [Thursday] Oral Session D In Locust Room

15:30-18:00 Reliability Modeling and Risk Analysis (I)

Moderators: Prof. Kai Sun, Xi'an University of Architecture and Technology, China

Prof. Yan-Feng Li, University of Electronic Science and Technology of China, China

15:30-15:45 [ICMR&QR2MSE2017-0007-0159](#) Reliability Analysis of Uncertain System Based on Discrete Time Bayesian Network/ *Yu-Fei Song (University of Electronic Science and Technology of China, China), Jinhua Mi, Yu-Hua Cheng*

In this paper, it focuses on the influence of epistemic uncertainty and CCF on system reliability.

15:45-16:00 [ICMR&QR2MSE2017-0001-0171](#) A Study on The Law of Information Spread Change and Functional Reliability Modeling of Explosive Logic Networks/ *Hua-Ming Qian (University of Electronic Science and Technology of China, China), Jun-Yu Guo, Hong-Zhong Huang*

In this paper, the analysis process on the law of information spread change of the ELN is put forward and the analysis process was applied to the two-inputs-four-outputs and two-inputs-one-output ELN. For the functional reliability of the ELN, this paper analyzed the functional reliability of the two-inputs-four-outputs ELN based on the Bayes estimation.

16:00-16:15 [ICMR&QR2MSE2017-0001-0110](#) Bayesian Analysis of Constant Stress Accelerated Life Testing with Inverse Weibull Distribution under General Progressive Type-II Censoring/ *Wei Cui (Inner Mongolia University of Technology, China), Zai-Zai Yan, Xiu-Yun Peng*

In this paper, a Bayesian analysis of constant stress accelerated life testing with inverse Weibull distribution under general progressive censoring is effectively implemented.

16:15-16:30 [ICMR&QR2MSE2017-0001-0098](#) Estimation of The Inverse Weibull Distribution Based on Adaptive First-failure Progressive Censored Scheme/ *Jun-Mei Jia (Inner Mongolia University of Technology, China), Zai-Zai Yan, Xiu-Yun Peng*

In this paper, a new life test plan called an adaptive first-failure progressive censoring scheme is introduced.

16:30-16:45 [ICMR&QR2MSE2017-0004-0089](#) A Method of Determining Test Load for Full-Scale Wind Turbine Blade Fatigue Tests/ *Hai-Xia Kou (Lanzhou University of Technology, China), Zong-Wen An, Qiang Ma, Xu Guo*

In this paper, the blade stiffness is chosen as the characteristic quantity of the blade performance in the full-scale fatigue testing of blade. Gamma process is used to model the degradation path of the blade stiffness.



16:45-17:00 **ICMR&QR2MSE2017-0004-0019** Probability Model of Residual Strength of Materials under Uncertain Cyclic Load/ *Jian-Xiong Gao (Lanzhou University of Technology, China), Zong-Wen An, Qiang Ma, Shen-Dan Zhao*

In this paper, the relationship between external stress and fatigue life is analyzed to reveal the probability characteristics of residual strength of material under uncertain cyclic load.

17:00-17:15 **ICMR&QR2MSE2017-0004-0084** Study on Reliability Testing of Special Vehicle/ *Qing-Chao Zhang (Inner Mongolia University of Technology, China), Guang-Jun Jiang*

In this paper, the theory of reliability and reliability testing of automobile is introduced and the reliability testing especially the endurance testing of special vehicles are discussed.

17:15-17:30 **ICMR&QR2MSE2017-0004-0170** Design of Reliability Qualification Test Plans Based on Weibull Distribution/ *Peng Huang (University of Electronic Science and Technology of China, China), Hong-Zhong Huang, He Li, Weiwen Peng*

In this paper, the author proposes how to design the fixed duration test plans based on Weibull distribution with known shape parameter, and a numerical example is used to illustrate its application.

17:30-17:45 **ICMR&QR2MSE2017-0002-0115** Design and Analysis of Cantilever Low-Pressure Casting Machine/ *Jian-Fei An (Inner Mongolia University of Technology, China), Jian-Xin Wu, Xiao-Ping Shi*

In this paper, a cantilevered low pressure casting machine is designed, and the production efficiency is significantly improved.

17:45-18:00 **ICMR&QR2MSE2017-0001-0109** Key Components Force and Modal Analysis of Chamfering Machine for Ice Spoon Curved Side-Shaped/ *Qiang Chen (Inner Mongolia University of Technology, China), Zhi-Fa Gao, Jian-Xin Wu, Xiao-Yu Liu*

In this paper, the design and analysis of the key components of chamfering machine for ice spoon curved side-shaped are fulfilled, and the simulation analysis is carried out through adopting ADAMS, accordingly verifying the reliability and rationality of the die movement.

18:00 Banquet

October 26 [Thursday] Oral Session D In Indus Room

15:30-17:10 Special Session on "Korean Programs in Reliability and Structural Integrity II" (X)

Moderators: Prof. Nam-Su Huh, Seoul National University of Science and Technology, Korea

15:30-15:55 **ICMR&QR2MSE2017-A-0078** Analysis of Assembly Force and Separation Force of a Snap-fit / *In-Seo Son (Yeungnam University, Korea), Bruno R. Mose, Dong-Kil Shin*

In this paper, an analysis of the existing snap-fit design equations and the limitations of analytic solutions was assessed and a finite element model of the snap-fit was developed to provide further understanding.

15:55-16:20 **ICMR&QR2MSE2017-A-0139** Residual Stress Analysis and Fatigue Strength Assessment of Multi-Pass Dissimilar Material Welded Joint between Alloy 617 and 12 Cr Steel / *Hafiz Waqar Ahmad (Sungkyunkwan University, Korea), Ju Hwa Lee, Jeong Ho Hwang, Dong Ho Bae*

In this paper, the residual stresses of multi-pass dissimilar material welded joint are investigated both experimentally and by numerical simulation.

16:20-16:45 **ICMR&QR2MSE2017-A-0140** The Study on the Relationship Between Yield Ratio and Degradation Life of Creep Strength Enhancement of Ferritic Steels (CSEFS) / *Dongki Jeon (Chonnam National University, Korea), Insu Jeon*

In this paper, creep enhancement of ferritic steels were investigated for the change of mechanical properties.

16:45-17:10 **ICMR&QR2MSE2017-0001-0108** Reliability Evaluation of a Hybrid DC-DC Converter Based on NHPP Model / *Kang-Hoon Cho (University of Ajou of Korea, Korea), Joong-Soon Jang, Sang-Chul Park*

In this paper, the authors deal with the reliability evaluation procedure of a hybrid DC-DC converter by using a NHPP (Nonhomogeneous poisson process) model.

18:00 Banquet



October 26 [Thursday] Oral Session D In Spruce Room

15:30-18:00 System Analysis, Simulation and Optimization (VII)

Moderators: Prof. Rui Peng, University of Science & Technology Beijing, China

Prof. Hui Xiao, Southwestern University of Finance and Economics, China

15:30-15:45 [ICMR&QR2MSE2017-0007-0007](#) The Complex Network Reliability Analysis Based on Entropy Theory/ *Kai Li (Academy of Armored Force Engineering, China), Wei Wu, Fu-Sheng Liu*

This paper shows that the entropy of the complex network could be used to study the network reliability.

15:45-16:00 [ICMR&QR2MSE2017-0007-0125](#) Optimal Design Studied of an Offshore Backfilling Plough -Fenders on The Related Working Parameters/ *Jianguo Qin (Harbin Engineering University, China), Liqun Wang*

This paper presents a virtual 3-D uniflow fluid-fluid coupling simulation model of an offshore fender in WORKBENCH. The analysis of the fender provides the Eulerian Model.

16:00-16:15 [ICMR&QR2MSE2017-0007-0164](#) Global Optimization of a Heavy-Load Gear Reducer/ *Guo-Zhong Fu (University of Electronic Science and Technology of China, China), Yuan-Jiang Yang, Hong-Zhong Huang*

In this paper, a revised MOO algorithm integrating Crow Search Algorithm (CSA) with preference-inspired co-evolutionary algorithm using weights (PICEA-w), named MOCSA is proposed to address a practical global optimization problem.

16:15-16:30 [ICMR&QR2MSE2017-0007-0034](#) Lubrication Analysis of a High Speed Rotor Bearing for Space Application/ *Shou-Qing Huang (Beijing Institute of Spacecraft Environment Engineering, China) Shou-Wen Liu, Xiao-Kai Huang, Jun-Yang Li, Wen-Gen Liu*

In this paper, effect laws of rotate speed, load, vacuum, high and low temperature and other working and environmental conditions on contact and lubrication properties of microscopic transmission interface of a bearing are analyzed, laying a theoretical basis for application of high speed rotor bearings in a multi-stress space environment.

16:30-16:45 [ICMR&QR2MSE2017-0002-0048](#) Design of Micropipette System with High Precision for Small Enzyme Immunoassay Analyzer/ *Zhi-Wu Shang (Tianjin Polytechnic University, China), Xiang-Ping Zhou, Cheng Li, Xin-Yu Zhou*

In this paper, a small autoinjection system was developed to improve the reliability and accuracy of the automatic enzyme immunoassay analyser's microscale pipetting system.



16:45-17:00 **ICMR&QR2MSE2017-0002-0087** Attitude Control Stability Analysis of the Flexible Spacecraft with Sloshing Fuel/ *Xiaojuan Song (Inner Mongolia University of Technology, China), Shufeng Lu, Wei Han, Ruifeng Meng, Lin Wang*

In this paper, we employ hybrid control method to deal with the stabilization and attitude tracking problems of the liquid-filled flexible spacecraft. The Lagrange's method is used to establish the multi-body system mathematical model.

17:00-17:15 **ICMR&QR2MSE2017-0004-0085** The Reliability Research of Martial Arts Arena Robot System Based on Fuzzy Set Theory/ *Le Gao (Inner Mongolia University of Technology, China), Guang-Jun Jiang*

In this paper, an application of Fuzzy set theory for reliability quantitative analysis in martial arts arena robot system is introduced, the results provide the theoretical basis for the diagnosis and maintenance of the kind of robot system.

17:15-17:30 **ICMR&QR2MSE2017-0004-0090** Model of Mean Circle Tube for State Identification of Wind Turbine Blade/ *Xue-Zong Bai (Lanzhou University of Technology, China), Zong-Wen An, Yun-Feng Hou*

In this paper, the stress and strain are taken as multistate random variables, from the mean value and risk state value of the variables, the mean circle tube is constructed. The mean value of a new state is predicted by local comparison between the comparison fragment and the historical data sample.

17:30-17:45 **ICMR&QR2MSE2017-0003-0126** On the Conditional Inactivity Time of Coherent system / *Jia-Bin Xia (Lanzhou Jiaotong University, China), Zhang-Zheng Cheng, Wen-Jiu Hong*

In this paper, the authors introduce some concepts of partial orderings between random variables which are useful in our derivation

17:45-18:00 **ICMR&QR2MSE2017-0007-0167** A Evaluation Testing Method to Predict Commercial DC/DC Converter Reliability/ *Peng Li (Chinese Academy of Sciences, China), Bing-Xin Yan, Ze-Ming Zhang, Wei Dang, Zhong-Chao Sun*

In this paper, it proposes an evaluation testing method to predict the reliability and verify performance parameter redundancy of ISL8225M series power supply module.

18:00 Banquet



October 26 [Thursday] Oral Session D In Banyan Room II

15:30-17:10 Analysis and Design Optimization of Uncertain Structures

Moderators: Prof. Bing Liu, Tsinghua University, China

15:30-16:20 Convergence Control in Iteration Algorithm of Structural Reliability Analysis and Design Optimization/
Dixiong Yang (Dalian University of Technology, China)

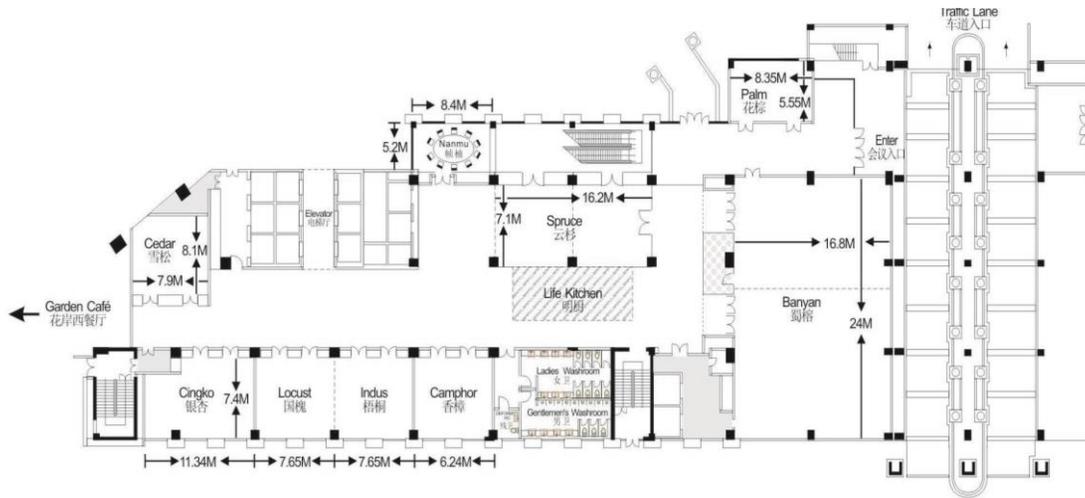
16:20-17:10 System Reliability Estimation Methods Integrating Multi-level and Multi-phase Measured Data/ *Yu Liu*
(University of Electronic Science and Technology of China, China)

18:00 Banquet

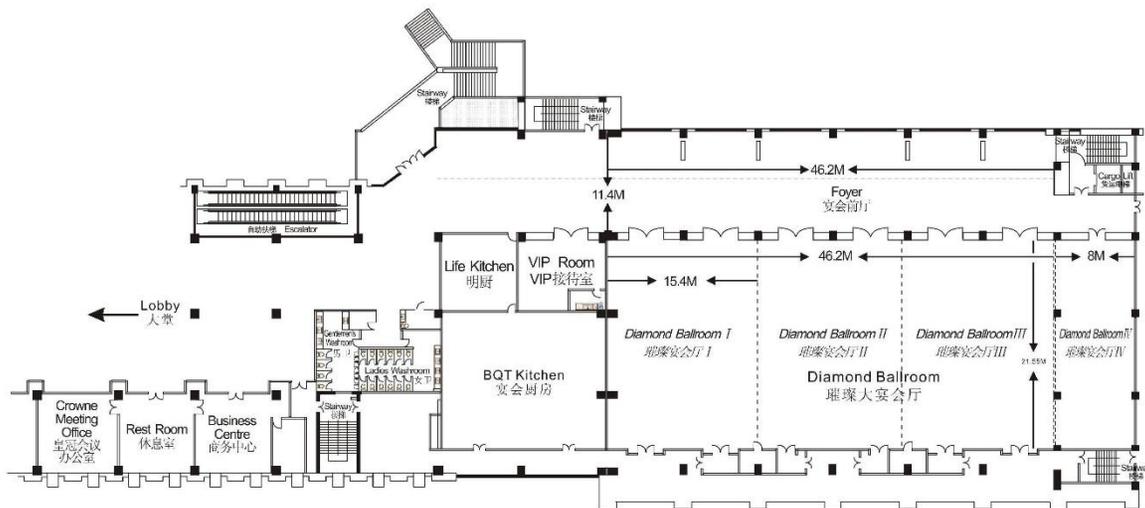
VII. Conference Information

A. Conference Floor

Floor for Oral Sessions



The First Floor of Crowne Plaza Chengdu West



The Second Floor of Crowne Plaza Chengdu West

MAP



B. Registration

Regular	600USD	On or Before October 15, 2017
Student	350USD	
Regular	800USD	After October 15, 2017
Student	550USD	

The regular registration fee includes the participation to all keynote speeches and technical sessions, conference tour, lunches and banquet. For Student registration, both the conference tour and banquet are not included.

C. Transportation

Accesses to Chengdu Shuangliu International Airport

- (1) From Beijing International Airport: Approximately 3 hours
- (2) From Shanghai Pudong International Airport and Shanghai Hongqiao International Airport: Approximately 3 hours 30 minutes
- (3) From Xi'an Xianyang International Airport: Approximately 1 hours 45 minutes
- (4) From Guangzhou Baiyun International Airport: Approximately 2 hours 30 minutes
- (5) From Shenyang Taoxian International Airport: Approximately 4 hours

Access to Crowne Plaza Chengdu West

(1) Access from Chengdu Shuangliu Airport to Crowne Plaza Chengdu West

Taxi	<p>(1) Shuangliu International Airport → Crowne Plaza Chengdu West Time: Approximately 50 minutes Taxi Fare: Around CNY 80</p> <p>(2) Chengdu Railway Station → Crowne Plaza Chengdu West Time: Approximately 40 minutes Taxi Fare: Around CNY 40</p> <p>(3) Chengdu East Railway Station → Crowne Plaza Chengdu West Time: Approximately 55 minutes Taxi Fare: Around CNY 90</p>
-------------	--

Contact information of conference secretariat

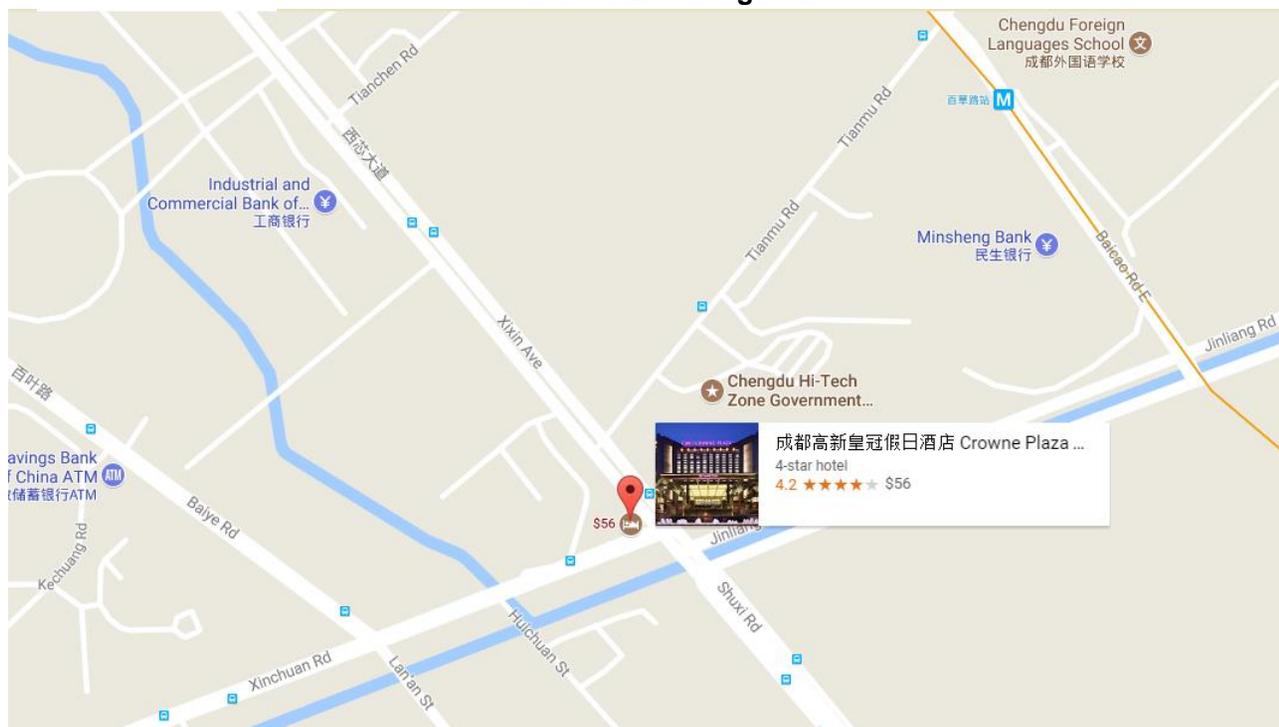
On-site volunteers at Chengdu Shuangliu Airport and Crowne Plaza Chengdu West are as follows.

Name	Cellphone Number
Mr. Junyu Guo	+86-18010649229
Mr. Peng Huang	+86-13086652935
Mr. Kaiyan Zhang	+86-18782464267
Mr. Yifan Li	+86-15882082217
Mr. Jun Liu	+86-18215629735

* Please do contact the conference secretariat if you need any help on transportation.

Conference Venue

Crowne Plaza Chengdu West





D. General Information

About Chengdu City

Chengdu (simplified Chinese: 成都; pinyin: Chéng dū), formerly transliterated as Chengtu, is the capital of Sichuan province, located in southwest China. Chengdu is also one of the most important economic centers, transportation and communication hubs in Western China. According to the 2007 Public Appraisal for Best Chinese Cities for Investment, Chengdu was selected to be one of the top ten cities to invest in amount of 280 urban centers in China.

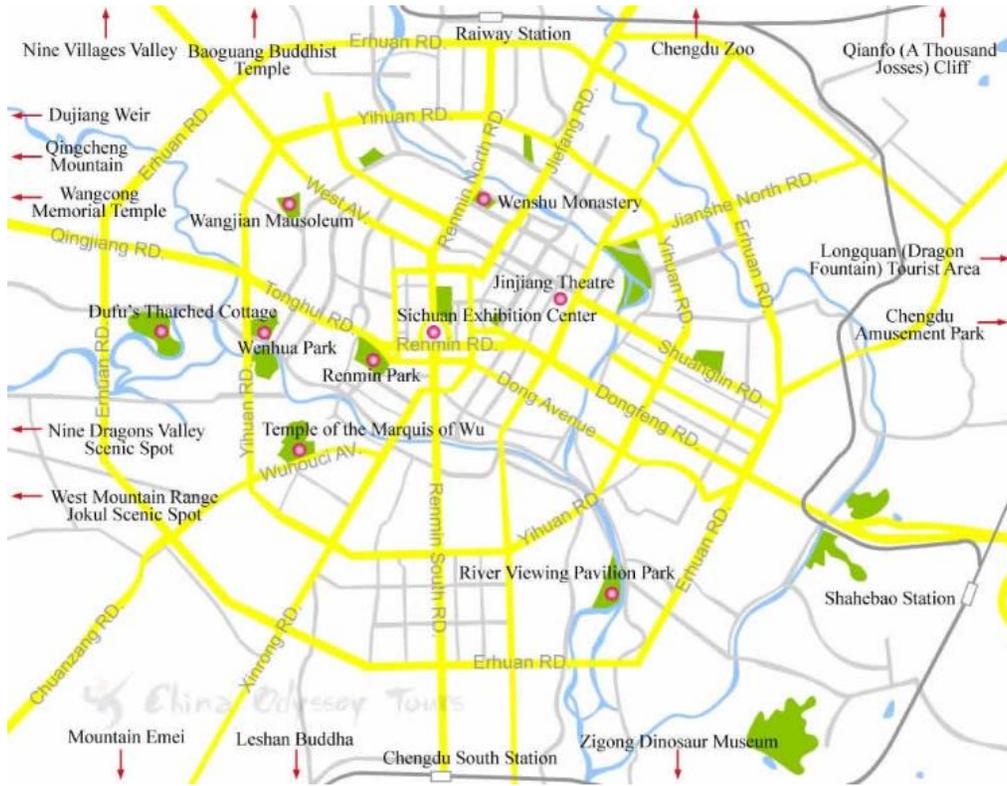
More than four thousand years ago, the prehistorical Bronze Age culture of Jīnshā (金沙) established itself in this region. The fertile Chengdu Plain is known as "天府之国" (Tiān fǔ zhī Guó), which literally means "the country of heaven", or more often seen translated as "the Land of Abundance".

Szechuan cuisine or Sichuan cuisine (Chinese: 四川菜) is a style of Chinese cuisine originating in the Sichuan Province of southwestern China famed for bold flavors, particularly the pungency and spiciness resulting from liberal use of garlic and chili peppers, as well as the unique flavour of the Sichuan peppercorn (花椒). Peanuts, sesame paste and ginger are also prominent ingredients in Szechuan cooking. There are many local variations of Sichuan cuisine within Sichuan Province and the Chongqing Municipality, which was politically part of Sichuan until 1997. The top regional sub-styles are Chongqing style, Chengdu style, Zigong style, and Buddhist vegetarian style. UNESCO has declared the city of Chengdu to be a city of Gastronomy in 2011, mainly because of its Szechuan style of cooking.

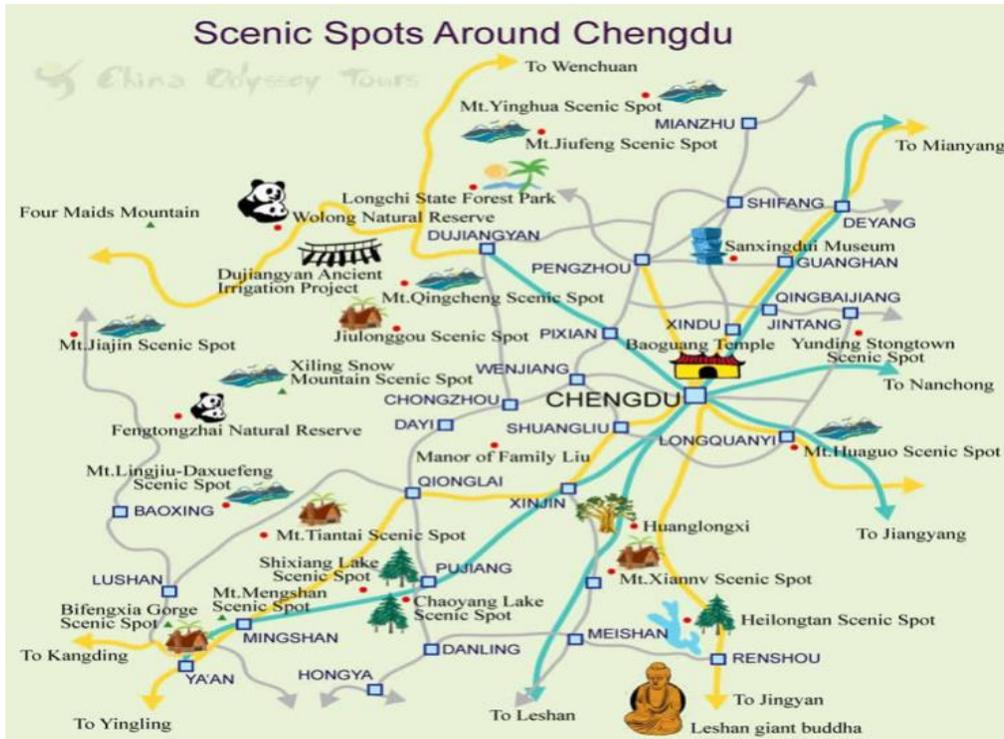
Chengdu is located at the western edge of the Sichuan Basin and sits on the Chengdu Plain; the dominating terrain is plains. The prefecture ranges in latitude from 30° 05' to 31° 26' N, while its longitude ranges from 102° 54' to 104° 53' E, stretching for 192 kilometers from east to west and 166 kilometers south to north, administering 12,390 square kilometers (4,780 sq mi) of land. Neighbouring prefectures are Deyang (NE), Ziyang (SE), Meishan (S), Ya'an (SW), and the Ngawa Tibetan and Qiang Autonomous Prefecture (N). The urban area, with an elevation of 500 meters, features a few rivers, three of them being the Jin, Fu (府河), and Sha Rivers. Outside of the immediate urban area, the topography becomes more complex: to the east lies the Longquan Range (龙泉山脉) and the Penzhong Hills (盆中丘陵); to the west lie the Qionglai Mountains, which rise to 5,364 meters (17,598 ft) in Dayi County. The lowest point in Chengdu Prefecture, at 378 meters, lies in the southeast in Jintang County.



Chengdu City Map



Scenic Spots Around Chengdu



Dujiangyan Dam (都江堰), 45km north of Chengdu, is an ancient technological wonder of the country. More than 2000 years ago, Li Bing (250-200BC), as a local governor of the Shu State, designed this water control and irrigation dam and organized thousands of local people to complete the project to check the Mingjiang River (岷江). For many years, the river flooded the Chengdu agricultural area and local farmers suffered a lot from the water disaster. Due to the success of the project, the dam automatically diverts the Mingjiang River (岷江) and channels it into irrigation canals. For many years, the dam has continued to make the most of the water conservancy works.



Chengdu Giant Panda Breeding Research Base (成都大熊猫基地) was established in 1987, is located in northern suburb of Chengdu axes Hill, 10 km away from the urban area, there is a wide road connecting the city and Base. Now, panda has become one of rare and endangered wild animals.

