# ROBERT E. SKELTON

TEES Distinguished Research Professor

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**EDUCATION**

1963 B.S. Electrical Engineering, Clemson University.

1970 M.S. Electrical Engineering, University of Alabama, Huntsville.

1976 Ph.D. Mechanics and Structures, University of California, Los Angeles.

**ACADEMIC EMPLOYMENT**

1975-78 Assistant Professor, Purdue University, School of Aeronautics and Astronautics

1978-82 Associate Professor, Purdue University, School of Aeronautics and

Astronautics

1982-96 Professor, Purdue University, School of Aeronautics and

Astronautics

1991-96 Director, Structural Systems and Control Laboratory, Institute for

Interdisciplinary Engineering Studies, Purdue University

1996-2009 UCSD Professor, Director Structural Systems and Control

Laboratory

2000-02 UCSD, Director Aerospace Program (interdepartmental program),

2006-09 Daniel L Alspach Professor of Dynamics and Control, UCSD

2009- Professor Emeritus, UCSD

2014 TIAS Faculty Fellow Texas A&M University

2015- TEES Distinguished Research Professor, Texas A&M University

**Industrial Experience**:

1965-75 Sperry Rand Corporation, Huntsville, Alabama. Head of Controls Research and Development Section of Sperry Rand Corporation, Space Support Division; Development of Pointing controller for SKYLAB; Throttle Control Concepts for Space Shuttle Main Engine; Attitude controls for NASA’s High Energy Astronomy Observatory, Large Space Telescope; Control concepts for fluid dynamics in project THERMO.

1963-65 Engineer, Lockheed Missiles and Space Company, Huntsville, Alabama. Developed a new laboratory for research in fluidic devices for flight systems control. Responsible for design and operation of NASA’s air bearing Space Vehicle Attitude Motion Simulator. Developed thrust vector control schemes for large rocket engines.

#### Awards and Honors, Appointments:

2014 TIAS Faculty Fellow, Texas A&M University

2014 Member Thomas Green Clemson Academy of Engineering

2012 Member National Academy of Engineering

2011 Alexander von Humboldt Foundation Research Award

2005 NASA Appreciation Award for service to the Hubble repair missions

2003 Distinguished Engineer Award, University Alabama Huntsville

2000-02 Director Aerospace Program (interdepartmental program), UCSD

2000-02 AIAA Student Chapter Advisor

1999 Distinguished Lecturer Award, University of Maryland

1999 Norman Medal, American Society of Civil Engineers

1997-99 Member, External Independent Readiness Review Committee, Second and Third Servicing Mission for the Hubble Space Telescope

1995 Fellow, Institute of Electrical and Electronic Engineers (IEEE)

1991 Humboldt Senior U.S. Scientist Award, Alexander von Humboldt Foundation

1991 Certificate of Appreciation, NASA Control-Structures Interaction, Guest Investigator Program

1991 Russell Severance Springer Chair, University of California Berkeley

1990 Fellow, American Institute of Aeronautics and Astronautics (AIAA)

1989-94 Vice Chairman of Applications Technical Committee, International Federation of Automatic Control (IFAC)

1986 Japan Society for the Promotion of Science Award,

1984-85 National Research Council ad hoc committee on NASA-Universities Relationships in Aero/Space Engineering

1983-88 Member, National Research Council’s Aeronautics and Space Engineering Board (ASEB)

1983-86 Member Educational Policy Committee, Purdue University

1983-86 Member University Senate, Purdue University

1981 Jane’s Who’s Who in Aviation and Aerospace, U.S. Edition

1974 SKYLAB Achievement Award from James Fletcher, Administrator, NASA

1970 ORBIT Award, Sperry Rand Corp

1963 Walter Merit Riggs Award, Clemson University

1963 Who’s Who Among Students in American Colleges and Universities

1962-63 W.F. Poole Alumni Scholarship, Clemson University

1961-62 Clemson Engineering Foundation Scholarship

1960 Certificate of Appreciation for Excellence in Teaching, United States Marine Corps

**Associate Editorships**

Mathematical Modelling of Systems, published by Swets and Zeitlinger, the Netherlands,

1994- present.

Mathematical Problems in Engineering, published by Gordon and Breach Publishing Group,

U.S.A., 1994- present.

Journal of Systems & Control Engineering 10/98 – present.

Applied Mechanics Reviews 1/01 – present.

Actual Problems of Aviation and Aerospace Systems, Russian-American Scientific Journal,

ISSN 1727-6853, Kazan, Russia

#### Society Memberships:

1995 Fellow, Institute of Electrical and Electronics Engineers

1990 Fellow, American Institute of Aeronautics and Astronautics

1972 Secretary, Huntsville Section, Alabama, Automatic Control Society, IEEE

1969 Chairman, Huntsville Section, Alabama, Automatic Control Society, IEEE

Tau Beta Pi, Phi Kappa Phi, Phi Eta Sigma, Sigma Gamma Tau, Sigma Xi

**RESEARCH**

##### Publications, Refereed Journal Papers:

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| 159 | F. Fraternali, G. Carpentieri, M. Modano, F. Fabbrocino, R.E. Skelton, A tensegrity approach to the optimal reinforcement of masonry domes and vaults through fiber-reinforced composite materials. Composite Structures, 134, 247-254, 2015. |
| 158 | G. Carpentieri, R.E. Skelton, F. Fraternali, A Tensegrity Paradigm for Minimal Mass Design of Roofs and Bridges, Meccanica, In review. |
| 157 | G. Carpentieri, R.E. Skelton, F. Fraternali, A minimal mass deployable structure for solar energy harvesting on water canals. Structural and Multidisciplinary Optimization (ISSN: 1615-147X), In review, 2015 (Manuscript ID: SMO31530236). |
| 156 | Cheong, J., and Skelton, R. “Nonminimal Dynamics of General Class k Tensegrity Systems” Int. Journal of Structural Stability and Dynamics, vol 15, No.2 (2015) 1450042, World Scientific Publishing Co. |
| 155 | Carpentieri, G., Skelton, R., Fraternali, F. “Minimum Mass and Optimal Complexity of Planar Tensegrity Bridges” to appear 2015 Scientific World Journal. Special Issue "Cable Structures: Dynamics, Control, and Monitoring" paper number 857128. |
| 154 | G. Carpentieri, R.E. Skelton, F. Fraternali, Minimum mass and optimal complexity of planar tensegrity bridges. International Journal of Space Structures (ISSN 0266-3511), 30(3-4), 221-244, 2015. |
| 153 | A. Amendola, G. Carpentieri, M. de Oliveira, R.E. Skelton, F. Fraternali, Experimental investigation of the softening–stiffening response of tensegrity prisms under compressive loading, Composite Structures, Volume 117, November 2014, Pages 234-243, ISSN 0263-8223, <http://dx.doi.org/10.1016/j.compstruct.2014.06.022>. |
| 152 | Skelton, R. Fraternali, F, Carpentieri, G., Micheletti, A. “Minimum mass design of tensegrity bridges with parametric architecture and multiscale complexity” Mechanics Research Communications, 59C (2014) 14-25. |
| 151 | Fraternali, F., Carpentieri, G., Amendola, A., Skelton, R., Nesterrnko, V. “Multiscale Tunability of Solitary Wave Dynamics in Tensegrity Metamaterials Applied Physics Letters 105, 201903 (2014) AIP Publishing. |
| 150 | Nagase, K. and Skelton R. “Network and Vector Forms of Tensegrity System Dynamics”, Mechanics Research Communications, 59C (2014) 14-25. |
| 149 | Nagase, K. and Skelton, R. “Double Helix Tensegrity Structures”, AIAA Journal 2014. |
| 148 | Skelton, R. “LMI Techniques in Optimal Control”, Encyclopedia of Systems and Control, edited by John Baillieu and Tariq Samad, Springer, 2014. |
| 147 | Cheong, J., Skelton, R., and Cho, Y. “A Numerical Algorithm for Tensegrity Dynamics with Non-minimal Coordinates”, Mechanics Research Communications 58 (2014) 46-52. |
| 146 | Nagase, K. and Skelton, R. “Minimal Mass Tensegrity Structures”, Journal of the International Association for Shell and Spatial Structures, vol 55 No. 1, March n. 179, 2014. |
| 145 | R.E. Skelton, F. Fraternali, G. Carpentieri, A. Micheletti, “Minimum mass design of tensegrity bridges with parametric architecture and multiscale complexity”, Mechanics Research Communications, Volume 58, June 2014, Pages 124-132, ISSN 0093-6413, http://dx.doi.org/10.1016/j.mechrescom.2013.10.017. |
| 144 | Skelton, R., de Oliveira, M., “Optimal Tensegrity Structures in Bending: The Discrete Michell Truss”, Journal of the Franklin Institute, Vol 347, No 1, pp 257-283, Feb 2010. |
| 143 | Skelton, R., de Oliveira, M., “Optimal Complexity of Deployable Compressive Structures”, Journal of the Franklin Institute, Vol 347, No 1, pp 228-256, Feb 2010. |
| 142 | Wroldsen, A., de Oliveira, M., Skelton, R., “Modeling and Control of Non-minimal Nonlinear Realizations of Tensegrity systems”, International Journal of Control, vol 82, No 3, pp 389-407, 2009. |
| 141 | Faming, L., de Oliveira, M., Skelton, R., “Integrating Information Architecture and Control or Estimation Design”, SICE Journal of Control, Measurement, and System Integration, Vol 1, No.2, pp 120-128, March, 2008. |
| 140 | Vera, C., Skelton, R., Bossens, F., Sung, A., ”3D Nanomechanics of an Erythrocyte Juntional Complex in Equibiaxial and Anisotropic Deformations”, Annals of Biomedical Eng, Vol 33, No. 10, pp 1387-1404, 2005. |
| 139 | de Oliveira, M., Vera, C., Valdez,P., Sharma, Y., Skelton, R., Sung, A., “Network Nano mechanics of the Erythrocyte Membrane Skeleton in Equibiaxial Deformation”, Biophysical Journal, 2009. |
| 138 | de Jager, B., Skelton, R., “Stiffness of Planar Tensegrity Truss Topologies”, International Journal of Solids and Structures, Vol 43 pp 1308-1330, 2006. |
| 137 | Han, J., de Oliveira, M., Skelton, R., “Linearization Algorithm for a Reduced Order H-infinity Control Design of an Active Suspension System”, European Journal of Control Vol 12 pp. 205-219, 2006. |
| 136 | Camino, J., Helton, W., Skelton, R., “Solving Matrix Inequalities Whose Unknowns are Matrices”, SIAM J. Optimization, Vol 17 No 1, pp1-36, 2006. |
| 135 | Masic, M. and Skelton, R. E., “Selection of prestress for optimal dynamic/control performance of tensegrity structures”, *International Journal Of Solids And Structures*, 43:2110–2125, 2006. |
| 134 | Masic, M., Skelton, R., Gill, P., Optimization of Tensegrity structures”, Vol 43, pp 4687-4703, 2006. |
| 133 | Masic, M., Skelton, R., Gill, P., “Algebraic Tensegrity Form-finding”, International Journal of Solids and Structures, vol 43, No 16, pp 4687-4703, Aug 2006. |
| 132 | de Jager, B. and Skelton, R. E., “Input-output selection for planar tensegrity models”, IEEE Transactions On Control Systems Technology, 13:778–785, 2005. |
| 131 | Masic, M. and Skelton, R. E., “Path planning and open-loop shape control of modular tensegrity structures”, Journal Of Guidance Control And Dynamics, 28:421–430, 2005. |
| 130 | de Jager, B., Skelton, R., ”Symbolic Stiffness Optimization of Planar Tensegrity Structures”, J. Intelligent Material systems and Structures, Vol 15, pp 181-193, March 2004. |
| 129 | Camino, J., Helton, W., Skelton, R., Ye, J., “Matrix Inequalities: A Symbolic Procedure to Determine Convexity automatically”, Integral Equations and Operator Theory, Vol 46, pp 399-454, 2003. |
| 128 | Williamson, D., Skelton, R., Han, J., “Equilibrium Conditions of a Tensegrity Structure”, International Journal of Solids and Structures, vol 40 pp 6347-6367, 2003. |
| 127 | Williamson, D. and Skelton, R. E. “General class of tensegrity structures: Topology and prestress equilibrium analysis,” *Journal of Guidance Control and Dynamics*, 26(5):685–694, 2003. |
| 126 | Skelton, R., “Structural Systems: A Marriage of Structural Engineering and System Science.” *Journal of Structural Control,* Vol 9 pp 113-133, 2002. |
| 125 | Lu, J., Skelton, R., “Mean-square Small Gain Theorem for Stochastic Control”, *IEEE Transactions on Automatic Control*, Vol. 47, No 3, March 2002. |
| 124 | Corless, M., Skelton, R., Sultan, C., “Symmetrical Reconfiguration of Tensegrity Structures”, *International Journal of Solids and Structures*, 39 (2002) 2215-2234. |
| 123 | Corless, M., Skelton, R., Sultan, C., “Linear Dynamics of Tensegrity Structures,” *Engineering Structures,* 24 (2002) 671-685. |
| 122 | Skelton, R., Helton, W., Ahdikari, R., Pinaud, J.P., Chan, W. “An Introduction to the Mechanics of Tensegrity Structures”, CRC Publishers, 2001. |
| 121 | Skelton, R., Pinaud, J.P., Mingori, D.L., “Dynamics of the shell class of tensegrity structures”, *Journal of the Franklin Institute, 338(2–3):255–320, 2001* |
| 120 | Zhu, C., Corless, M., Skelton, R., “Some Robustness Properties of linear Systems,” to appear *Mathematical Problems in Engineering Systems*, 2001. |
| 119 | Corless, M., Skelton, R., Sultan, C., “The Prestressability Problem of Tensegrity Structures: Some Analytical Solutions,” *Internal Journal of Solids and Structures,* 38 (2001) 5223-5252. |
| 118 | Lu, J., Skelton, R., “Integrating Closed-Loop Identification and Control Using Control Energy Sensitivity.” *International Journal of Control,* 2001, Vol. 74, No. 14, 1412-1424. |
| 117 | Shi, G., Skelton, R., “Markov Data-Based LQG Control”, *Journal of Dynamic Systems, Measurement & Control*, September 2000, vol 122, pp551-559. |
| 116 | Lu, J., Skelton, R.E., “Integrating Structure and Control Design to Achieve Mixed H₂/H Performance”, International Journal of Control, 2000 **Vo**l. 73, **pp**. 1449-1462. |
| 115 | Lu, J, Skelton, R., “Robust Variance Control for Systems with Finite-to-Noise Uncertainty,” *Automatica*, **No**. 36, **pp**. 511-525, 2000. |
| 114 | Skelton, E., Lu, J., “Integrating Instrumentation and Control Design”, *International Journal of Control*, 1999, **vol**. 72, **No**. 9, **pp**. 799-814. |
| 113 | Shi, G., Skelton, R., Zhu, G., “Closed-Loop Identification and MPC\_Control Design for a Virtual Diesel Engine,” *ASME Journal of Dynamic Systems, Measurement & Control*, March 1999. |
| 112 | Lu, J., Skelton, R.E., “Covariance Control Using Closed-Loop Modelling for Structures”, *Earthquake* *Engineering and Structural Dynamics*, **Vol**. 27, **pp.** 1367-1383, (1998). |
| 111 | Skelton, R.E., Hiramoto, H.D, “Active Control of Cantilevered Pipes Conveying Fluid with Constraints on Input Energy”, *Journal of Fluids and Structures,* (1998) **Vol.** 12, **pp**. 615-628. |
| 110 | Shi, G., Skelton, R., “Infinite Horizon Constrained Model Predictive Control for Stable ARX Models,” to appear, *Automatica*. |
| 109 | Geromel, J., de Souza, C., Skelton, R., “Static Output Feedback Controllers: Stability & Convexity,” *IEEE Transactions of Automatic Control,* Vol. 43, # 1, January 1998, pp. 120-125. |
| 108 | Housner, G.W., Bergman, L.A., Caughey, T.K., Chassiakos, A.G, Claus,R.O., Masri, S.F., Skelton, R.E., Soong, T.T., Spencer, B.F., & Yao, J.T.P., “Structural Control: Past Present and Future”, Journal of Engineering Mechanics, **Vol**. 123, **No.**9. |
| 107 | Lu, J., Skelton, R., “Covariance Control Using Closed-Loop Modeling for Structures,” *Earthquake Engineering and Struc. Dynamics*, November 1997, Vol. 26. |
| 106 | Lu, J., R.E. Skelton, “Optimal Hybrid Control for Structures,” *Computer-Aided Civil and Infrastructure Engineering* 13, 1998, pp405-414. |
| 105 | Lu, J., Skelton, R., “Iterative Identification and Control Design Using Finite-Signal-to-Noise Models.” *Mathematical Modelling of Systems* 1997, Vol 3. No 1, pp. 102-135. |
| 104 | Lu, J., Skelton, R., “Mean-Square Small Gain Theorem for Stochastic Control: Discrete-Time Case,” *IEEE*, June 1997. |
| 103 | Grigoriadis, K.M., R.E. Skelton, “Minimum-energy covariance Controllers,” *Automatica*, vol. 33, no.4, pp.569-78, April 1997. |
| 102 | Skelton, R.E., J. Lu, “Iterative identification and control design using finite-signal-to-noise models,” *Mathematical Modelling of Systems*, vol.3, no.1, pp.102-35, Jan. 1997 |
| 101 | Zhu, G., M.A. Rotea, R. Skelton “A convergent algorithm for the output covariance constraint control problem,” *SIAM Journal on Control and Optimization*, vol. 35, no.1, pp.341-61, Jan. 1997. |
| 100 | Grigoriadis, K.M., G. Zhu, R.E. Skelton, “Optimal redesign of linear Systems,” *Journal of Dynamic Systems, Measurement and Control*, vol.118, no.3, pp.598-605, Sept. 1996. |
| 99 | Grigoriadis, K.M., R.E. Skelton, “Low-order control design for LMI problems using alternating projection methods,” *Automatica*, vol.32, no.8, pp.1117-25, Aug. 1996. |
| 98 | Skelton, R.E., G. Shi, “Iterative identification and control using a weighted q-Markov COVER with measurement noise,” *Signal Processing*, vol.52, no.2, pp.217-34, July 1996. |
| 97 | Iwasaki, T. Skelton, R., Corless, M., “A Recursive Construction Algorithm for Covariance Control”, *IEEE Transaction on Automatic Control,* March 1996. |
| 96 | Grigoriadis, K.M., R.E. Skelton, “Alternating convex projection methods for discrete-time covariance control design*,*” *Journal of Optimization Theory and Applications*, vol.88, no.2, pp.399-432, Feb. 1996. |
| 95 | Zhu, G. G., R. E. Skelton, “L2 to L∞ Gains for Sampled-data Systems,” *Int'l. Journal of Control*, Vol. 61, No. 1, pp. 19-32, 1995. |
| 94 | Skelton, R. E., T. Iwasaki, “Increased Roles of Linear Algebra in Control Education,” *IEEE Control Systems Magazine*, Vol. 15, No. 4, pp. 76-90, Aug. 1995. |
| 93 | Iwasaki, T., R. E. Skelton, “All Fixed-Order H∞ Controllers: Observer-Based Structure and Covariance Bounds,” *IEEE Transactions on Automatic Control*, Vol. 40, No. 3, IETAA9, pp. 512-516, Mar. 1995. |
| 92 | Iwasaki, T., R. E. Skelton, “A Unified Approach to Fixed-Order Controller Design via Linear Matrix Inequalities,” *Mathematical Problems in Engineering*, Vol. 1, No. 1, pp. 59-75, 1995. |
| 91 | Iwasaki, T., R. E. Skelton, “The XY-centring Algorithm for the Dual LMI Problem: A New Approach to Fixed-order Control Design,” *Int'l. Journal of Control*, Vol. 62, No. 6, pp. 1257-1272, 1995. |
| 90 | Zhu, G., R. E. Skelton, Pingkang Li, “Q-Markov Cover Identification Using Pseudo-Random Binary Signals,” *International Journal of Control*, Vol. 62, No. 6, pp. 1273-1290, 1995. |
| 89 | Zhu, G., K.M. Grigoriadis, R. E. Skelton, “Covariance Control Design for the Hubble Space Telescope,” *AIAA Journal of Guidance, Control, & Dynamics*, Vol. 18, No. 2, pp. 230-236, May 1995. |
| 88 | Iwasaki, T., R. E. Skelton, “Parametrization of All Stabilizing Controllers via Quadratic Lyapunov Functions,” *Journal on Optimization Theory and Applications*, Vol. 85, No. 2, May 1995. |
| 87 | Grigoriadis, K. M., R. E. Skelton, “Alternating Convex Projection Methods for Covariance Control Design,” *International Journal of Control*, Vol. 60, No. 6, pp. 1083-1106, 1994. |
| 86 | Iwasaki, T., R. E. Skelton, J. C. Geromel, “Linear Quadratic Suboptimal Control with Static Output Feedback,” *Systems and Control Letters*, Vol. 23, pp. 421-430, 1994. |
| 85 | Skelton, R. E., J. H. Xu, K. Yasuda, “Minimal Energy Covariance Control,” *International Journal of Control*, Vol. 59, No. 6, pp. 1567-1578, July 1994. |
| 84 | Grigoriadis, K. M., A. E. Frazho, R. E. Skelton, “Application for Computation of Positive Toeplitz Matrices,” *IEEE Transactions on Signal Processing*, Vol. 42, July 1994. |
| 83 | Stoustrup, J., R. Skelton, T. Iwasaki, “The H∞ Control Problem Using Static Output Feedback,” *Int'l. Journal of Robust and Nonlinear Control*, Special Issue on H∞ Vol. 4, No. 4, pp. 449-456, July 1994. |
| 82 | Iwasaki, T., R.E. Skelton, “All Controllers for the General H∞ Control Problem: LMI Existence Conditions and State Space Formulas,” *Automatica*, Vol. 30, No. 8, Aug. 1994. |
| 81 | Zhu, G., R. E. Skelton, “Integrated Modeling and Control for the Large Spacecraft Control Laboratory Experiment Facility,” *J. of Guidance Control and Dynamics*, Vol. 17, No. 3, pp. 442-450, May-June 1994. |
| 80 | Yaz, E., R.E. Skelton, “Parametrization of All Linear Compensators for Discrete-Time Stochastic Parameter Systems,” *Automatica*, Vol. 30, No. 6, pp. 945-955, June 1994. |
| 79 | Liu, K., R.E. Skelton, J.P. Sharkey, “Modeling Hubble Space Telescope Flight Data by Q-Markov Cover Ident.,” *J. of Guidance, Control & Dynamics*, Vol. 17, No. 2, pp. 250-256, Mar.-Apr. 1994. |
| 78 | Yasuda, K., R.E. Skelton, K.M. Grigoriadis, “Covariance Controllers: A New Parametrization of the Class of All Stabilizing Controllers,” *Automatica*, Vol. 29, No. 3, pp. 785-788, 1993. |
| 78 | Iwasaki, T., R.E. Skelton, “n the Observer-based Structure of Covariance Controllers,” *Systems and Control Letters*, Vol. 22, pp. 17-25, 1994. |
| 77 | Liu, K., R. E. Skelton, “Q-Markov Covariance Equivalent Realization and its Application to Flexible Structure Ident.,” *Journal of Guidance, Control, & Dynamics*, Vol. 16, No. 2, Mar.-Apr. 1993. |
| 76 | Zhu, G., R.E. Skelton, “MIMO L2/L∞ Constraints in Large Flexible Structure Control -- An Experiment on the JPL LSCL Facility,” *Journal of Society of Instrument and Control Engineers*, Vol. 32, No. 4, pp. 284-289, 1993. |
| 75 | Skelton, R.E., T. Iwasaki, "Liapunov and Covariance Controllers,” *International Journal Control*, Vol. 57, No. 3, pp. 519-536, 1993. |
| 74 | Skelton, R.E., “The Routh Test and Covariance Control,” *C-TAT*, Vol. 9, No. 3, pp. 691-720, 1993. |
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| 72 | Zhu, G., R. Skelton, “A Two-Riccati, Feasible Algorithm for Guaranteeing Output L∞ Constraints,” Journal of Dynamic Systems, Measurement and Control, Vol. 114, No. 3, pp. 329-338, 1992. |
| 71 | Zhu, G., R. Skelton, “Robust Properties of Periodic Discrete and Multirate Systems,” *IEEE Transactions on Automatic Control,* Vol. 37, No. 3, pp. 610-615, 1992. |
| 70 | Liu, K., R. Skelton, K. Grigoriadis, “Optimal Controllers for Finite Wordlength Implementation,” *IEEE Transactions on Automatic Control,* Vol. 37, No. 9, pp. 1294-1304, 1992. |
| 69 | Zhu, G., R. Skelton, “Robust Discrete Controllers Guaranteeing l2 and l∞ Performances,” *IEEE Transactions on Automatic Control,* Vol. 37, No. 10, pp. 1620-1625, 1992. |
| 68 | Xu, J., R. Skelton, “An Improved Covariance Assignment Theory for Discrete Systems,” *IEEE Transactions on Automatic Control,* Vol. 37, No. 10, pp. 1588-1591, 1992. |
| 67 | Skelton, R. E., G. Zhu, “Optimal L∞ Bounds for Disturbance Robustness,” *IEEE Transactions on Automatic Control,* Vol. 37, No. 10, pp. 1568-1572, 1992. |
| 66 | Skelton, R., B. Hanks, M. Smith, “Structure Redesign for Improved Dynamic Response,” *Journal Guidance Control Dynamics,* Vol. 15, No. 5, pp. 1272-1278, 1992. |
| 65 | Liu, K., R. Skelton, “The Q-Markov Cover and its Application to Flexible Structure Identification,” *Journal Guidance Control Dynamics,* Vol. 57, No. 2, 1992. |
| 64 | Smith, M., K. Grigoriadis, R. Skelton, “Optimal Mix of Passive and Active Control in Structures,” *Journal of Guidance, Control and Dynamics,* Vol. 15, No. 4, pp. 912-919, July-Aug. 1992. |
| 63 | Hsieh, C., J. Kim, K. Liu, G. Zhu, R. Skelton, “Control of Large Flexible Structures -- An Experiment on the NASA Mini-Mast Facility,” *IEEE Control Magazine*, Vol. 8, pp. 13-21, Oct. 1991. |
| 62 | Skelton, R., J. Xu, K. Yasuda, “On the Freedom in Covariance Control,” *Int'l. Journal Control,* 1991. |
| 61 | Zhu, G., R. E. Skelton, “Mixed L2 and L2 Problems by Weight Selection in Quadratic Optimal Control,” *International Journal Control,* Vol. 63, No. 5, pp. 1161-1176, 1991. |
| 60 | Yasuda, K., R. Skelton, “Assigning Controllability and Observability Gramians in Feedback Control,” *Journal Guidance Control Dynamics,* Vol. 14, No. 5, pp. 878-885, Sept.-Oct. 1991. |
| 59 | Williamson, D., R.E. Skelton, G. Zhu, Moment Matching Model Reduction for Multirate Linear Systems,” *International Journal Control,* Vol. 52, No. 6, pp. 1279-1294, 1990. |
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| 57 | Xu, J., R.E, Skelton, G. Zhu, “Upper and Lower Covariance Bounds for Perturbed Linear Systems,” *IEEE Transactions on Automatic Control*, Vol. 35, No. 8, Aug. 1990, pp. 944-948. |
| 56 | Damra, F.M., R.E. Skelton, J. Xu, “Optimal Covariance Control,” *Optimal Control Application and Methods*, 1990. |
| 55 | Hsieh, C., R.E. Skelton, “All Covariance Controllers for Linear Discrete Time Systems,” *IEEE Transactions on Automatic Control*, Vol. 35, No. 8, Aug. 1990. |
| 54 | Okada, K., R.E. Skelton, “Sensitivity Controller for Uncertain Systems,” *AIAA J. Guidance*, *Control and Dynamics*, Vol. 13, No. 2, Mar. 1990. |
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| 52 | Hsieh, C., R. Skelton, F. Damra, “Minimum Energy Controllers with Inequality Constraints on Output Variances,” *Optimal Control Application and Methods*, Vol. 10, No. 4, pp. 347-366, 1989. |
| 51 | Skelton, R.E., Dong Da, “Component Model Reduction in Canonical Correlation Coordinates,” *Computational Mechanics*, 1989. |
| 50 | Williamson, D., R.E. Skelton, “Optimal Q-Markov Cover for Finite Wordlength Implementation,” *Math. Systems Theory*, Vol. 22, No. 4, pp. 255-273, 1989. |
| 49 | Norris, G., R.E. Skelton, “Selection of Dynamic Sensors and Actuators in the Control of Linear Systems,” *ASME Journal Dynamic Systems, Meas. & Control*, Vol. 111, pp. 389-397, Sept. 1989. |
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| 47 | Skelton, R.E., M. Ikeda, “Covariance Controllers for Linear Continuous-Time Systems*,” International Journal Control*, Vol. 49, No. 5, pp. 1773-1785, 1989. |
| 46 | Skelton, R.E., “Model Error Concepts in Control Design,” *International Journal Control*, Vol. 49, No. 5, pp. 1725-1753, 1989. |
| 45 | Hu, A., R.E. Skelton, “Convergence Properties of Modal Costs for Certain Distributed Parameter Systems,” *Journal Vibration, Acoustics, Stress & Reliability in Design* (ASME), Vol. 111, pp. 272-277, July 1989. |
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| 183 | Zhu, G., R.E. Skelton and Pingkang Li, “Q-Markov Cover Identification Using Pseudo Random Binary Signals,” Proceedings of the 1994 American Control Conference, Baltimore, MD, June 1994. |
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| 184 | Iwasaki, T. and R.E. Skelton, “A Unified Approach to Fixed-Order Controller Design via Linear Matrix Inequalities,” Proceedings of the 1994 American Control Conference, Baltimore, MD, June 1994. |
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| 185 | Zhu, G., K.M. Grigoriadis and R.E. Skelton, “Optimal Finite Wordlength Digital Control with Skewed Sampling,” Proceedings of the 1994 American Control Conference, Baltimore, MD, June 1994. |
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| 186 | Skelton, R.E., “Increased Roles of Linear Algebra in Control Education,” Proceedings of the 1994 American Control Conference, Baltimore, MD, June 1994. |
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| 188 | Geromel, J., C.C. de Souza and R.E. Skelton, “LMI Numerical Solution for Output Feedback Stabilization,” Proceedings of the 1994 American Control Conference, Baltimore, MD, June 1994. |
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| 20 | Singh, R. and Skelton, R.E., “Large Scale Telescope Attitude Control Study Part I: Momentum Exchange Controller,” Sperry Rand Corporation, Huntsville, AL, SP-250-0746, Feb. 1, 1973. |
| 19 | Skelton, R.E., “Controllability of Momentum Exchange Controllers,” Sperry Rand Corporation, Huntsville, AL, SP-250-0720, Aug. 31, 1972. |
| 18 | Skelton, R.E., Templeton, J., and Bapna, B., “A Simulation Program for the Near-Optimal Control of Partially Controllable Linear Systems,” Vol. I, Vol. II, Vol. III, Sperry Rand Corporation, Huntsville, AL, SP-252-0718, Aug. 31, 1972. |
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| 16 | Willyard, C. and Skelton, R.E., “Space Shuttle Main Engine Mathematical Model and a Throttlable Rocket Engine Optimal Controller Design Philosophy,” Sperry Rand Corporation, Huntsville, AL, SP-250-0557, Oct. 28, 1971. |
| 15 | Hendley, A.C. and Skelton, R.E., “A Four CMG Optimal Controller for Space Station,” Sperry Rand Corporation, Huntsville, AL, SP-250-0547, Sept. 30, 1971. |
| 14 | Skelton, R.E. and Hendley, A.C., “A Three CMG Optimal Control Study for Space Station,” Sperry Rand Corporation, Huntsville, AL, SP-250-6200-0015, Aug. 31, 1971. |
| 13 | Skelton, R.E., “Linearized Mathematical Models of the Aerodynamic and Gravity Gradient Torques Acting on Orbiting Vehicles,” Sperry Rand Corporation, Huntsville, AL, SP-250-0534, Aug. 25, 1971. |
| 12 | Skelton, R.E., “A Line of Sight Roll Mode for the SKYLAB Experiment Pointing Control System,” Sperry Rand Corporation, Huntsville, AL, SP-225-0503, June 24, 1971. |
| 11 | Skelton, R.E., “On the Control of Spinning Vehicles with CMG’s and the Estimation of Principal Axis Locations,” Sperry Rand Corporation, Huntsville, AL, SP-250-0603, Jan. 31, 1972. |
| 10 | Skelton, R.E., “Controllability of HEAO Scan Mode,” Sperry Rand Corporation, Huntsville, AL, SP-230-0512, Nov. 10, 1970. |
| 9 | Skelton, R.E., “A Method of Determining SKYLAB Vehicle Attitudes to Minimize Momentum Accumulation in the Presence of Uncertain Venting Disturbances,” Sperry Rand Corporation, Huntsville, AL, SP-230-0415, Oct. 5, 1970. |
| 8 | Skelton, R.E., “On the Optimal Control of Control Moment Gyro Systems,” Sperry Rand Corporation, Huntsville, AL, SP-230-0269, Sept. 8, 1970. |
| 7 | Skelton, R.E., “Optimal Momentum Management in Momentum Exchange Controls Systems for Orbiting Vehicles,” Sperry Rand Corporation, Huntsville, AL, SP-231-0176, Feb. 4, 1969. |
| 6 | Skelton, R.E. and Kimery, R., “An ATM Experiment Pointing Control System Design Without Rate Gyros,” Sperry Rand Corporation, Huntsville, AL, SP-213-0121, Sept. 9, 1968. |
| 5 | Skelton, R.E., “Rigid Two-Body Math Models for ATM,” Sperry Rand Corporation, Huntsville, AL, SP-522-0048, Apr. 26, 1968. |
| 4 | Skelton, R.E., “Experiment Pointing Control Studies for ATM,” Sperry Rand Corporation, Huntsville, AL, SP-522-0003, Oct. 20, 1967. |
| 3 | Skelton, R.E., “Control Concepts for Project THERMO,” Sperry Rand Corporation, Huntsville, AL, 517-66-13, Dec. 21, 1966. |
| 2 | Skelton, R.E., “Coordinate Transformations for an Attitude Motion Simulator,” Lockheed Missiles and Space Company, Huntsville, AL, LMSC A711010, TM-54/60-1, Aug. 20, 1965. |
| 1 | Skelton, R.E., “Gaseous Blowdown as an S-IVB Retro System,” Lockheed Missiles and Space Company, Huntsville, AL, LMSC A033117, TM-54/01-28, Oct. 28, 1963. |
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## Invited Seminars, Colloquia:

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| Col1 “Accommodating Modal Uncertainty in the Control of Spacecraft,” UCLA Mechanics and Structures Department, June 1976. |
|  |
| Col2 “Model Reduction & Controller Design,” NASA Langley Large Space Systems Tech. Workshop June, 1979. |
|  |
| Col3 “Model Reduction for Flexible Spacecraft by Modal Cost Analysis,” University of Toronto, Institute of Aerospace Studies, Dec. 17, 1979. |
|  |
| Col4 “Model and Controller Reduction in Large Scale Systems Using Component Cost Analysis,” Renssalaer Polytechnic Institute, Electrical Engineering Department Jan. 24, 1980. |
|  |
| Col5 “Model Reduction,” Stanford University, Department of Aeronautics and Astronautics, Nov. 12, 1980. |
|  |
| Col6 “Component Cost Analysis of Linear Systems,” Michigan State University, Feb. 26, 1981. |
|  |
| Col7 “Control Design of Flexible Spacecraft,” University of Michigan, Nov. 12, 1981. |
|  |
| Col8 “Structural Perturbations of Dynamic Systems Via Cost-Decomposition Methods,” Illinois Institute of Technology, Chicago, IL, Feb. 4, 1982. |
|  |
| Col9 “Control of Flexible Vehicles,” Univ. of Stuttgart, MECHANIC SEMINAR, Stuttgart, Germany, June 1, 1982. |
|  |
| Col0 “Towards a Unification of the Modeling and Control Problems,” Lawrence Livermore Lab, University California, Sept. 28, 1984. |
|  |
| Col1 "Dynamics and Control of Flexible Structures," Stevens Institute of Tech., Hoboken, NJ, Nov. 5, 1984. |
|  |
| Col12 “Modeling and Control Strategies for Flexible Space Structures,” Massachusetts Institute of Technology, Department of Aerospace Engineering, Nov. 6, 1984. |
|  |
| Col13 “Modeling and Control of Flexible Spacecraft,” NASA Langley Research Center, Nov. 30, 1984. |
|  |
| Col14 “Q-Cover Concepts in Control System Design,” Aerospace Corporation, Los Angeles, Jan. 9, 1985. |
|  |
| Col15 “A Perspective on Controller Reduction,” The Australian Nat'l. Univ., Canberra, Jan. 31, Feb. 7, 1985. |
|  |
| Col16 “Covariance Equivalent Model Reduction,” Univ. of Newcastle, Newcastle, Australia, Feb. 14, 1985. |
|  |
| Col17 “Covariance Equivalent Realizations for Discrete-Time Systems,” The Australian National University, Canberra, Mar. 4, 1985. |
|  |
| Col18 “Model Reduction to Preserve Covariances,” The Australian National Univ., Canberra, Mar. 18, 1985. |
|  |
| Col19 “On the Structure of Modeling Errors,” The Australian National University, Canberra, Mar. 26, 1985. |
|  |
| Col20 “Introduction to Covariance Control,” The Australian National University, Canberra, May 7, 1985. |
|  |
| Col21 “Recent Developments in Model Reduction,” Univ. of Strathclyde, Glasgow, Scotland, June 5, 1985. |
|  |
| Col22 “Dynamics and Control of Flexible Structures,” University of Washington, Seattle, July 2, 1985. |
|  |
| Col23 “Covariance Approximation and Control,” University of Illinois, EE Department, Oct. 7, 1985. |
|  |
| Col24 “Model Reduction of Linear Systems,” University of Toledo, Toledo, Ohio, Oct. 14, 1985. |
|  |
| Col25 “An Introduction to Covariance Control Theory,” Univ. of Michigan, Ann Arbor, MI, Oct. 15, 1985. |
|  |
| Col26 “Multi-objective Control of Large Space Structures,” Kobe University, Koe, Japan, Mar. 13, 1986. |
|  |
| Col27 “Sensor/Actuator Selection in Large Space Structures,” Kyoto University, Kyoto, Japan, Mar. 15, 1986. |
|  |
| Col28 “Covariance Control of Large Space Structures,” Nagoya University, Nagoya, Japan, Mar. 18, 1986. |
|  |
| Col29 “Dynamics and Control of Flexible Structures,” National Aerospace Laboratory, Mar. 19, 1986. |
|  |
| Col30 “Modeling and Control of Flexible Spacecraft,” Univ. of Osaka Prefecture, Japan, Mar. 24, 1986. |
|  |
| Col31 “Model Reduction and the Q-Markov Cover Method,” Osaka University, Osaka, Japan, Mar. 28, 1986. |
|  |
| Col32 “On the Control of Flexible Structures,” University of Illinois, Urbana, IL, Apr. 28, 1986. |
|  |
| Col33 “Control of Flexible Structures,” Georgia Institute of Technology, Atlanta, GA, Feb. 16, 1987. |
|  |
| Col34 “Model Reductions by Projections: Preserving 4 Properties of a Higher Order System,” Australian National University, Canberra, Aug. 6, 1987. |
|  |
| Col35 “Controller Reduction Combining Canonical Correlation Analysis and Q-Markov COVERS,” Australian National University, Canberra, Aug. 11, 1987. |
|  |
| Col36 “Linear Discrete-Time Systems: Realizations from Input-Output Data,” Australian National University, Canberra, Aug. 13, 1987. |
|  |
| Col37 “A Generalized Approach to Q-Markov COVERS for Discrete Systems,” Australian National University, Canberra, Aug. 20, 1987. |
|  |
| Col38 “Dynamics and Control of Flexible Structures,” Arizona State University, Tempe, AZ, Nov. 3, 1987. |
|  |
| Col39 “Model Reductions Using a Projection Formulation,” Univ. of Michigan, Ann Arbor, Apr. 12, 1988. |
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| Col40 “Covariance Control of Flexible Structures,” UC Irvine, Irvine, CA, Jan. 30, 1989. |
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| Col41 “Dynamics and Control of Flexible Structures,” University of California at Irvine, Jan. 30, 1989. |
|  |
| Col42 “Covariance Controllers for Flexible Structures,” Ohio State University, May 5, 1989. |
|  |
| Col43 “Multiobjective and Covariance Control,” Johns Hopkins University, Oct. 19, 1989. |
|  |
| Col44 “Lyapunov and Covariance Controllers,” Oct. 7-Nov. 1, 1991, Springer Professor Lectures, UC Berkeley. |
|  |
| Col45 “Covariance Control,” DLR, 1992, Oberpfaffenhofen, Germany. |
|  |
| Col46 “Integrated Modeling and Control for Flexible Structures,” DLR, 1992, Oberpfaffenhofen, Germany. |
|  |
| Col47 “Covariance Control and the Routh Test,” EE Department, Zurich, Switzerland, 1992. |
|  |
| Col48 “Integrated Modeling and Control for Flexible Structures,” ME Department, Zurich, Switzerland, 1992. |
|  |
| Col49 “Covariance Control,” University Copenhagen, Denmark, 1992. |
|  |
| Col50 “A Finite Step Algorithm for Covariance Control,” Eindhoven University, Netherlands. |
|  |
| Col51 “Linear Controllers with Output Feedback (LMI Approaches),” Nov. 23, 1993, Universidade Estadual de Campinas, Brazil. |
|  |
| Col52 “Low-Order Control Design for LMI Problems Using Alternating Projection Methods,” Nov. 26, 1993, Universidade Estadual de Campinas, Brazil. |
|  |
| Col53 “An Integrated Approach to Combine Plant and Controller Design,” Feb. 11, 1994, University of Michigan. |
|  |
| Col54 “Equivalent Models and Equivalent Control Problems,” Oct. 19, 1995, Invited Lecture, University of Notre Dame, Notre Dame IN. |
|  |
| Col55 “Robust Control for Electro-Mechanical Systems,” April 4, 1996, Invited Lecture, University of California, San Diego, CA. |
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| Col56 “Robust Control for Electro-Mechanical Systems,” April 24, 1996, University of Illinois, Champaign-Urbana, IL. |

1. Col1 “Accommodating Modal Uncertainty in the Control of Spacecraft,” UCLA Mechanics and Structures Department, June 1976.
2. Col2 “Model Reduction & Controller Design,” NASA Langley Large Space Systems Tech. Workshop June, 1979.
3. Col3 “Model Reduction for Flexible Spacecraft by Modal Cost Analysis,” University of Toronto, Institute of Aerospace Studies, Dec. 17, 1979.
4. Col4 “Model and Controller Reduction in Large Scale Systems Using Component Cost Analysis,” Renssalaer Polytechnic Institute, Electrical Engineering Department Jan. 24, 1980.
5. Col5 “Model Reduction,” Stanford University, Department of Aeronautics and Astronautics, Nov. 12, 1980.
6. Col6 “Component Cost Analysis of Linear Systems,” Michigan State University, Feb. 26, 1981.
7. Col7 “Control Design of Flexible Spacecraft,” University of Michigan, Nov. 12, 1981.
8. Col8 “Structural Perturbations of Dynamic Systems Via Cost-Decomposition Methods,” Illinois Institute of Technology, Chicago, IL, Feb. 4, 1982.
9. Col9 “Control of Flexible Vehicles,” Univ. of Stuttgart, MECHANIC SEMINAR, Stuttgart, Germany, June 1, 1982.
10. Col0 “Towards a Unification of the Modeling and Control Problems,” Lawrence Livermore Lab, University California, Sept. 28, 1984.
11. Col1 "Dynamics and Control of Flexible Structures," Stevens Institute of Tech., Hoboken, NJ, Nov. 5, 1984.
12. Col12 “Modeling and Control Strategies for Flexible Space Structures,” Massachusetts Institute of Technology, Department of Aerospace Engineering, Nov. 6, 1984.
13. Col13 “Modeling and Control of Flexible Spacecraft,” NASA Langley Research Center, Nov. 30, 1984.
14. Col14 “Q-Cover Concepts in Control System Design,” Aerospace Corporation, Los Angeles, Jan. 9, 1985.
15. Col15 “A Perspective on Controller Reduction,” The Australian Nat'l. Univ., Canberra, Jan. 31, Feb. 7, 1985.
16. Col16 “Covariance Equivalent Model Reduction,” Univ. of Newcastle, Newcastle, Australia, Feb. 14, 1985.
17. Col17 “Covariance Equivalent Realizations for Discrete-Time Systems,” The Australian National University, Canberra, Mar. 4, 1985.
18. Col18 “Model Reduction to Preserve Covariances,” The Australian National Univ., Canberra, Mar. 18, 1985.
19. Col19 “On the Structure of Modeling Errors,” The Australian National University, Canberra, Mar. 26, 1985.
20. Col20 “Introduction to Covariance Control,” The Australian National University, Canberra, May 7, 1985.
21. Col21 “Recent Developments in Model Reduction,” Univ. of Strathclyde, Glasgow, Scotland, June 5, 1985.
22. Col22 “Dynamics and Control of Flexible Structures,” University of Washington, Seattle, July 2, 1985.
23. Col23 “Covariance Approximation and Control,” University of Illinois, EE Department, Oct. 7, 1985.
24. Col24 “Model Reduction of Linear Systems,” University of Toledo, Toledo, Ohio, Oct. 14, 1985.
25. Col25 “An Introduction to Covariance Control Theory,” Univ. of Michigan, Ann Arbor, MI, Oct. 15, 1985.
26. Col26 “Multi-objective Control of Large Space Structures,” Kobe University, Koe, Japan, Mar. 13, 1986.
27. Col27 “Sensor/Actuator Selection in Large Space Structures,” Kyoto University, Kyoto, Japan, Mar. 15, 1986.
28. Col28 “Covariance Control of Large Space Structures,” Nagoya University, Nagoya, Japan, Mar. 18, 1986.
29. Col29 “Dynamics and Control of Flexible Structures,” National Aerospace Laboratory, Mar. 19, 1986.
30. Col30 “Modeling and Control of Flexible Spacecraft,” Univ. of Osaka Prefecture, Japan, Mar. 24, 1986.
31. Col31 “Model Reduction and the Q-Markov Cover Method,” Osaka University, Osaka, Japan, Mar. 28, 1986.
32. Col32 “On the Control of Flexible Structures,” University of Illinois, Urbana, IL, Apr. 28, 1986.
33. Col33 “Control of Flexible Structures,” Georgia Institute of Technology, Atlanta, GA, Feb. 16, 1987.
34. Col34 “Model Reductions by Projections: Preserving 4 Properties of a Higher Order System,” Australian National University, Canberra, Aug. 6, 1987.
35. Col35 “Controller Reduction Combining Canonical Correlation Analysis and Q-Markov COVERS,” Australian National University, Canberra, Aug. 11, 1987.
36. Col36 “Linear Discrete-Time Systems: Realizations from Input-Output Data,” Australian National University, Canberra, Aug. 13, 1987.
37. Col37 “A Generalized Approach to Q-Markov COVERS for Discrete Systems,” Australian National University, Canberra, Aug. 20, 1987.
38. Col38 “Dynamics and Control of Flexible Structures,” Arizona State University, Tempe, AZ, Nov. 3, 1987.
39. Col39 “Model Reductions Using a Projection Formulation,” Univ. of Michigan, Ann Arbor, Apr. 12, 1988.
40. Col40 “Covariance Control of Flexible Structures,” UC Irvine, Irvine, CA, Jan. 30, 1989.
41. Col41 “Dynamics and Control of Flexible Structures,” University of California at Irvine, Jan. 30, 1989.
42. Col42 “Covariance Controllers for Flexible Structures,” Ohio State University, May 5, 1989.
43. Col43 “Multiobjective and Covariance Control,” Johns Hopkins University, Oct. 19, 1989.
44. Col44 “Lyapunov and Covariance Controllers,” Oct. 7-Nov. 1, 1991, Springer Professor Lectures, UC Berkeley.
45. Col45 “Covariance Control,” DLR, 1992, Oberpfaffenhofen, Germany.
46. Col46 “Integrated Modeling and Control for Flexible Structures,” DLR, 1992, Oberpfaffenhofen, Germany.
47. Col47 “Covariance Control and the Routh Test,” EE Department, Zurich, Switzerland, 1992.
48. Col48 “Integrated Modeling and Control for Flexible Structures,” ME Department, Zurich, Switzerland, 1992.
49. Col49 “Covariance Control,” University Copenhagen, Denmark, 1992.
50. Col50 “A Finite Step Algorithm for Covariance Control,” Eindhoven University, Netherlands.
51. Col51 “Linear Controllers with Output Feedback (LMI Approaches),” Nov. 23, 1993, Universidade Estadual de Campinas, Brazil.
52. Col52 “Low-Order Control Design for LMI Problems Using Alternating Projection Methods,” Nov. 26, 1993, Universidade Estadual de Campinas, Brazil.
53. Col53 “An Integrated Approach to Combine Plant and Controller Design,” Feb. 11, 1994, University of Michigan.
54. Col54 “Equivalent Models and Equivalent Control Problems,” Oct. 19, 1995, Invited Lecture, University of Notre Dame, Notre Dame IN.
55. Col55 “Robust Control for Electro-Mechanical Systems,” April 4, 1996, Invited Lecture, University of California, San Diego, CA.
56. Col56 “Robust Control for Electro-Mechanical Systems,” April 24, 1996, University of Illinois, Champaign-Urbana, IL.

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| 56. | “Robust Control for Electro-Mechanical Systems,” April 24, 1996, University of Illinois, Champaign-Urbana, IL. |
| 55. | “Robust Control for Electro-Mechanical Systems,” April 4, 1996, Invited Lecture, University of California, San Diego, CA. |
| 54. | “Equivalent Models and Equivalent Control Problems,” Oct. 19, 1995, Invited Lecture, University of Notre Dame, Notre Dame IN. |
| 53. | “An Integrated Approach to Combine Plant and Controller Design,” Feb. 11, 1994, University of Michigan. |
| 52. | “Low-Order Control Design for LMI Problems Using Alternating Projection Methods,” Nov. 26, 1993, Universidade Estadual de Campinas, Brazil. |
| 51. | “Linear Controllers with Output Feedback (LMI Approaches),” Nov. 23, 1993, Universidade Estadual de Campinas, Brazil. |
| 50. | “A Finite Step Algorithm for Covariance Control,” Eindhoven University, Netherlands. |
| 49. | “Covariance Control,” University Copenhagen, Denmark, 1992. |
| 48. | “Integrated Modeling and Control for Flexible Structures,” ME Department, Zurich, Switzerland, 1992. |
| 47. | “Covariance Control and the Routh Test,” EE Department, Zurich, Switzerland, 1992. |
| 46. | “Integrated Modeling and Control for Flexible Structures,” DLR, 1992, Oberpfaffenhofen, Germany. |
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| 9. | “Control of Flexible Vehicles,” Univ. of Stuttgart, MECHANIC SEMINAR, Stuttgart, Germany, June 1, 1982. |
| 8. | “Structural Perturbations of Dynamic Systems Via Cost-Decomposition Methods,” Illinois Institute of Technology, Chicago, IL, Feb. 4, 1982. |
| 7. | “Control Design of Flexible Spacecraft,” University of Michigan, Nov. 12, 1981. |
| 6. | “Component Cost Analysis of Linear Systems,” Michigan State University, Feb. 26, 1981. |
| 5. | “Model Reduction,” Stanford University, Department of Aeronautics and Astronautics, Nov. 12, 1980. |
| 4. | “Model and Controller Reduction in Large Scale Systems Using Component Cost Analysis,” Renssalaer Polytechnic Institute, Electrical Engineering Department Jan. 24, 1980. |
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## Invited Short Courses:

1. Skelton, R.E., “Rotational Dynamics I,” short course for Sperry Rand Corp., Huntsville, AL, Apr. 1970.
2. Skelton, R.E., “Rotational Dynamics II,” short course for Sperry Rand Corp., Huntsville, AL, May 1970.
3. Skelton, R.E., “Modern Control Theory and Applications,” short course for Sperry Rand Corp., Huntsville, AL, Apr. 1972.
4. Skelton, R.E., “Dynamic Programming,” short course for Sperry Rand Corp., Huntsville, AL, May 1973.
5. Skelton, R.E., “Linear System Theory,” short course for Sperry Rand Corp., Huntsville, AL, June 1973.
6. Skelton, R.E., and P.W. Likins, “Dynamics and Control of Flexible Spacecraft,” short course sponsored by AIAA, Los Angeles, Sept. 30-Oct. 1, 1978.
7. Skelton, R.E., and P.W. Likins, “Dynamics and Control of Flexible Spacecraft,” short course sponsored by AIAA, Provincetown, Massachusetts, June 28-29, 1979.
8. Skelton, R.E., and P.W. Likins, “Dynamics and Control of Flexible Spacecraft,” UCLA short course, July 28-Aug. 1, 1980.
9. Skelton, R.E., “Dynamics and Control of Flexible Spacecraft,” short course sponsored by US Air Force, Wright Patterson Air Force Base, July 10-11, 1980.
10. Skelton, R.E., and P.C. Hughes, “Dynamics and Control of Flexible Structures,” short course for McDonnell Douglas Aerospace Co., St. Louis, MO, July 9-11, 1981.
11. Skelton, R.E., and P.C. Hughes, “Dynamics and Control of Flexible Structures,” short course for Eastman Kodak Co., Rochester, NY, June 8-11, 1981.
12. Skelton, R.E., P.C. Hughes, and H.T.Y. Yang, “Dynamics and Control of Flexible Structures,” UCLA short course, July 20-24, 1981.
13. Skelton, R.E., “Beneficial Interactions of the Dynamics Guidance and Control Disciplines,” Lecture series for the American Astronautical Society Annual Rocky Mountain Guidance & Control Conf., Jan. 30, 1982.
14. Skelton, R.E., P.C. Hughes, “Dynamics and Control of Flexible Structures,” UCLA short course, Aug. 22-26, 1983.
15. Skelton, R.E., “Dynamics and Control of Flexible Space Structures,” short course, Honeywell, Inc., Clearwater, FL, Dec. 3-7, 1984.
16. Goodwin, G., R.E. Skelton, and D.L. Mingori, “Control Theory for Modern Mechanical and Aerospace Applications,” UCLA, Jan. 7-11, 1985.
17. Skelton, R.E., “Control of Flexible Structures,” Carl-Cranz Gesellschaft e.V., Flugplatz, Wessling-Oberpfaffenhofen, Germany, June 9-11, 1986.
18. Skelton, R.E., “Dynamics and Control of Flexible Structures,” Lawrence Livermore National Laboratory, Livermore, CA, July 13-18, 1986.
19. Skelton, R.E., “Control Structure Interaction,” Sandia National Labs, Jan. 26-30, 1987.
20. Skelton, R.E., “Dynamics and Control of Flexible Structures,” Edwards Air Force Base, June 22-26, 1987.
21. Skelton, R.E., “Optimal Estimation and Control,” JPL.
22. Skelton, R.E., “Flexible Structure Control,” European Space Agency, April 1992, short course.
23. Skelton, R.E., “Grigoriadis, “Integrated Structure and Control Design”, short course for ACC, Philadelphia, 1998.
24. Skelton, R.E., Iwasaki, Grigoriadis, “System Design”, Plant and Control, 1999, ACC.

24. Skelton, R.E., Iwasaki, Grigoriadis, “System Design”, Plant and Control, 1999, ACC.

23. Skelton, R.E., “Grigoriadis, “Integrated Structure and Control Design”, short course for ACC, Philadelphia, 1998.

22. Skelton, R.E., “Flexible Structure Control,” European Space Agency, April 1992, short course.

21. Skelton, R.E., “Optimal Estimation and Control,” JPL.

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11. Skelton, R.E., and P.C. Hughes, “Dynamics and Control of Flexible Structures,” short course for Eastman Kodak Co., Rochester, NY, June 8-11, 1981.

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7. Skelton, R.E., and P.W. Likins, “Dynamics and Control of Flexible Spacecraft,” short course sponsored by AIAA, Provincetown, Massachusetts, June 28-29, 1979.

6. Skelton, R.E., and P.W. Likins, “Dynamics and Control of Flexible Spacecraft,” short course sponsored by AIAA, Los Angeles, Sept. 30-Oct. 1, 1978.

5. Skelton, R.E., “Linear System Theory,” short course for Sperry Rand Corp., Huntsville, AL, June 1973.

4. Skelton, R.E., “Dynamic Programming,” short course for Sperry Rand Corp., Huntsville, AL, May 1973.

3. Skelton, R.E., “Modern Control Theory and Applications,” short course for Sperry Rand Corp., Huntsville, AL, Apr. 1972.

2. Skelton, R.E., “Rotational Dynamics II,” short course for Sperry Rand Corp., Huntsville, AL, May 1970.

1. Skelton, R.E., “Rotational Dynamics I,” short course for Sperry Rand Corp., Huntsville, AL, Apr. 1970.