

Indrajit Ray, Ph.D., Member ASTM, MIE, CEng, MIGS

Contact Email addresses: IndrajitRay29@gmail.com

1. Education:

- **Ph. D. in Civil Engineering**
Indian Institute of Technology, KGP (IIT), India
- **MS in Civil Engineering (Structural Engineering) (First Class)**
Jadavpur University, India
- **BS in Civil Engineering (First Class, Honors)**
Jadavpur University, India

2. Employment History and Experiences:

Academic Faculty Employment

- Professor and Program Coordinator – October 2015 -Present
Construction Materials, Engineering and Management, Civil Engineering Department, University of West Indies, St Augustine, Trinidad and Tobago, WI
- Visiting Professor - August 2014 through June 2015
Civil Engineering, Department of Engineering, Indiana University-Purdue University, Fort Wayne, IN 46835
- Visiting Professor – August, 2012 through May, 2014
Department of Civil and Mechanical Engineering, Purdue University Northwest, Hammond, IN 46323
- Research Associate Professor - July, 2008 through June, 2012 [4 years]
Approved Graduate Faculty for College of Engineering Ph.D. and MS committees
Department of Civil and Environmental Engineering, West Virginia University, Morgantown, West Virginia 26506
- Research Assistant Professor - August 2000 through June 2008 [8 years]
Approved Graduate Faculty for College of Engineering Ph.D. and MS committees
Department of Civil and Environmental Engineering, West Virginia University, Morgantown, West Virginia
- Reader (Associate Professor)-January 1993 through July 2000 [8½ years]
Department of Civil Engineering, Jadavpur University, India
- Lecturer/Senior Lecturer (Assistant Professor)- April 1984 through June 1991 [7 years]
Department of Civil Engineering, Jadavpur University, India

Industry Employment/Experience

- Assistant Engineer, July 1982 – March 1984 [1¾ years]

3. Research Interests:

- Advanced and sustainable concretes for civil infrastructures
- Statistical analysis based on survey data related to construction safety and cost
- Prediction of concrete properties from microstructure and composite properties
- Externally bonded fiber reinforced polymer (FRP) wrap for rehabilitation of structures
- Accelerated ageing tests and long-term prediction models for durability of FRP bars in concrete
- Intelligent and novel construction materials for resilient and sustainable structures
- Prototype and field implementation of advanced concretes for civil infrastructures

4. Honors and Awards:

- CEE Excellence in Teaching Award (2009-2010)
- CEE Excellence in Teaching Award (2007-2008)
- CEE Excellence in Teaching Award (2005-2006)
- CEE Excellence in Teaching Award (2004-2005)
- Inducted as Member of Sigma Xi in 2005
- Selected in Who's Who in Engineering Marquis (2006) and Strathmore (2005)
- Honors in Bachelor of Civil Engineering
- MS Scholarship by University Grants Commission, India (Jan 1980 to June 1981)
- MS scholarship by Department of Science and Technology (July 1981 to June 1982)
- Ph.D. Scholarship by Ministry of Human Resources Development, India (Aug 1991 to July 1994)

5. Teaching and Course Development:

5.1 The University of the West Indies (JBM, UK accredited)

- COEM 6013- Materials Technology [Fall 2016, 2017, and 2018]
- COEM 6006- Construction Accounting and Finance [Fall 2016, 2017, and 2018]- 12 lectures out of 52
- COEM 6020- Research Methods [Spring 2016 and 2017]
- CVNG 1000- Mechanics of Solids [Spring 2016 and 2017]
- CVNG 2001- Structural Mechanics-I [Fall 2017]
- CVNG 3015-Special Investigative Project for 6 students in 2016 and 2017 [Year long]
- Senior design project supervisor for 6 students in 2016 and 2017 [Year long]

5.1 Indiana University-Purdue University (IPFW), Fort Wayne (ABET accredited)

- CE 47800 – Design of Concrete Structures [Spring 2015]
- CE 37500 - Structural Analysis [Spring 2015]
- ENGR 12700* – Engineering Fundamentals-I (Lecture and Lab) [Spring 2015]
- CE 47500 – Design of Steel Structures [Fall 2014]
- CE 37500 - Structural Analysis [Fall 2014]
- ENGR 12700* – Engineering Fundamentals-I (Lab component) [Fall 2014]

*New course is offered. Computer lab part and lecture parts are co-developed with Professors

Senior Design Projects Advisor/co-advisor :

Senior Design Projects Advisor/co-advisor:

- CE 48700 –Civil Engineering Design Project I
--ASCE Steel Bridge [Fall 2014, Spring 2015] (Advisor)
-- ASCE Concrete Canoe [Fall 2014, Spring 2015] (co-Advisor)

5.2 Purdue University Northwest (ABET accredited)

- CE 33400 - Structural Analysis [Fall 2013 and Fall 2012]
- CE 47100 - Reinforced Concrete Design [Fall 2013 and Fall 2012]
- ME 59700 - Finite Element Analysis- Graduate Level Course [Fall 2013 and Fall 2012]
- ME 40400- Finite Element Analysis [Spring 2014]
- CE 27300- Mechanics of Materials [Summer 2013]
- CE 41100 – Steel Design [Spring 2013 and Spring 2014]
- CE 27300 - Mechanics of Materials (Section-1 during Morning and Section-2 during evening). Each section had 30 students [Spring 2013]
- CE 27301- Lab course on Mechanics of Materials (evening course) [Spring 2013 and Spring 2014]
 - *I developed this new lab course in civil engineering*

Senior Design Projects Advisor/co-advisor (Two-semester) :

- CE 42900/CE 43900- Geopolymer concrete as sustainable construction materials (Advisor) (Received Indiana Space Grant through Purdue University Calumet) [Spring 2014]
- CE 42900/CE 43900 -ASCE Concrete canoe competition (Advisor) (Received Indiana Space Grant through Purdue University Calumet) [Fall 2013 and 2014 Spring]
- CE 42900/CE 43900 -- ASCE Steel bridge competition (co-Advisor) (Received Undergraduate Research Grant from Purdue University Calumet) [Fall 2013 and 2014 Spring]
- CE 42900/CE 43900 - Life-cycle assessment of structures with green and sustainable concrete (Advisor) (Received Undergraduate Research Grant from Purdue University Calumet) [Spring 2013 and Fall 2013]
- CE 42900/CE 43900 Pervious concrete pavement (Advisor) (Received Undergraduate Research Grant from Purdue University Calumet) [Fall 2012 and Spring 2013]
- CE 42900/CE 43900 - ASCE Concrete canoe competition (Advisor) (Received Undergraduate Research Grant from Purdue University Calumet) [Fall 2012 and Spring 2013]
- CE 42900/CE 43900 - ASCE Steel bridge competition (co-Advisor) (Received Undergraduate Research Grant from Purdue University Calumet) [Fall 2012 and Spring 2013] *Won first place in regional competition under “stiffness” category*
- Guest lecturer- Graduate Seminar [Fall 2012]
- Developed new graduate course on “Nondestructive Evaluations” and “Bridge Engineering”

5.3 West Virginia University (ABET accredited)

Courses taught:

- CE 464 - Timber Design [Spring 2012]

- CE 591Y - Energy, Environment, Sustainable Infrastructure [Fall 2011]
 - *Guest teacher in five lectures (1.25 hours/ lecture)*
 - *Taught on Introduction to sustainable design, Concrete as sustainable materials, Life-cycle analysis of structures.*
- CE 493O -Sustainable Construction Materials [Fall 2010]
 - *Developed the new course syllabus and content*
 - *Taught the properties and role of concrete as sustainable construction material including pervious concrete, geopolymer binders, insulated concrete form wall panel as energy efficient buildings*
 - *Students developed and evaluated sustainable concrete through hands-on projects in the laboratory*
 - *Students completed project of designing green building components and estimated the LEED credit points for the entire building*
- CE 416 – Advanced Concrete Materials [Fall 2009, Fall 2008, and Fall 2007]
 - *Developed a new course on concrete materials and technology covering both basic to advanced topics with hands-on laboratory*
 - *Further enhanced the course with special emphasize on development of green and sustainable concrete using laboratory work involving preparation of the materials and evaluating the mechanical and durability properties*
 - *Students presented their work in the form of project with practical examples of use of such construction materials and structures*
- CE 412 – Concrete and Aggregates [Fall 2006, Fall 2005, Fall 2004, Fall 2003, Fall 2002, and Fall 2001]
 - *Upgraded and significantly enhanced the CE 412 course taught at WVU course to include hydration of cement, mineral and chemical admixtures, mix design with supplementary cementing materials, lab testing of various types of concrete, evaluations of strengths, chloride permeability, and shrinkage*
 - *Performed non destructive tests with the help of equipment fund for the class provided to me by the Canaan Valley Institute, West Virginia*
- CE 493M/CE 593C- Advanced Concrete Technology [Spring 2006, Spring 2005, Spring 2004, Spring 2003, and Spring 2002]
 - *Procured major funding from West Virginia Department of Transportation of \$100,000, I developed Advanced Concrete Materials Research Lab with teaching capabilities.*
 - *Developed a new course and syllabus on advanced concrete research topics.*

5.4 Jadavpur University, India (Equivalent to regionally accredited colleges/universities in USA)

During my career as faculty in Jadavpur University (*accredited by National Assessment and Accreditation Council*) for over 10 years, I taught several courses such as “Structural Mechanics”, “Theory of Structures”, “Design of Steel Structures”, “Design of Concrete Structures”, “Numerical Analysis of Structures”, “Surveying” in undergraduate and “Precast and Prestressed Concrete” in graduate level. Supervised 15 undergraduate students for final year design project.

Courses taught:

Undergraduate courses (average 3 courses per semester, class contained average=70 to 90 students):
(“T” denotes ‘Theoretical course’ and “S” denotes ‘Project or Practical or Lab course’ (typically 6 to 9 hours)).

- CE/T/126-Structural Mechanics – I
- CE/S/212- Structural Design/Analysis Project

- CE/T/213- Surveying-I
- CET/T/215- Numerical Analysis and Computer Programming
- CE/T/216- Structural Mechanics- II
- CE/S/222- Civil Engineering Lab-I (Concrete and Structures)
- CE/T/226- Theory of Structures-I
- CE/T/315 - Theory of Structure – II
- CE/T/316- Design of Concrete Structures –I
- CE/S/321- Survey Practical (Field survey for 4 weeks)
- CE/T/325- Design of Steel/Metal Structures- I
- CE/T/415- Theory of Structures-II
- CE/T/425C-Advanced Structural Analysis
- CE/S/413- Civil Engineering Project-I (Concrete) --- Senior Design
- CE/S/422- Civil Engineering Project -II (Steel/Metal) – Senior Design
- CE/T/426- General Viva-Voce (Shared with panel of teachers)
- Arch/CE/T/114- Structural Mechanics- I for Architectural Engineering
- Arch/CE/T/124- Structural Mechanics- II for Architectural Engineering
- Arch/CE/T/214 – Theory of Structures- I for Architectural Engineering

Graduate courses (average 1 course per semester, class contained average=10 to 15 students):
 (“T” denotes ‘Theoretical course’ ; “S” denotes ‘Project or Practical or Lab course’; “A” (typically 6 to 9 hours).

- Graduate/CE/T/128-A-Precast and Prestressed Concrete Structures (600 or 700 level)
- Graduate/CE/T/113-A- Advanced Structural Design (600 or 700 level)
- Graduate/CE/T/114-A- Advanced Structural Analysis (600 or 700 level)
- Graduate/CE/S/ Advanced Concrete Technology Laboratory (600 or 700 level)
- Graduate/CE/TH-21/Thesis (600 or 700 level)

6. Research and Scholarly Activities:

6.1 Externally Funded Research Projects as PI/co-PI (My Share is over \$2.5 million) of total funding of about 4.5 million)

	Research Title	Granting or Sponsoring Agency	Date of Award and Duration	Award Amount
1.	Pervious concrete for stormwater management	Department of Natural Resources (DNR) State of Indiana	Accepted	\$46,000
2.	Development of Bridge Foundation Movement Criteria			\$57, 333 (PI-WVU)
		NCHRP	Awarded in 2012*	\$ 350,000 North Dakota State University (main proposer)
	*Since I moved to other university (PUC) July 2012, I could not continue on this project			

3. Center for Transportation Security and Infrastructure Innovations-TranSI ²	WV Higher Education Policy Commission/WV EPSCoR	July 1, 2007 to June 30, 2012 1st year: 500,000 2nd year: 400,000 3rd year: 300,000 4 th year : 200,000 5 th year: 100,000	\$1,500,000 (co-PI- first 4 year- PI 2011-2012)
4. Advanced Materials Program-Phase II - High-Performance Concrete (Task A), Deck Overlays (Task B), and Short-Span Steel Bridges (Task C)	West Virginia Department of Transportation-Division of Highways (WVDOT-DOH)	May 15, 2006 through October 31, 2011	\$1,257,887 (co-PI and Task Leader)
5. Energy Efficient and Seismic/Blast Resistant Buildings with Concrete-Filled FRP Sandwich Wall Panels	Program to Stimulate Competitive Research (PSCoR)	July 1, 2010 to December 31, 2011	\$25,000 (co-PI/PI)
6. Resilient Tunnel System (RTP)—Flood Containment Plug	Battelle Memorial Institute	August 16, 2007 to Dec 31, 2011	Total project cost approx: \$ 3,135,000 (worked as consultant on concrete sealing, tunnel lining)
7. District 3-0 Investigation of Fiber-Wrap Technology for Bridge Repair and Rehabilitation (Phase III)	PennDOT USDOT, FHWA	January 15, 2008 through January 14, 2010	\$204,216 (co-PI/Task Leader)
8. District 3-0 Investigation of Fiber Wrap Technology for Bridge Repair and Rehabilitation (Phase-II)	PennDOT USDOT, FHWA	March, 2006 through March 2007	142,900 (co-PI/Task Leader)
9. District 3-0 Investigation of Fiber Wrap Technology for Bridge Repair and Rehabilitation (Phase-I)	PennDOT USDOT, FHWA	September , 2004 through September, 2005	\$137,725 (co-PI/Task Leader)
10. Evaluations of FRP-Concrete Interaction	Korea Institute of Construction Technology	October 2003 through August 2004	\$ 39,000 (co-PI/Task Leader)

11. Advanced Materials Program: High-Performance Concrete, Bridge Deck Overlays and High-Performance Steel	WVDOT-DOH	August 2002 through July 2005	\$775,000 (co-PI/Task Leader)
12. Interface fracture of concrete externally reinforced with composite materials	National Science Foundation grant—Civil and Mechanical System	June 2000—May 2003	133,000 Contributed as Researcher/Investigator
13. Exploratory Study on HPC for Bridge Deck in West Virginia	West Virginia Department of Transportation	June 2001 through May 2004	\$55,000 (co-PI)
14. Development of High-performance concrete Suitable for Nuclear Industry	Atomic Energy Regulatory Board, Govt. of India	1996-2000	\$30,000 (equivalent)

6.2. Publications

Peer Reviewed

1. Mueller, D., Ashur, S., Bi, Z., Moor, S., **Ray, I.**, (2017) "Use of CAD software to solve Trigonometry and Vector Problems.", Transactions on Techniques on STEM Education, Vol. 2, No.2, pp 93-100
2. Kar, A., **Ray, I.** Halabe, U B., and Unnikrishnan, A. (2016) "Physicochemical and Microstructural Characterizations of Alkali-Activated Binder Systems," International Journal of Structural and Civil Engineering Research, Vol 5, No.2 , pp 119-129
3. Kar, A., **Ray, I.** Unnikrishnan, A, Halabe, U B. (2016) "Prediction Models for Compressive Strength of Concrete with Alkali-Activated Binder," Computers and Concrete, Vol 17, No 4, pp 523-540
4. Kar, A., Halabe, U B, **Ray, I.** Unnikrishnan, A, (2015) Comparisons of Linear Regression Models for Properties of Alkali Activated Binder Concretes," European Scientific Journal, Vol.11, No.27, ISSN: 1857 – 7881 (Print) e - ISSN 1857- 7431, pp 1-17
5. Kar, A., **Ray, I.**, Halabe, U.B., Unnikrishnan, A., and Dawson-Andoh, N. (2014) "Characterizations and Quantitative Estimation of Alkali-Activated Binder Paste from Microstructures," *International Journal of Concrete Structures and Materials (Springer)*, Vol.8, Issue 3, pp 213-228
6. Kar, A., **Ray, I.**, Halabe, U.B., Unnikrishnan, A., and Dawson-Andoh, N. (2014) "Characterizations and Quantitative Estimation of Alkali-Activated Binder Paste from Microstructures," *International Journal of Concrete Structures and Materials (Springer)*, Vol.8, Issue 3, pp 213-228
7. Roy, M., **Ray, I.**, Davalos, J.F., (2014) "High-performance Fiber Reinforced concrete: Development and Evaluations as Repairing Materials," *ASCE Journal of Materials in Civil Engineering*, Vol. 26, Issue 10, pp. 04014074-1-04014074-2
8. Kar, A., Halabe, U B., **Ray, I.**, and Unnikrishnan, A. (2013) "Nondestructive Characterizations of Alkali-activated Fly ash and/or Slag Concrete," European Scientific Journal, Vol.9, No.24 ISSN: 1857 – 7881 (Print) e - ISSN 1857- 7431, pp 53-74

9. Kar, A., **Ray, I.**, Unnikrishnan, A., Davalos, J.F. (2013) "Composite Modeling to Predict Shrinkage from C-S-H for Concretes Containing Supplementary Cementitious Materials," *Construction and Building Materials*. Vol 43, pp 139-155
10. **Ray, I.**, Fan, D., Davalos, J.F., and Kar, A., (2013) "Durability Evaluations of Bridge deck High-performance Concrete" *International Journal of Structural Engineering (IJStruc.E)*, Vol. 4, Nos 1/2, pp 35-62
11. Davalos, J.F., Parish, G., Chen, A. and **Ray, I.** (2013) "Effect of Anchoring Schemes for Beams Aged by Accelerated Corrosion and Strengthened with Carbon Fiber Reinforced Polymer," *Structure and Infrastructure Engineering*, Vol. 9, Issue 3, pp 229-241
12. Kar, A., **Ray, I.**, Unnikrishnan, A., Davalos J.F., (2012) "Estimation of C-S-H and Calcium Hydroxide for Cement Pastes Containing Slag and Silica Fume." *Construction and Building Materials*, Vol. 30, pp 505-515
13. **Ray, I.**, Gong, Z., Davalos, J.F., and Kar, A., (2012) "Shrinkage and Cracking Studies of High-performance Concrete Bridge deck," *Construction and Building Materials*, Vol. 28, pp 244-254
14. Davalos J. F., Chen Y., and **Ray, I.**, (2012) "Long-term Durability Prediction Model for GFRP Bars in Concrete Environment," *Journal of Composite Materials*, Vol. 45, pp 1899-1914
15. Kar, A., **Ray, I.**, Unnikrishnan, A., Davalos J.F. , (2012) "Microanalysis and optimization-based estimation of C-S-H contents of cementitious systems containing fly ash and silica fume," *Cement and Concrete Composites*, Vol. 34, pp 419-429
16. Davalos, J.F., Chen, A., **Ray, I.**, Levan, J. (2011) "A Comprehensive Study on Using Externally Bonded FRP Composites for the Rehabilitation of Reinforced Concrete T-beam Bridges," *Journal of Infrastructure Systems*, ASCE, Vol. 18 (2), pp 89-102
17. **Ray, I.**, Parish, G., Davalos, J.F., and Chen, A. (2011) "Effect of Concrete Substrate Repair Methods for Beams Aged by Accelerated Corrosion and Strengthened with CFRP," *Journal of Aerospace Engineering*, ASCE , Vol. 24, No. 2, pp 227-239
18. Zou, B., Davalos, J.F., Chen, A., and **Ray, I.** (2011) "Evaluation of Load Distribution Factor by Series Solution for Orthotropic Bridge Decks," *Journal of Aerospace Engineering*, ASCE, Vol. 24, No. 2, pp 240-248
19. Mahmoud, A.M., Ammar, H., Mukdadi, O.M., **Ray, I.**, Imani, F.S., Chen, A., and Davalos, J. F. (2010) "Non-Destructive Ultrasonic Evaluation of CFRP-Concrete Specimens Subjected to Accelerated Aging Conditions," *NDE & T International*, Vol.43, No. 7, pp 635-641
20. **Ray, I.**, Davalos, J. F., and Sun, Z. (2010) "Design of Experiment and Statistical Analysis of Bond Strength Test of Bi-layer Concrete", *International Journal of Materials and Product Technology*, Vol. 39, No.3/4, pp. 333-347
21. Uchoa, S. B., **Ray, I.**, Davalos, J. F., and Tonholo, J., (2009) "Comparative Studies of Chloride Permeability, Conductivity, Salt-ponding Tests of Concrete Containing Different Admixtures," *International Journal of Modelling, Identification and Control*, Vol. 7, No. 2, pp 160-170.
22. Davalos, J. F., Kodakani, S., **Ray, I.**, and Lin, C., (2008) "Fracture Evaluation for GFRP-Concrete Interfaces for Freeze-thaw and Wet-dry cycling," *Journal of Composite Materials*, Vol. 42, No. 14, pp 1439-1466
23. Davalos, J. F., Chen, Y., and **Ray, I.**, (2008) "Effect of FRP Bar Degradation on Interface Bond with High-Strength Concrete", *Cement and Concrete Composites*, Vol. 30, No. 8, pp 722-730
24. Bhattacharya, A., **Ray, I.**, and Davalos, J. F., (2008) "Effects of Aggregate Grading and Admixture/Filler on Self-Consolidating Concrete", *The Open Construction and Building Technology Journal, Bentham*, Vol. 2, pp 89-95

25. Boyajian, D. M., **Ray, I.**, and Davalos, J. F.,(2007) “Freeze-thaw Cycling under a Calcium Chloride Environment: Effects on CFRP Strengthened Concrete Structures”, *International Journal of Materials and Product Technology*, Vol. 28, No. 1/2, pp 89-102
26. Chen, Y., Davalos, J. F., **Ray, I.**, and Kim, H. Y.,(2007)“Accelerated Aging Tests for Evaluations of Durability Performance of FRP Reinforcing Bars for Concrete Structures”, *Composite Structures* , Vol. 78, No. 1, pp 101-111
27. Chen, Y., Davalos, J. F., and **Ray, I.**, (2006) “Durability Prediction for GFRP Reinforcing Bars Using Short-term Data of Accelerated Aging Tests”, *Journal of Composites for Construction*, ASCE, Vol. 10, No. 4, pp 279-286
28. Davalos, J. F., Kodkani, S., and **Ray, I.**, (2006) “Fracture Mechanics Methods for Mode-I Interface Evaluations of FRP Bonded to Concrete Substrate”, *Journal of Materials for Civil Engineering*, ASCE, Vol. 18, No. 5, pp 732-742
29. Davalos, J. F., Kodkani, S., **Ray, I.** and Boyajian, D., (2005) “A fracture mechanics approach for interface durability of surface bonded FRP to concrete”, *7th International Symposium on Fiber Reinforced Polymer Reinforcement for Reinforced Concrete Structures (FRPRCS7)*, ACI- SP 230, Paper # D-08, Kansas City, MO, ACI Special Publication
30. **Ray, I.**, Davalos, J. F., Gong, Z. and Chatterjee, A., (2005) “Mechanical properties of high-performance concrete made for bridge decks using West Virginia aggregates”, *7th International Symposium on the Utilization of High-Strength/High-Performance Concrete*, ACI- SP-228-56, ACI, Washington DC, ACI Special Publication
31. Davalos, J. F., **Ray, I.**, Sun, Z. and Hong, T., (2005) “Interface bond characterization of high-performance concrete overlays and substrate”, *7th International Symposium on the Utilization of High-Strength/High-Performance Concrete*, ACI- SP-228-57, ACI, Washington DC, ACI Special Publication
32. **Ray, I.**, Julio F. Davalos, J. F., and Luo, S., (2005) “Interface Evaluations of Overlay Concrete Bi-layer Composites by a Direct Shear Test”, *Cement and Concrete Composites*, Vol. 27, pp 339-347
33. Boyajian, D. M., Davalos, J. F., and **Ray, I.**, (2005) “Appraisal of the Novel Single Contoured-cantilever Beam”, *Journal Materials and Structures*, RILEM, France, Vol. 38, pp 11-16
34. Chakraborty, A. K., Dutta, S. and **Ray, I.**, (2000) “Variation in Effect of Acrylic Latex with Change in Water to Cement Ratio of Silica Fume Modified Superplasticised Concrete or Mortar”, *Journal of Institution of Engineers*, Civil Engineering Division, India, Vol. 80, No. 4, pp 186 -190
35. Chakraborty, A. K., Dutta, S., Sen, P., and **Ray, I.**,(2000) “Improved Performance of Silica Fume Modified Mortar due to Addition of Polymer Emulsions”, *Journal of Polymer Materials*, Vol. 17, No.1, pp 53-62
36. Chakraborty, A. K., Dutta, S., and **Ray, I.**, (1999) “Effect of Acrylic Latex on Silica Fume Modified Superplasticised Mortar in Various Water to Cement Ratio Ranges”, *Indian Concrete Institute Journal*, Vol. 69, No. 2, pp 29-31
37. **Ray, I.**, Gupta, A. P., and Biswas, M., (1996) “Physicochemical Studies on Single and Combined Effect of Latex and Superplasticiser on Portland Cement Mortar”, *Cement and Concrete Composites*, Vol. 18, pp 343-355
38. **Ray, I.**, Gupta, A. P., and Biswas, M., (1996)“Cementitious Systems Modified with Binary Admixture – Areas of Needed Research”, *Civil Engineering*, ASCE (India), pp 8-12
39. **Ray, I.**, Gupta, A. P., and Biswas, M., (1995) “Effect of Latex and Superplasticiser on Portland Cement Mortar in the Hardened State”, *Cement and Concrete Composites*, Vol. 17, No.1, pp 9-21
40. **Ray, I.**, Gupta, A. P., and Biswas, M., (1994) “Effect of Latex and Superplasticiser on Portland Cement Mortar in the Fresh State”, *Cement and Concrete Composites*, Vol. 16, pp 309-316
41. Kar, A., **Ray, I.**, Halabe, U.B., Unnikrishnan, A., and Dawson-Andoh, B. (2015) “Microstructural Characterizations of Alkali-Activated Fly ash and/or Slag Binder System” UK-India Education

- Research Initiative Concrete Congress, Concrete Research Driving Profit and Sustainability, Jalandhar, Punjab, India, November 2-5, 2015 (accepted)
42. Mueller, D.W, Ashur, S., Bi, Z., Moor S.S, **Ray, I.** (2015) "Use of CAD software to Solve Trigonometry and Vector Problems" American Society of Engineering Education, Indiana- Illinois Section Conference 2015, IPFW, Fort Wayne, IN 46805, March 27-28, 2015
 43. Imani F.S., **Ray, I.**, Chen, A., and Davalos J.F. (2013) "Evaluations of CFRP-Concrete Interface Subjected to Accelerated Ageing Test" Proceedings American Society for Composites, 28th Technical Conference, State College, Pennsylvania, Edited by Charles Bakis, DEStech Publications, Inc., ISBN 978-1-60595-107-2, Sep 9-11, 2013
 44. Imani F.S., Chen, A., Davalos, J.F., and **Ray, I.** (2013) "An Exploratory Study on Mode II Fracture Evaluation of CFRP-Concrete Interface using Novel Displacement-based Approach" Proceedings American Society for Composites, 28th Technical Conference, State College, Pennsylvania, Edited by Charles Bakis, DEStech Publications, Inc., ISBN 978-1-60595-107-2, Sep 9-11, 2013
 45. Kar, A., **Ray, I.**, Unnikrishnan, A., Davalos, J.F., and Chen, A. (2012) "Prediction of Shrinkage of Concrete Containing Fly ash and/or Silica fume using Composite Modeling", 13th ASCE Aerospace Division Conference on Engineering, Construction, and Operations in Challenging Environments, ASCE Earth and Space 2012 conference, Pasadena, California
 46. McGraw, B., Chen, A., Davalos, J.F., and **Ray, I.** (2012) "Evaluation of Wood Composite I- Joist with Sinusoidal Web", 13th ASCE Aerospace Division Conference on Engineering, Construction, and Operations in Challenging Environments, ASCE Earth and Space 2012 conference, Pasadena, California
 47. Jiao, P., McGraw, B., Chen, A., Davalos, J.F., and **Ray, I.** (2012) "Flexural-torsional Buckling of Cantilever Composite Wood I-Joist with Sinusoidal Web Geometry", 13th ASCE Aerospace Division Conference on Engineering, Construction, and Operations in Challenging Environments, ASCE Earth and Space 2012 conference, Pasadena, California
 48. Zahabi, M., Chen, A., Davalos, J.F., and **Ray, I.** (2012) "A Unified Mode-II Long-term Traction-Separation Law for Carbon FRP-Concrete Interface", 13th ASCE Aerospace Division Conference on Engineering, Construction, and Operations in Challenging Environments, ASCE Earth and Space 2012 conference, Pasadena, California
 49. Mahmoud, A.M., Ammar, H., Mukdadi, O.M., **Ray, I.**, Imani, F.S., Chen, A., and Davalos, J. F. (2011). "Ultrasonic Evaluation of CFRP-Concrete Interface for Specimens under Temperature and Water-Immersion Aging Effects", *Proceedings of the 5th International Conference on FRP Composites in Civil Engineering-CICE 2010*, Beijing, China, September 27-29, Advances in FRP Composites in Civil Engineering
 50. Imani, F. S., Chen, A., Davalos, J.F., and **Ray, I.** (2011). "Temperature and Moisture Effects on Mode II Fracture Behavior of CFRP-Concrete Interface", *Proceedings of the 5th International Conference on FRP Composites in Civil Engineering*, Beijing-CICE 2010, China, September 27-29, Advances in FRP Composites in Civil Engineering
 51. Anderson, M., **Ray, I.**, Davalos, J.F., Chen, A. (2011). "A Study on the Applicability of ECE Technique on Chloride Contaminated Concrete Beams Retrofitted with FRP Strips", *Proceedings of the 5th International Conference on FRP Composites in Civil Engineering-CICE 2010*, Beijing, China, September 27-29, Advances in FRP Composites in Civil Engineering
 52. Davalos, J.F, Vantaram, A., Chen, A., **Ray, I.**, and Plunckett, J.D. (2011). "Honeycomb Fiber-Reinforced Polymer Sandwich Panels for Fish Culture Tanks", *Proceedings of the 5th International Conference on FRP Composites in Civil Engineering-CICE 2010*, Beijing, China, September 27-29, Advances in FRP Composites in Civil Engineering
 53. Davalos, J.F., Chen, A., and **Ray, I.** (2011) "A Sustainable Rehabilitation System of Reinforced Concrete T-Beam Structures Using Externally Bonded FRP Composites," Joint Structural Division

- Annual Seminar, 2011 Joint Structural Division Annual Seminar 2011: Meeting the Challenge of Low Carbon Emission, 14 June 2011, Sponsored by The Hong Kong Institute of Engineers., **Invited Paper**
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103. **Ray, I.**, Davalos, J. F., Gong, Z., (2007) "Evaluations of fracture mechanics properties of high-performance concrete", *18th Engineering Mechanics Division Conference of ASCE*, Virginia Tech, Blacksburg, Virginia, USA
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2. Chen, A., **Ray, I.**, Wattick, J.A., and Pertl, E. (2012), "Energy Efficient and Seismic/Blast Resistance Buildings with Concrete Filled FRP Sandwich Wall Panels," Final Report, WVU Program to Stimulate Competitive Research (PSCoR), Project 10008736, Award NT10055R
3. Davalos, J.F., **Ray, I.**, Gong, Z., Velez, S., Bhattacharya, A., Uchoa, S., and Kar, A., (2011) " High-Performance Concrete Mixes for Cast-in-place Bridge Decks in West Virginia (Phase-II), RP-209, Draft Final Report, West Virginia Department of Transportation, Division of Highways, Charleston, West Virginia
4. Davalos, J.F., **Ray, I.**, Konduru, S., Hong, T., Meadway, J., Kar, A., (2011) " Concrete Overlays for Bridge Decks in West Virginia (Phase-II), RP-209, Draft Final Report, West Virginia Department of Transportation, Division of Highways, Charleston, West Virginia
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9. Davalos, J. F., Barth, K. E., **Ray, I.**, Justice, A., Parish, G. and Sascher, W., (2008) "Task 1 Report: Planning Activities for Field Work and Research", Submitted to Pennsylvania Department of Transportation/Bureau of Planning and Research, Harrisburg, PA 17120, PennDOT-MAUTC Partnership
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21. Davalos, J. F., **Ray, I.**, and Chen, Y., (2004) "Interim Report on Evaluations of FRP-Concrete Interactions through Accelerated and Long-term Tests for Performance Requirements (Phase-I)", Korean Institute of Construction Technology, Republic of Korea
22. Davalos, J. F., **Ray, I.**, and Chen, Y., (2004) "Mid-term Report on Evaluations of FRP-Concrete Interactions through Accelerated and Long-term Tests for Performance Requirements (Phase-I)", Korean Institute of Construction Technology, Republic of Korea, February 27 (2004)

Reviewer of the following Journals:

ACI Materials Journal; Journal of Composite Materials; Construction and Building Materials, Journal of Composites for Construction; ASCE Journal of Aerospace Engineering; ASCE Journal of Bridge Engineering; ASCE Journal of Aerospace Engineering, Construction Materials Journal - Institution of Civil Engineers (ICE); Materials and Structures- RILEM; ACI Structural Journal; Engineering Structures; Cement and Concrete Composites; Journal of Vibration and Control; Journal Water Science and Engineering; Engineering Fracture Mechanics; and Computational Materials Science; Journal of Shocks and Vibrations; Journal of Institution of Engineers

6.3 Graduate Students for Research Advising:

- **M.S Thesis Advisor/co-Advisor as Major Professor**

Name	Department & University	Topics	Year
1.Denevue Bando	UWI	Improving Quality Management System Implementaion	2018
2. Nigel Narcis	UWI	The status of construction and demolition waste management	
3. Fey Mohammad	UWI	Optimizing volcanic ash for high	2017

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4. Jihan Sylvester	UWI	strength concrete Burnt clay and volcanic ash to produce durable concrete	2017
5. Ramrattan Russel		Construction and Solid Waste Management	2016
6. John Wattick	CEE WVU	Concrete-filled sandwich wall panels for energy efficient buildings	2012
7. Bradley McGraw	CEE WVU	Corrugated Wood composite web panel for I-joist from waste veneer- mill residues	2012
8. Pengcheng Jiao	CEE WVU	Evaluations of buckling behavior of composite I-joists	2012
9. Manish Roy	CEE West Virginia University (WVU)	High-performance fiber reinforced concrete as a repairing/patching materials	2011
10. Soumya Chowdhury	CEE WVU	High volume fly ash/slag concrete and geopolymer concrete as sustainable materials	2011
11. Arkamira Kar	CEE WVU	Microstructure to macrolevel prediction of shrinkage	2010
12. Matt Anderson	CEE WVU	Electrochemical Techniques for Corrosion Protections of Reinforced Concrete Beams and Repairing with FRP	2010
13. Santiago Velez	CEE WVU	Plant and laboratory scale studies of high-performance concrete for bridge decks in West Virginia	2008
14. Sathish Konduru	CEE WVU	Performance evaluations of latex- modified and silica fume modified concrete bridge deck overlays	2008
15. Arka Bhattacharya	CEE WVU	Effects of Aggregate Grading and Admixtures/fillers on Properties of Self-Consolidating Concrete	2008
16. George Parish	CEE WVU	CFRP Repair of Concrete Beams Aged by Accelerated Corrosions	2008
17. Tao Hong	CEE WVU	Edge Curling Effect on Interface Delamination of Concrete Overlays for Bridge Decks	2006
18. Dayong Fan	CEE WVU	Durability Studies of High- Performance Concrete used for Bridge Decks	2005
19. Ani Chatterjee	CEE WVU	Shrinkage and strength characterizations of concrete containing supplementary cementing materials	2004
20. Zhenhua Sun	CEE WVU	Evaluation of concrete bridge deck overlays	2004

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21. Shilpa Kodkani	CEE WVU	Interface durability of externally bonded GFRP to normal and high-performance concrete	2004
22. Shiwei Luo	CEE WVU	Evaluations of concrete overlays for bridge deck application	2002
23. Jennifer Morris	CEE WVU	A comparative study of cracking and shrinkage of HPC mixtures for bridge decks	2002
24. Wenbo Zhang	CEE WVU	Exploratory study on HPC for bridge deck repair and new constructions	2001
25. Soumen Pal	Civil Engineering (CE), Jadavpur University (JU), India	Silica fume modified HPC with Special attributes for containment structures	2000
26. Abin Dey	CE JU	Silica fume modified high slump concrete for containment structure	1999
27. Rajiv Chatterjee	CE JU	Effect of silica fume on concrete made with Indian OPC and ASTM Type F and G superplasticizer	1998
28. Raja Chattopadhyay	CE JU	Effect of silica fume on latex-superplasticizer concrete	1997
29. Prodosh Sen	CE JU	High performance repairing material using ternary admixture systems	1996
30. Milan Mukhopadhyay	CE JU	Moderately high- strength fly-ash concrete	1989
31. Jagdish Mondal	CE JU	Use of superplasticizer for cement savings	1988
32. Gautam Basak	CE JU	High strength concrete using superplasticizer	1987

• **Ph.D./Post-doc Advisor/co-Advisor**

Name	Department & University	Topics	Year
1. Arkamitra Kar	CEE WVU He received “ASCE Freeman Fellowship” on this research topics	Characterizations of concretes with alkali-activated binder and correlating their properties from micro- to specimen level	Ph.D. 2013
2. Yi Chen		Accelerated ageing tests and long-term prediction models for durability of FRP bars in concrete	Ph.D. 2007
3. Zhiguo Gong	CEE WVU	Cracking Studies of High-performance Concrete for Bridge Decks	Ph.D. 2006
4. David Boyajian	CEE WVU	Mode I fracture and durability of CFRP –concrete interface bond	Ph.D. 2002

Curriculum Vitae -- Indrajit Ray

5. Santanu Bhanja	CE, JU	Influence of microsilica on the characteristics of HSC at different w/cm ratios and specimen size	Ph.D. 2002
6. Silvia Uchoa	University of Alagoa, Brazil	Conductance, Diffusion and Impedance of Concrete	Ph.D. as Visiting faculty 2006-2007
7. Chunfu Lin	CEE WVU	FRP concrete composites	Post-doc 2005-2007

• **Member of Graduate Student Advisory Committee (MS and Ph.D.)**

Name	Department	Degree	Year
1. Subhadeep Ghosh	CEE WVU	MS	2012
2. Fatemeh S. Imani	CEE WVU	MS	2010
3. Adam Justice	CEE WVU	MS	2010
4. Tapas Das	MINING WVU	Ph..D.	2010
5. Aramando Orabio	CEE WVU	Ph..D.	2010
6. Joseph Giampalo	CEE WVU	MS	2010
7. Mackenzie Murphy	CEE WVU	MS	2010
8. Adame Cornellis	CEE WVU	MS	2009
9. William Sacher	CEE WVU	MS	2008
10. Bin Zou	CEE WVU	Ph.D.	2008
11. Lauren Cullen	CEE WVU	MS	2007
12. Dan Brayack	CEE WVU	MS	2006
13. Lora B. Wolfe	CEE WVU	MS	2006
14. Andrew Hayes	CEE WVU	MS	2005
15. Nicholas Roberts	CEE WVU	MS	2004
16. Wesley D. Hevener	CEE WVU	MS	2004
17. Weiqiao Wang	CEE WVU	Ph.D.	2004
18. Sri H. Nallamothe	CEE WVU	MS	2003
19. Lili yang	CEE WVU	MS	2003
20. Junhui Jia	CEE WVU	Ph.D.	2002
21. Ramanand Nukula	CEE WVU	MS	2001
22. Rachel Christopher	CEE WVU	MS	2000

6.4 Technical Invited Presentations and Session Chair

Technical Presentations (Invited and Others)

1. Invited Faculty for Global Initiative of Academic Network to Conduct 1 week Course on Design and Application of FRP for Concrete Rehabilitations at NIT, Warangal, India, August , 2017
2. Invited speaker in North Eastern ASCE Chapter at Fort Wayne, IN- Cracking Studies of Bridge Decks and Fracture Evaluations, February 11, 2015, Fort Wayne, IN
3. Invited speaker in First International Collaboration Congress (ICC-1)- Advanced Materials for Construction and Rehabilitation of Civil Infrastructure, August12 - August 24, 2010, Guyanajuato, Mexico (2010)

4. Session Chair of 16th U.S. National Congress of Theoretical and Applied Mechanics, June 27 to July 2, 2010, State College, Pennsylvania, Session: Mechanics of Advanced Infrastructure Materials—II (2010)
5. Presented topics on Cracking of HPC at 19th ACBM/ NIST workshop at NIST, Gaithersburg, Maryland on 18th June (2008)
6. Chaired in session of ‘Advanced Materials, Structures and Mechanics – New Advances in the 21st Century’ of Earth and Space Conference 2008-ASCE Division, Long Beach, CA, March (2008)
7. Invited to chair the session of 18th Engineering Mechanics Division Conference (EMD-2007) at Virginia Tech (2007)
8. Presented invited papers in International conference on “Civil Engineering in the New Millennium: Opportunities and Challenges”, B E College, India (2007)
9. Invited member of International panel of advisers in International conference on Civil Engineering in the New Millennium: Opportunities and Challenges”, B E College, India (2007)
10. Invited member of International panel of advisers in International conference on Civil Engineering in the New Millennium: Opportunities and Challenges”, B E College, India, January (2007)
11. Chaired in session of “Interface Mechanics” at 18th ASCE Engineering Mechanics Division Conference (EMD-2007), Blacksburg, VA, June (2007)
12. “Microanalysis and Optimizations to Estimate C-S-H and CH for Cement Modified with Supplementary Cementitious Materials.” Presentation Only, Presented at the 21 NIST Computer Modeling Workshop, Gaithersburg, 2010
13. “Restrained Shrinkage Cracking of Self-Consolidating Concrete”, Short Paper, *Proceeding of 16th US National Congress of Theoretical and Applied Mechanics (USNCTAM 2010)*, State College, PA, 2010
14. “Repair of Concrete Beams Aged by Accelerated Corrosion using Externally Bonded CFRP Fabrics”, In Abstract, *2009 Joint ASCE-ASME-SES Conference on Mechanics and Materials*, Blacksburg, VA, 2009
15. “Some cracking studies for high-performance concrete for bridge decks”, Presentation Only, Presented at the 19th NIST Computer Modeling Workshop, Gaithersburg
16. “Comparative evaluations of self-consolidating concrete using West Virginia aggregates”, *Third North American Conference on Design and Use of Self-consolidating Concrete*, ACBM, Chicago, USA
17. “Characterization of Interface Properties of High-Performance Concrete Overlays and Normal Concrete Substrate”, *Advanced Materials, Structures and Mechanics -11th International Conference on Engineering, Science, Construction, and Operations in Challenging Environments, Aerospace Division of ASCE, Earth and Space Conference*, Long Beach, California, USA, March 3-5, 2008
18. “Combined Freeze-thaw and Deicing Salt Tests for High-performance Concrete”, *The First International Conference on Recent Advances in Concrete Technology*, Washington D.C., pp 241-252
19. “Overview of Advanced Concrete Materials Development for Bridge Decks of West Virginia”, *The First International Conference on Recent Advances in Concrete Technology*, Washington D.C., pp 583-597
20. “Early age curling and delamination behavior of overlays” *18th Engineering Mechanics Division Conference of ASCE*, Virginia Tech, Blacksburg, Virginia, USA, 2007
21. “Evaluations of fracture mechanics properties of high-performance concrete”, *18th Engineering Mechanics Division Conference of ASCE*, Virginia Tech, Blacksburg, Virginia, USA, 2007
22. “An Overview of Rehabilitation of Concrete Structures with Externally Applied FRP Composites”, *7th International Conference on Durability of Composite Systems*, Blacksburg, VA, 2006
23. “An Overview of Rehabilitation of Concrete Structures with Externally Applied FRP Composites”, *7th International Conference on Durability of Composite Systems*, Blacksburg, VA, 2006
24. “Durability Predictions for GFRP Reinforcing Bars in Concrete Environment”, *7th International Conference on Durability of Composite Systems*, Blacksburg, VA, 2006

7. Professional Memberships, Activities, and Services (Past 5 years are shown):

7.1 Membership in Committees, Professional Societies, Editorial Boards, Evaluator, and Reviewer

- Participating and voting members for the following ASTM committees and sub-committees (1)C09 Concrete and Concrete Aggregates; (2) C09.23 Chemical Admixtures; (3) C09.24 Supplementary Cementitious Materials; (4) C09.44 Polymer-Modified Concrete and Mortars; (5) C09.47 Self-Consolidating Concrete; and (6) C09.66 Concrete's Resistance to Fluid Penetration
- Life Member, Institution of Engineers
- Editorial Board Member of "The Open Construction and Building Technology Journal"
- International External Examiner of Ph.D. dissertation from IIT Guwahati in 2011
- International External Examiner of Ph.D. dissertation from IIT New Delhi in 2008
- International External Examiner of Ph.D. dissertation from Visvesvaraya Technological University, India in 2008
- Certification: Recognized as a "NRMCA Concrete Green Building Specialist", October 6, 2011 through October 6, 2016 after successfully completed the requirements for the National Ready Mix Concrete Association (NRMCA) Concrete Green Specialist Certification in September 2011
- Reviewer of research proposal from Mountain-Plains Consortium (MPC) university transportation center in the Federal Region-8 encompassing States; Colorado, North Dakota, South Dakota, Utah, and Wyoming
- Reviewer of four funding proposals from "Shota Rustaveli National Science Foundation, Georgia" with two each year in 2013 and 2011, and four funding proposals by "Georgian National Science Foundation" as expert of "High international Standing" in 2008 and 2009
- Reviewer of project proposal by Alberta Ingenuity Fund, Canada (www.albertaingenuity.ca) which supports science and engineering research of the highest caliber for internally competitive projects (2007)
- International Advisory Panel member of International Conference "Civil Engineering in the New Millennium: Opportunities and Challenges" in India (2007)

7.2 Professional Development Certifications and Webinars Attended (Past 5 years)

1. Webinar meeting for ASTM Committee Training on "Developing and Revisiting an ASTM Standard" (Registration ID# 860821 and Session number 791 222124), May 7, 2015
2. Webinar meeting on "ACI 237- Self Consolidating Concrete Committee Meeting" February 24, 2015
3. Certificate of completion on "Designing High-performance Parking Structures" Precast/Prestressed Concrete Institute, Chicago, IL 60606, June 17, 2014
4. Certificate of completion on "Resiliency: Surviving the Storm," Precast/Prestressed Concrete Institute, Chicago, IL 60606, March 27, 2014
5. Attended ACI 237 (Self consolidating concrete) committee webinar meeting, American Concrete Institute, April 23, 2014
6. Certificate of completion on "Discover High-Performance Precast," Precast/Prestressed Concrete Institute, Chicago, IL 60606, March 21, 2014
7. Certificate of completion on "Back to the Future: Relearning Passive Fire-Resistant Design," Precast/Prestressed Concrete Institute, Chicago, IL 60606, August 23, 2013
8. Certificate of completion on "It's the Law, High-Performance through Envelope Code Requirements," Precast/Prestressed Concrete Institute, Chicago, IL 60606, July 23, 2013