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Dr. Ram P. Bharti, *Associate Professor*

Ph.D. (IIT Kanpur, India), Post-Doc (University of Melbourne, Australia)

Department of Chemical Engineering	rpbharti@iitr.ac.in, rpbharti@gmail.com
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE	+91 1332 28 5304 (O), +91 94 106 94711 (M)
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	http://www.iitr.ac.in/~CH/rpbharti

Professional Experience

(a) Post-PhD Experience   (>8 years as on June 8, 2016)

★ **Apr 2016 - Present** **Associate Professor** I.I.T. Roorkee, India
⊛ *Department of Chemical Engineering*
⊛ Academics (Teaching and research supervisions to UG/PG and Ph.D. students)

★ **Sept 2009 - Apr 2016** **Assistant Professor** I.I.T. Roorkee, India
(6 years & 7 months)
⊛ *Department of Chemical Engineering*
⊛ Academics (Teaching and research supervisions to UG/PG and Ph.D. students)

★ **May 2007 - May 2009** **Post-Doctoral Research Fellow** University of Melbourne, Australia
(2 years)
⊛ *Department of Chemical & Biomolecular Engineering*
⊛ Academics (Research on "*electroviscous flow of Newtonian/non-Newtonian fluids through microchannels*". Mentor: Prof. M.R. Davidson

★ **Jan 2007 - Mar 2007** **Senior Project Associate** I.I.T. Kanpur, India
(3 months)
⊛ *Department of Mechanical Engineering*
⊛ Academics (Research project on "*Implementation of a subroutine to calculate the Non-Newtonian flux in the General Purpose Robust CFD Solver*". Mentor: Prof. V. Eswaran)

(b) Pre-PhD Experience   (6 years)

★ **Jul 2002 - Dec 2006** **Teaching Assistant/Doctoral Student** I.I.T. Kanpur, India
($4\frac{1}{2}$years)
⊛ *Department of Chemical Engineering*
⊛ Academics (Teaching assistant and research)

★ **Jul 2000 - Jan 2002** **Teaching Assistant/Masters Student** I.I.T. Bombay, India
($1\frac{1}{2}$years)
⊛ *Department of Chemical Engineering*
⊛ Academics (Teaching assistant and research)

Academic Profile

2006 **Ph.D.** *(Chemical Engineering)* . . . .
⊛ I.I.T. Kanpur, India
⊛ Thesis on "*Steady Flow of Incompressible Power-Law Fluids across a Circular Cylinder: A Numerical Study*" (Supervisors: Prof. R.P. Chhabra and Prof. V. Eswaran)
⊛ Thesis submitted: 26 Dec 2006; ⊛ Thesis defended: 07 May 2007

2002 **M.Tech.** *(Chemical Engineering)* . . . .
⊛ I.I.T. Bombay, India
⊛ Thesis on "*Monte Carlo Analysis of Molecular Weight Distribution of Vinyl Acetate Emulsion Polymers*" (Supervisors: Prof. H. Nanavati and Prof. K. Moudgalya)

2000 **GATE** *(Chemical Engineering)* . . . .

2000 **B.Tech.** *(Chemical Engineering, Spl. in Paper Technology)* . . . .
⊛ S.L.I.E.T Longowal, India
⊛ Central (Deemed) University (erstwhile affiliated to Punjab Technical Univ., Jalandhar)

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1997	**Diploma***(Chemical Technology, Spl. in Fertilizer Technology)* . . . .
	⍟ Government Polytechnic Budaun, India.
	⍟ Affiliated to Board of Technical Education, Lucknow, U.P.
1993	**High School***(Science Group)*
	⍟ Government Inter College Budaun, India.
	⍟ Affiliated to U.P. Board, Allahabad

Broad Research Interests

- ★ Computational Fluid Dynamics (CFD)

- ★ Microfluidics

- ★ Convective Hydrodynamics and Heat Transfer

- ★ Bluff bodies flow, Non-Newtonian fluid flow and Electrokinetic flow

- ★ Development of numerical algorithms for non-Newtonian flow simulations

Fellowships/Awards/Recognitions

2013	*Marquis Who's Who in the World.* Listed in 30th Pearl Anniversary Edition. Marquis Who's Who, Berkeley Heights, NJ. Nov 2012, ISBN: 978-0-8379-1150-2
2012	*IAO - Certified Faculty Member.* International Accreditation Organization, Houston, USA
2007-09	*Post-Doctoral Research Fellowship.* University of Melbourne, Australia
2006-07	*Cash Award (₹ 20,000)* for publications by students at I.I.T. Kanpur, India
2002-06	*MHRD Fellowship* during Ph.D. at I.I.T. Kanpur, India
2000-02	*MHRD Fellowship* during M.Tech. at I.I.T. Bombay, India

Research Publications

⊗ Kindly see **Annexure - I** (Page 7 of 19) for more details

★ In Refereed International Journals	29
★ In Conference Proceedings/Abstracts	22
★ Research Thesis	02

Research/Project Guidance

⊗ Kindly see **Annexure - II** (Page 12 of 19) for more details

★ Doctoral (Ph.D.) Thesis	05 (01 Completed + 04 In Progress)
★ Masters (M.Tech.) Dissertations	20 (18 Completed + 02 In Progress)
★ Undergraduate(B.Tech.) Minor Projects (one semester)	22 (17 Completed + 05 In Progress)
★ Undergraduate(B.Tech.) Major Projects (one year)	31 (25 Completed + 06 In Progress)

Sponsored Project and Industrial Consultancies

⊗ Kindly see **Annexure - III** (Page 16 of 19) for more details

	Completed	Under Progress	Funding (Rs. in Lakhs)
★ Research Projects	01	00	2.80+134 (applied)
★ Industrial Consultancy	01	00	0.85

Teaching Engagements

⊗ Kindly see **Annexure - IV** (Page 17 of 19) for more details

[A] Teaching Engagement @ IIT Roorkee	Theory	10 Course
	Practical	08 Course
[B] Teaching Assistantships	@ IIT Kanpur	04 Course
	@ IIT Bombay	02 Course

Research Skills

⊗ Kindly see **Annexure - V** (Page 19 of 19) for more details

* **CFD Solvers:** FLUENT, COMSOL, POLYFLOW, OpenFOAM, In-house solvers based on FVM, FEM and LBM

* **Numerical Methods:** Structured Finite volume method (FVM), Finite difference method (FDM), Lattice Boltzmann method (LBM), Meshless method, Deforming-Spatial-Domain/Stabilized-Space-Time (DSD/SST) method

* **Hands-on and Development Experience:**

  ⊛ Rheometer and viscometers handling experience

  ⊛ Developed a Deforming-Spatial-Domain/Stabilized-Space-Time (DSD/SST) finite element method in computation of non-Newtonian fluid flow and heat transfer with moving boundaries
    + One of the highly accurate method for complex fluid flow simulations
    + Moving and deformable boundary problems can be handle at very ease
    + Incorporates forced and mixed convection flow and heat transfer in Non-Newtonian fluids

  ⊛ FVM Solver for Newtonian flow in a lid-driven cavity (Prof. Eswaran's Research Group @ IIT Kanpur); further developed and extended as
    + Development of grid generation solver for flow across circular cylinder
    + Implementation of boundary conditions of channel confined and unconfined cylinder flow
    + Implementation of non-Newtonian power-law fluid viscosity model for Non-Newtonian flow and heat transfer

  ⊛ FVM (serial and parallel) Solver for electroviscous flows of Newtonian and non-Newtonian fluids through microchannels (Prof. Davidson's Research Group @ University of Melbourne)
    + Partial implementation of non-Newtonian Carreau-fluid viscosity model
    + Partial implementation of electrokinetics in permeable wall

  ⊛ Development of FDM algorithm and FORTRAN solver for electroviscous flow of power-law fluids through planner microchannels of circular and non-circular cross-sections (@ University of Melbourne)

  ⊛ **Programming Languages:** C/C++, FORTRAN, MPI, Parallel Programming, LaTeX, HTML, CSS, Javascript

  ⊛ **Operating Systems:** Windows and Linux

  ⊛ **Miscellaneous Tools:** MATLAB, Scilab, Mathematica, Maple, ASPEN, Tecplot, Origin

Professional Activities and Recognitions

* **Editorial Board Member**, International Journal of Aerospace Sciences, Scientific and Academic Publishing (SAP), California, USA. (Since Aug 2012).

* **Reviewer for International Journals:**

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1. AIChE Journal
2. Canadian Journal of Physics
3. Chemical Engineering Science
4. Industrial & Engineering Chemistry Research
5. Heat and Mass Transfer
6. ASME Journal of Fluid Engineering
7. Computational Thermal Sciences
8. Journal of Applied Fluid Mechanics
9. Physics of Fluids
10. American Journal of Fluid Dynamics
11. Indian Journal of Chemical Technology
12. Polymers for Advanced Technologies
13. Journal of Experimental Nanoscience
14. Int. Journal of Hydraulic Engineering
15. Journal of Nanomaterials
16. Int. Journal of Mechanics and Applications

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- ⋆ **Reviewer for International Conferences:** Chemeca 2008, EURECA 2013

- ⋆ **Reviewer/Examiner for Ph.D. Thesis:** University of Delhi (Malti Bansal, 2010)

- ⋆ **Examiner** for many M.Tech. dissertations and B.Tech. projects

Memberships of Professional Bodies

- ⋆ **Life Member** (LM-49655). Indian Institute Of Chemical Engineers (IIChE), Kolkata, India.

- ⋆ **IAO Certified Faculty Member** (2012). International Accreditation Organization, Houston, USA.

- ⋆ **Member** (#105527), International Association of Engineers (IAENG)

- ⋆ **Member**, IAENG Society of Chemical Engineering

- ⋆ **Member**, IAENG Society of Scientific Computing

- ⋆ **Member**, Alumni Association, Sant Longowal Institute of Engineering & Technology, Longowal

- ⋆ **Member**, Alumni Association, Indian Institute of Technology Bombay, Mumbai

- ⋆ **Member**, Alumni Association, Indian Institute of Technology Kanpur, Kanpur

Invited Seminars

- ⋆ National Chemical Laboratory (NCL) Pune, India (2006)

- ⋆ IIT Roorkee (2009, 2010, 2015)

- • IIT Delhi (2009)

- ⋆ DST New Delhi (2010) for Australia-India Strategic Research Fund (AISRF) project proposal

- ⋆ Lecture on "Electrokinetics in microchannel flow" in Faculty Development Programme on "*Advance Topics in Fluid Flow & Heat Transfer*" at Thapar University, Patiala. September 17-18, 2013.

Other Academic/Administrative Activities

- ⋆ **Faculty Coordinator** (Jan 2016 - Apr 2016), Academic Reinforcement Program (ARP), IIT Roorkee.

- ⋆ **Faculty Advisor, SC/ST Students** (Jan 2016 - Apr 2016), IIT Roorkee.

- ⋆ **Convener** (2016 - Present), Dr. B.R. Ambedkar Pragteesheel Manch, IIT Roorkee.

- ⋆ **Session Chair** (2015), Session on "Non-Newtonian flow", 42nd National Conference on Fluid Mechanics and Fluid Power (FMFP-2015), NIT Karnataka, Surathkal, India. December 14-16.

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- ⋆ **O.C. (Examination)** (Mar 2015 - Present), Department of Chemical Engineering, IIT Roorkee.

- ⋆ **Member** (May 2015 - Present), Department Academic Committee (DAC), Department of Chemical Engineering, IIT Roorkee.

- ⋆ **O.C. (CAD Centre)** (2014 - Present), Department of Chemical Engineering, IIT Roorkee.

- ⋆ **Faculty Advisor** (Aug 2014 - Present), 1st Year, B.Tech.(Chemical Engineering), IIT Roorkee.

- ⋆ **Warden** (June 2014 - Present), Rajendra Bhavan, IIT Roorkee.

- ⋆ **Member** (Apr 2014 - Present), Department Administrative Committee (DAC), Department of Chemical Engineering, IIT Roorkee.

- ⋆ **Member** (March 2013 - April 2015), Department Research Committee (DRC), Department of Chemical Engineering, IIT Roorkee, Roorkee, India.

- ⋆ **Joint Organizing Secretary**, *International Conference on Advances in Chemical Engineering* (ACE 2013), Feb 22 – 24, 2013. IIT Roorkee, Roorkee.

- ⋆ **Manager, Task Force** (December 2012 - Present), *Master Planning of Campuses*. IIT Roorkee, Roorkee.

- ⋆ **Member, Advisory Committee**, *International Congress on Engineering and Information* (ICEAI 2012), Aug 17 – 20, 2012. Beijing, China. http://www.iceai.org/

- ⋆ **Member, Advisory Committee**, Conference on Technical Advancements in Chemical and Environmental Engineering (TACEE 2012), Mar 23 – 24, 2012. Birla Institute of Technology & Science (BITS), Pilani.

- ⋆ **Member** (January 2011 - February 2013), Department Academic Committee (DAC), Department of Chemical Engineering, IIT Roorkee, Roorkee.

- ⋆ **Attended** workshop on "Complex Fluids & Microfluidics Workshop 2008 (CFMW08)" Sept 1–2, 2008. Organized by Australian Society of Rheology (ASR) at RMIT University Melbourne, Australia.

- ⋆ **Attended** "DST-SERC School-cum-Symposium on Rheology of Complex Fluids" Dec 10 – 15, 2006. Organized by Department of Chemical Engineering, IIT Kanpur.

- ⋆ **Member, Organizing Committee**, "CHEMFERENCE-2003": the first annual series of seminars presented by the research scholars of the department of chemical engineering, IIT Kanpur.

- ⋆ Chemical engineering department web site development and maintenance at IIT Kanpur (2003-2006).

Industrial Trainings

⋆ 1996	Kanha Vanaspati Limited, Ujhani, Budaun, India	(4 weeks)
⋆ 1998	Tata Chemicals Limited (Fertilizer Division), Babrala, Budaun, India	(6 weeks)
⋆ 1999	Indian Formers Fertilizers Cooperative (IFFCO) Ltd., Aonla, Bareilly, India	(6 weeks)

Personal Profile

⋆ Name (as in Passport)	Dr. Ram Prakash
⋆ Date of birth	07 April 1979
⋆ Natioanlity	Indian
⋆ Gender	Male
⋆ Marital Status	Unmarried

Languages Known

⋆ Hindi	Fluent	(Read, Write and Speak)
⋆ English	Fluent	(Read, Write and Speak)
⋆ Punjabi	Fair	(Read, Write)
	Poor	(Speak)

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References

⋆ **Prof. Raj P. Chhabra**
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Kanpur-208016, U.P., India
⊛ URL: http://www.iitk.ac.in/che/rpc.htm

✉: chhabra@iitk.ac.in,rpc1953@yahoo.com
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📟:

⋆ **Prof. V. Eswaran**
Department of Mechanical Engineering
Indian Institute of Technology Hyderabad
Yeddumailaram-502205, A.P., India
⊛ URL: https://sites.google.com/site/veswaraniith/

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⋆ **Prof. Malcolm R. Davidson**
Department of Chemical & Biomolecular Engg.
University of Melbourne
Parkville 3010, VIC, Australia
⊛ URL: http://www.chemeng.unimelb.edu.au/people/staff.php?person_ID=981

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⋆ **Prof. Dalton J.E. Harvie**
Department of Chemical & Biomolecular Engg.
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Parkville 3010, VIC, Australia
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FAX: +61 3 8344 4153
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Declaration

I herebye declare that all the information furnished above is true to the best of my knowledge and belief.

Dated: Place: Roorkee   (Ram P. Bharti)

Annexure - I: Research Publications

Summary:

[A] In Refereed International Journals	29
[B] In Conference Proceedings/Abstracts	22
[C] Research Thesis	02

[A] In Refereed International Journals

1. N. Mangadoddy, Ram Prakash, R.P. Chhabra and V. Eswaran (2004). *Forced convection in cross flow of power law fluids over a tube bank.* Chemical Engineering Science 59(11) 2213 – 2222.

2. R.P. Bharti, R.P. Chhabra and V. Eswaran (2006). *Steady flow of power-law fluids across a circular cylinder.* Canadian Journal of Chemical Engineering 84(4) 406 – 421.

3. P. Sivakumar, R.P. Bharti and R.P. Chhabra (2006). *Effect of power-law index on critical parameters for power-law flow across an unconfined circular cylinder.* Chemical Engineering Science 61(18) 6035 – 6046.

4. R.P. Bharti, R.P. Chhabra and V. Eswaran (2007). *A numerical study of the steady forced convection heat transfer from an unconfined circular cylinder.* Heat and Mass Transfer 43(7) 639 – 648.

5. R.P. Bharti, R.P. Chhabra and V. Eswaran (2007). *Steady forced convection heat transfer from a heated circular cylinder to power-law fluids.* International Journal of Heat and Mass Transfer 50(5-6) 977 – 990.

6. P. Sivakumar, R.P. Bharti and R.P. Chhabra (2007). *Steady flow of power-law fluids across an unconfined elliptic cylinder.* Chemical Engineering Science 62(6) 1682 – 1702.

7. R.P. Bharti, R.P. Chhabra and V. Eswaran (2007). *Two-dimensional steady Poiseuille flow of power-law fluids across a circular cylinder in a plane confined channel: wall effects and drag coefficients.* Industrial & Engineering Chemistry Research 46(11) 3820 – 3840.

8. R.P. Bharti, R.P. Chhabra and V. Eswaran (2007). *Effect of blockage on heat transfer from a cylinder to power-law liquids.* Chemical Engineering Science 62(17) 4729 – 4741.

9. R.P. Bharti, P. Sivakumar and R.P. Chhabra (2008). *Forced convection heat transfer from an elliptic cylinder to power-law fluids.* International Journal of Heat and Mass Transfer 51(7-8) 1838 – 1853.

10. R.C. Patil, R.P. Bharti and R.P. Chhabra (2008). *Steady flow of power-law fluids over a pair of cylinders in tandem arrangement.* Industrial & Engineering Chemistry Research 47(5) 1660 – 1683.

11. R.P. Bharti, D.J.E. Harvie and M.R. Davidson (2008). *Steady flow of ionic liquid through a cylindrical microfluidic contraction-expansion pipe: Electroviscous effects and pressure drop.* Chemical Engineering Science 63(14) 3593 – 3604.

12. R.C. Patil, R.P. Bharti and R.P. Chhabra (2008). *Forced convection heat transfer in power law liquids from a pair of cylinders in tandem arrangement.* Industrial & Engineering Chemistry Research 47(23) 9141 – 9164.

13. R.C. Patil, R.P. Bharti and R.P. Chhabra (2008). *Forced convection in cross flow of power-law fluid over a pair of circular cylinder in tandem arrangement.* ASME Proceedings 1(A & B) 207 – 215.

14. R.P. Bharti, D.J.E. Harvie and M.R. Davidson (2008). *Fully developed flow of power-law fluid through a cylindrical microfluidic pipe: pressure drop and electroviscous effects.* ASME Proceedings 1(A & B) 223 – 232.

15. M.R. Davidson, R.P. Bharti, P. Liovic and D.J.E. Harvie (2008). *Electroviscous effects in low Reynolds number flow through a microfluidic contraction with rectangular cross-section.* World Academy of Science, Engineering and Technology 2(4) 235 – 239.

16. M.R. Davidson, R.P. Bharti, P. Liovic and D.J.E. Harvie (2008). *Electroviscous effects in low Reynolds number flow through a microfluidic contraction with rectangular cross-section.* International Journal of Chemical, Molecular, Nuclear, Materials and Metallurgical Engineering 2(4) 40 – 44.

17. R.P. Bharti, D.J.E. Harvie and M.R. Davidson (2009). *Electroviscous effects in steady fully developed flow of a power-law liquid through a cylindrical microchannel.* International Journal of Heat and Fluid Flow 30(4) 804 – 811.

18. V.K. Patnana, R.P. Bharti and R.P. Chhabra (2009). *Two-dimensional unsteady flow of power-law fluids over a cylinder.* Chemical Engineering Science 64(12) 2978 – 2999.

19. A.T. Srinivas, R.P. Bharti and R.P. Chhabra (2009). *Mixed convection heat transfer from a cylinder in power-law fluids: Effect of aiding buoyancy.* Industrial & Engineering Chemistry Research 48(21) 9735 – 9754.

20. V.K. Patnana, R.P. Bharti and R.P. Chhabra (2010). *Two-dimensional unsteady forced convection heat transfer in power-law fluid from a heated cylinder.* International Journal of Heat and Mass Transfer 53(19-20) 4152 – 4167.

21. M.R. Davidson, R.P. Bharti and D.J.E. Harvie (2010). *Electroviscous effects in a Carreau liquid flowing through a cylindrical microfluidic contraction.* Chemical Engineering Science 65(23) 6259 – 6269.

22. J.D. Berry, M.R. Davidson, R.P. Bharti and D.J.E. Harvie (2011). *Effect of wall permittivity on electroviscous flow through a contraction.* Biomicrofuidics 5(4) 044102 – (17 pages).

23. A. Kumar, A.K. Dhiman and R.P. Bharti (2014). *Power-law flow and heat transfer over an inclined square bluff body: effect of blockage ratio.* Heat Transfer Asian Research 43(2) 167 – 196.

24. F.-B. Tian, R.P. Bharti and Y.-Q. Xu (2014). *Deforming-Spatial-Domain/Stabilized Space-Time (DSD/SST) method in computation of non-Newtonian fluid flow and heat transfer with moving boundaries.* Computational Mechanics 53(2) 257 – 271. (Selected and highlighted as Featured Article in Advances in Engineering, under the category of Mechanical Engineering, April 13, 2014).

25. K.M. Gangawane, R.P. Bharti and S. Kumar (2015). *Two dimensional lattice Boltzmann simulation of natural convection in differentially heated square cavity: effect of Prandtl and Rayleigh numbers.* Canadian Journal of Chemical Engineering 93(4) 766 – 780.

26. K.M. Gangawane, R.P. Bharti and S. Kumar (2015). *Lattice Boltzmann analysis of natural convection in a partially heated open ended enclosure for different fluids.* Journal of the Taiwan Institute of Chemical Engineers 49(-) 27 – 39.

27. K.M. Gangawane, R.P. Bharti and S. Kumar (2015). *Lattice Boltzmann analysis of effect of heating location and Rayleigh number on natural convection in partially heated open ended cavity.* Korean Journal of Chemical Engineering 32(8) 1498 – 1514.

28. K.M. Gangawane, R.P. Bharti and S. Kumar (2016). *Effects of heating location and size on natural convection in partially heated open ended enclosure by using lattice Boltzmann method.* Heat Transfer Engineering 37(6) 507 – 522.

29. R.P. Ram, R.P. Bharti and A.K. Dhiman (2016). *Forced convection flow and heat transfer across an in-line bank of circular cylinders.* Canadian Journal of Chemical Engineering 94(07) 1381 – 1395.

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[B] In Conference Proceedings/Abstracts

1. R.P. Bharti, A.K. Dhiman, S.D. Dhole, R.P. Chhabra and V. Eswaran. *Steady flow and forced convection heat transfer to non-Newtonian power-law fluids from heated complex geometries. CSChE 2005: 55th Canadian Chemical Engineering Conference*, Toronto, Ontario, Canada, October 16-19 (2005).

2. R.P. Bharti, R.P. Chhabra and V. Eswaran. *Forced convection heat transfer to non-Newtonian fluids from a heated circular cylinder. CHEMCON 2005: 58th Annual Session of the Indian Institute of Chemical Engineers*, IIT Delhi, India, December 14-17 (2005).

3. P. Sivakumar, R.P. Bharti and R.P. Chhabra. *Steady power-law flow over a circular cylinder. Recent Advances in Computational Mechanics and Simulations*, Vol. II, Paper No. 170, Pages 1254-1260 (2006). *(D. Maity & S. K. Dwivedy (Eds.), I.K. Int. Publishing House Pvt. Ltd., New Delhi, India). ICCMS-06: 2nd International Congress on Computational Mechanics and Simulations, IIT Guwahati, India. December 8-10, 2006.*

4. M.R. Davidson, R.P. Bharti, P. Liovic and D.J.E. Harvie. *Electroviscous effects in low Reynolds number flow through a microfluidic contraction with rectangular cross-section. Proceedings of World Academy of Science, Engineering and Technology (PWASET)*, Vol. 30, Pages 256-260 (2008). *FMHT 2008: 5th International Conference on Fluid Mechanics, Heat Transfer and Thermodynamics, Paris, France. July 4-6, 2008.*

5. R.C. Patil, R.P. Bharti and R.P. Chhabra. *Forced convection in cross flow of power-law fluids over a pair of circular cylinder in tandem arrangement. FEDSM-2008: ASME 2008 Fluids Engineering Division Summer Meeting*, Jacksonville, Florida, USA., August 10-14 (2008). *Paper No.: FEDSM2008-55056*

6. R.P. Bharti, D.J.E. Harvie and M.R. Davidson. *Fully Developed flow of power-law fluid through a cylindrical microfluidic pipe: pressure drop and electroviscous effects. FEDSM-2008: ASME 2008 Fluids Engineering Division Summer Meeting*, Jacksonville, Florida, USA., August 10-14 (2008). *Paper No.: FEDSM2008-55128*

7. M.R. Davidson, R.P. Bharti and D.J.E. Harvie. *Electroviscous effects in steady flow of a shear-thinning Carreau liquid through a microfluidic contraction. 2nd South-East European Conference on Computational Mechanics (SEECCM 2009). An IACM-ECCOMAS Special Interest Conf.*, Rhodes, Greece, June 22-24 (2009). *M. Papadrakakis, M. Kojic, V. Papadopoulos (Eds)*

8. Rajshekhar Mallaramu, P. Biswas and R.P. Bharti. *Modeling and simulation of different types of agglomerates in cathode catalyst layer of PEM fuel cells. CHEMCON 2011*, Bangalore, India, December 27-29 (2011). *Paper No. 548*

9. Krunal M. Gangawane, R.P. Bharti and S. Kumar. *Thermal lattice Boltzmann methods: a review. Conference on Technological Advancements in Chemical and Environmental Engineering (TACEE 2012)*, Birla Institute of Technology and Science (BITS) Pilani, India, March 23 – 24 (2012). *Paper No. O270*

10. Bhaskar Kumar, Voggu Vikas Reddy and R.P. Bharti. *Confined flow of power-law fluids across a pair of square cylinders in tandem arrangement. Communicated to 4th International Congress on Computational Mechanics and Simulations (ICCMS-12)*, IIT Hyderabad, India, December 10-12 (2012). *Paper No. 341*

11. Krunal M. Gangawane, R.P. Bharti and S. Kumar. *Thermal analysis of natural convection in differentially heated shallow cavities at different Rayleigh numbers by lattice Boltzmann approximation. Proceedings of CHEMCON 2012 (International Conference on Sustainable Technologies for Energy and Environment in Process Industries and Indo-US Joint International Conference on Energy and Environment)*, NIT Jalandhar, India, December 27-30 (2012). *Paper No. 311*

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12. K.M. Gangawane, R.P. Bharti and S. Kumar. *Lattice Boltzmann simulation of natural convection in partially differentially heated square enclosure. 22nd National and 11th International ISHMT-ASME Heat and Mass Transfer Conference 2013*, IIT Kharagpur, India, December 28-31 (2013). *Paper No. HMTC1300114*

13. R. Pravesh, R.P. Bharti and A.K. Dhiman. *Periodic fluid flow across an array of circular cylinders. Proceedings of International Conference on Advances in Chemical Engineering (ACE-2013)*, IIT Roorkee, India, February 22 - 24 (2013). *Paper No. ACE-2013-0147*

14. K.M. Gangawane, R.P. Bharti and S. Kumar. *Thermal analysis of natural convection in an enclosure containing heated square body by thermal lattice Boltzmann approximation. Proceedings of International Conference on Advances in Chemical Engineering (ACE-2013)*, IIT Roorkee, India, February 22 - 24 (2013). *Paper No. ACE-2013-0103*

15. R. Pravesh, A.K. Dhiman and R.P. Bharti. *Estimation of drag coefficient for the fluid flow through periodic array of cylinders. Proceedings of CHEMCON 2013*, Institute of Chemical Technology, Mumbai, India, December 27-30 (2013). *Paper No. FMC 051*

16. K.M. Gangawane, R.P. Bharti and S. Kumar. *Lattice Boltzmann computation of forced convection heat transfer from heated built-in square cylinder: effect of wall confinement. Proceedings of 5th International and 41st National Conference on Fluid Mechanics and Fluid Power (FMFP-2014)*, IIT Kanpur, India, December 12-14 (2014). *Paper No. FMFP-14-674*

17. R. Pravesh, R.P. Bharti and A.K. Dhiman. *Flow of non-Newtonian fluids through periodic array of circular cylinders. Proceedings of 5th International and 41st National Conference on Fluid Mechanics and Fluid Power (FMFP-2014)*, IIT Kanpur, India, December 12-14 (2014). *Paper No. FMFP-14-103*

18. K.M. Gangawane and R.P. Bharti. *Thermal lattice Boltzmann simulation of magneto-hydrodynamics (MHD) natural convection in partially heated and cooled enclosure. Proceedings of 42nd National Conference on Fluid Mechanics and Fluid Power (FMFP-2015)*, NIT Karnataka, Surathkal, India, December 14-16 (2015). *Paper No. FMFP-15-0159*

19. K.M. Gangawane and R.P. Bharti. *Two dimensional lattice Boltzmann simulation of non-Newtonian flow past a channel. Proceedings of 42nd National Conference on Fluid Mechanics and Fluid Power (FMFP-2015)*, NIT Karnataka, Surathkal, India, December 14-16 (2015). *Paper No. FMFP-15-0164*

20. J. Tomar and R.P. Bharti. *Characterization of flow regimes for shear thinning fluid flow across a channel confined circular cylinder. Proceedings of 42nd National Conference on Fluid Mechanics and Fluid Power (FMFP-2015)*, NIT Karnataka, Surathkal, India, December 14-16 (2015). *Paper No. FMFP-15-0241*

21. G. Vishal and R.P. Bharti. *Critical parameters for shear thickening fluid flow across a channel confined circular cylinder. Proceedings of 42nd National Conference on Fluid Mechanics and Fluid Power (FMFP-2015)*, NIT Karnataka, Surathkal, India, December 14-16 (2015). *Paper No. FMFP-15-0243*

22. N.V. Venkataramn, K.-P. Weiss, R.P. Bharti, H. Neumann and R. Ramalingam. *Strain calibration of substrate-free FBG sensors at cryogenic temperature. 6th EAI (European Alliance for Innovation) International Conference on Sensor Systems and Software*, Rome, Italy, October 26-27 (2015).

(C) Research Thesis

- **Ph.D. Thesis** (2006)   ⊛ *Submitted on* Dec 26, 2006 and ⊛ *Defended on* May 07, 2007
  Steady Flow of Incompressible Power-Law Fluids across a Circular Cylinder: A Numerical Study.

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⊛ Department of Chemical Engineering, IIT Kanpur, India.

⊛ Supervisors: Prof. R.P. Chhabra and Prof. V. Eswaran, IIT Kanpur

- **M.Tech. Thesis** (2002)

  Monte Carlo Analysis of Molecular Weight Distribution of Vinyl Acetate Emulsion Polymers.

  ⊛ Department of Chemical Engineering, IIT Bombay, India.

  ⊛ Supervisors: Prof. H. Nanavati and Prof. K. Moudgalya, IIT Bombay.

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Annexure - II: Research / Project Guidance

Summary

[A] Doctoral (Ph.D.) Thesis	05 (01 Completed + 04 In Progress)
[B] Masters (M.Tech.) Dissertations	20 (18 Completed + 02 In Progress)
[C] Undergraduate(B.Tech.) Minor Projects (one semester)	22 (17 Completed + 05 In Progress)
[D] Undergraduate(B.Tech.) Major Projects (one year)	31 (25 Completed + 06 In Progress)

[A] Ph.D. Thesis Guidance

1. Krunal Madhukar Gangawane   (Jul 2010 – Apr 2015)
   ⊛ *Convective flow and heat transfer analysis by using thermal lattice Boltzmann method.* (Co-supervisor: Prof. Surendra Kumar). Thesis submitted: December 19, 2014; Thesis defended: April 07, 2015

2. Vijay Kumar Verma   (Jan 2011 – Continuing)
   ⊛ *Meshless finite volume method for the complex fluid flow simulations..*

3. Ram Pravesh Ram   (July 2012 – Continuing)
   ⊛ *Periodic flow of newtonian and non-newtonian fluids over an array of circular cylinders.* (Co-supervisor: Prof. Amit K. Dhiman)

4. Abhishesk Kumar Lal   (July 2013 – Continuing)
   ⊛ *Unstructured finite volume method for the complex fluid flow and heat transfer in microfluidic devices.*

5. Akepogu Venkateshwarlu   (Jan 2016 – Continuing)
   ⊛ *....*

[B] M. Tech. Dissertation Guidance

1. P. Sivakumar   2006   *Flow past circular and elliptical cylinders: a numerical study.* (Guide: Prof. R.P. Chhabra)

2. Rahul C. Patil   2007   *Flow over two circular cylinders in tandem configuration: drag and heat transfer.* (Guide: Prof. R.P. Chhabra)

3. Avadhani T. Srinivas 2008   *Mixed convection from a circular cylinder to power-law liquid.* (Guide: Prof. R.P. Chhabra)

4. Vijaya K. Patnana   2008   *Momentum and heat transfer from a cylinder to power-law fluids in the unsteady flow regime.* (Guide: Prof. R.P. Chhabra)

5. P. Ramulu Rathod   2011   *Finite difference solution of electrokinetic flow through microfluidic pipe.*

6. Bhaskar Thota   2011   *Finite difference solution of electrokinetic flow through microchannel.*

7. Manish Bhatia   2011   *Steady flow of non-Newtonian fluids across an array of circular cylinders.*

8. Pratik D. Kakkar   2012   *Mixed convection heat transfer in unconfined flow of power-law fluids across a cylinder: effect of temperature and shear-dependent viscosity.*

9. Mayank Agarwal   2012   *Mixed convection heat transfer in Poiseuille flow of power-law fluids across a cylinder.*

10.	Vipin M. Rokade	2012	*Effect of opposing buoyancy on convective heat transfer from a cylinder to power-law fluids.*
11.	Aarti Kain	2013	*Effect of aiding buoyancy in confined flow of power-law fluid across a circular cylinder.*
12.	Sharad Tiwari	2013	*Convective flow of power-law fluids across a pair of tandem circular cylinder in confined arrangement.*
13.	Toshi Gupta	2013	*Effect of opposing buoyancy in confined flow of power-law fluids across a circular cylinder.*
14.	Vipin K. Sachan	2014	*Mixed convection heat transfer in confined flow of power-law fluid across a pair of tandem circular cylinders.*
15.	Shikha Verma	2014	*Electroviscous effects in shear flow of power-law fluid through a microchannel.* (partial supervison)
16.	Jyoti Tomar	2015	*Characterization of flow regimes for shear-thinning fluid flow across a channel confined circular cylinder.*
17.	Garima Vishal	2015	*Critical Parameters for shear thickening fluid flow across a channel confined circular cylinder.*
18.	Venkataraman N.V.	2015	*Preliminary investigation and simulation of fibre Bragg grating (FBG) cryogenic flowmeters..* (Co-Supervisor: Dr. R. Ramalingam, Institute of Technical Physics (ITEP), Karlsruhe Institute of Technology (KIT), Germany)
19.	Ashok Paliwal	201x	*Non-Newtonian fluid flow and heat transfer from a cylinder confined in irregular channel.*
20.	S. Aman Kumar	201x	*Non-Newtonian fluid flow and heat transfer from a cylinder confined in corrugated channel.*

[C] B. Tech. (Minor Project/Case Study*) Guidance

1.	Suhen Singhal	2010	
2.	T. Sivaram Reddy	2010	*Poiseuille flow of power-law fluids across a rotating circular cylinder.*
3.	Tarun S. Bhatia	2010	
4.	Himanshu Goyal	2011	*Lattice Boltzmann simulation of non-Newtonian fluid flow in a pipe.*
5.	Himanshu Agarwal	2011	
6.	Rajat G. Garia	2012	
7.	Shubham Khare	2012	... ...
8.	Ravi K. Chaudhary	2012	
9.	Rakesh Bhardwaj	2013	
10.	Raunak Kumar	2013	... ...
11.	Ronak Jain	2013	
12.	Anuj Kumar	2014	*Effect of temperature dependent viscosity on the hydrodynamic characteristics of a cylinder confined within the square cavity.*
13.	Anurag Anand	2014	*Hydrodynamic characteristics of power-law fluid flow across a cylinder confined within the square cavity.*

14.	Shubham Jain	2015	
15.	Saurabh Bharti	2015	… … … ….
16.	K.P. Vikas	2015	
17.	Sachin Kumar	2015	
18.	Shivansh Singh	2016*	
19.	Shobhit Gupta	2016*	… … … ….
20.	Shubham Gusain	2016*	
21.	Shubham Kumar Jain	2016*	
22.	Shyam Pratap Singh	2016*	

[D] B. Tech. (Major Project) Guidance

1.	Manas Gupta	2011	
2.	Arun Singh	2011	*Techno-economic feasibility analysis of a plant for the production of 500 TPD Fischer Tropsh liquid from Syngas (H2:CO – 2:1).* (Co-guide: Prof. Sri Chand)
3.	Shubham Sharma	2011	
4.	Ajay Kumar Meena	2011	
5.	Arkapol Basu	2011	
6.	Sahil Sood	2012	
7.	Saumya Agarwal	2012	*Techno-economic feasibility analysis of a plant for the production of Propylene from LPG.* (Co-guide: Prof. V.K. Agarwal and Prof. Shashi)
8.	Harshit Wadhwa	2012	
9.	D.S.S. Krishna Teja	2012	
10.	Rameshwari Ahriwar	2012	
11.	Sanjay K. Dudawat	2012	
12.	Voggu Vikas Reddy	2013	
13.	Bhanu K. Paliwal	2013	*Techno-economic feasibility analysis of a plant for the recovery of valuable olefins from FCCU off gas streams.* (Co-guide: Prof. Shishir Sinha)
14.	Priyanka Gupta	2013	
15.	Sandeep Kumar	2013	
16.	Utsav Marwaha	2013	
17.	Manav Bhati	2014	
18.	Himanshu Gupta	2014	*Techno-economic feasibility analysis of a plant for the production of sodium chlorate through electrolysis route using NaCl as a feedstock.* (Co-guide: Prof. Sri Chand)
19.	Tanuj Agarwal	2014	
20.	Alok Ratre	2014	
21.	Latil K. Patidar	2014	
22.	Jitendra K Prabhakar	2015	*Techno-economic feasibility analysis of a plant of 1.2 million TPA total recycle hydrocracker for maximizing middle distillates from vacuum distillation unit residue in a high sulphur heavy crude petroleum refinary.* (Co-guide: Prof. B. Prasad)
23.	Maanik Gupta	2015	
24.	Siva Sanhit Vaddiparthi	2015	
25.	Surya P Singh Solanki	2015	
26.	Faisal Saifi	2016	
27.	Ishtyaque Ahmad Ansari	2016	
28.	M. Satyam	2016	*100000 MTPA phenol production by toluene oxidation.*
29.	Mohit Goyal	2016	

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| 30. | Rahul | 2016 |
| 31. | Virendra Kumar Verma | 2016 |

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Annexure - III: Sponsored Project and Industrial Consultancies

[A] Sponsored Research Projects

	Project Title	Year	Investigators	Funding
1.	*Bluff body hydrodynamics of non-Newtonian fluids.* ⊛ **Funding Source:** Faculty Initiation Grant (Scheme A). Sponsored Research & Industrial Consultancy (SRIC), IIT Roorkee ⊛ **Ref. No.:** IITR/SRIC/886/F.I.G.(Scheme-A))	2010-13	R.P. Bharti	Rs. 2.80 Lacs
2.	*Continuous synthesis and aggregation study of metal nanoparticles in flexible microchannels.* ⊛ **Funding Source:** DST Nano-Mission (Proposal submitted) ⊛ **Ref. No.:** SR/NM/NS-1222/2015		G. Sharma, P.K. Jha, R.P. Bharti	Rs. 134 Lacs

[B] Industrial Consultancies

	Project Title	Year	Investigators	Funding
1.	*Opinions on phosphorus pentachloride (PCl_5) manufacturing process.* ⊛ **Funding Source:** Pharma Chemicals Industries (PCI), Plot 2811, GIDC, Sarigam - 396155, Valsad, Gujrat, India	2010	R.P. Bharti	Rs. 0.85 Lacs

Annexure - IV: Teaching Engagements

Summary

[A] Teaching Engagement @ IIT Roorkee	Theory	10 courses
	Practical	08 courses
[B] Teaching Assistantships	@ IIT Kanpur	04 courses
	@ IIT Bombay	02 courses

[A] Teaching Engagements @ IIT Roorkee Since 2009

⊛ **L**: Lectures   ⊛ **T**: Tutorials   ⊛ **P**: Practicals

⊛ **AS**: Autumn Semester (July - Dec)   ⊛ **SS**: Spring Semester (Jan - May)

	Subject Code and Title		*L-T-P*	*Session*	*Students*	*Level*
1.	*CHN-103*:	*Computer Programming and Numerical Analysis*	3-2-2	(i) 2013 (AS)	109	UG, 1st Yr
				(ii) 2014 (AS)	112	UG, 1st Yr
				(iii) 2015 (AS)	153	UG, 1st Yr
2.	*CHN-104*:	*Fluid Dynamics*	3-2-2	(i) 2014 (SS)	109	UG, 1st Yr
				(ii) 2015 (SS)	112	UG, 1st Yr
				(iii) 2016 (SS)	120	UG, 1st Yr
3.	*CH-205*:	*Fluid Dynamics*	3-2-2	(i) 2010 (AS)	71	UG, 2nd Yr
				(ii) 2011 (AS)	85	UG, 2nd Yr
				(iii) 2012 (AS)	80	UG, 2nd Yr
				(iv) 2013 (AS)	113	UG, 2nd Yr
4.	*CH-308*:	*Industrial Instrumentation*	2-0-0	(i) 2010 (SS)	54	UG, 3rd Yr
5.	*CH-310*:	*Chemical Engineering Lab - II*	0-0-3	(i) 2010 (SS)	54	UG, 3rd Yr
				(ii) 2011 (SS)	54	UG, 3rd Yr
6.	*CH-312*:	*Communication Skills*	0-0-4	(i) 2010 (SS)	54	UG, 3rd Yr
				(ii) 2012 (SS)	71	UG, 3rd Yr
7.	*CH-407*:	*In-Plant Training*	0-2-0	(i) 2009 (AS)	54	UG, 4th Yr
				(ii) 2012 (AS)	71	UG, 4th Yr
8.	*CH-423*:	*Process Integration (Elective)*	3-0-0	(i) 2011 (AS)	44	UG, 4th Yr
				(ii) 2012 (AS)	36	UG, 4th Yr
9.	*CH-426*:	*Advanced Numerical Methods (Elective)*	3-0-0	(i) 2012 (SS)	60	UG, 4th Yr
				(ii) 2013 (SS)	71	UG, 4th Yr
10.	*CH-504*:	*Process Simulators*	0-0-4	(i) 2011 (SS)	63	PG, 1st Yr
				(ii) 2012 (SS)	63	PG, 1st Yr
				(iii) 2013 (SS)	63	PG, 1st Yr
11.	*CH-507*:	*Computer Programming & Software Tools*	0-0-4	(i) 2010 (AS)	63	PG, 1st Yr
				(ii) 2011 (AS)	63	PG, 1st Yr
				(iii) 2012 (AS)	63	PG, 1st Yr
12.	*CH-560*:	*Process Intensification (Elective)*	3-1-0	(i) 2010 (SS)	14	UG, 4th Yr
13.	*CHN-561*:	*Computational Fluid Dynamics*	3-1-0	(i) 2014 (SS)	35	PG, 1st Yr
				(ii) 2015 (SS)	41	PG, 1st Yr
14.	*ICH-01*:	*Computational Fluid Dynamics (Institute Elective)*	3-2-0	(i) 2011 (SS)	45	UG, 4th Yr
				(ii) 2012 (SS)	60	UG, 4th Yr
				(iii) 2013 (SS)	69	UG, 4th Yr

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	Subject Code and Title		L-T-P	Session	Students	Level
15.	*MI-101*:	*Thermodynamics (Institute Core Course)*	2-1-0	(i) 2010 (AS)	118	UG, 1st Yr

[B] Teaching Assistantships

1. At **I.I.T. Kanpur, India** (2002-2006):

   ⊛ Heat and Mass Transfer Lab (ChE391, Instructor: Prof. J. P. Gupta)

   ⊛ Reaction Engineering Lab (ChE 491, Instructor: Prof. D. P. Rao)

   ⊛ Process Control Lab (ChE 492, Instructor: Prof. A. Khanna)

   ⊛ Departmental Web & Computers (Task Supervisor: Prof. V. Shankar)

2. At **I.I.T. Bombay, India** (2000-2002):

   ⊛ Thermodynamics (B. Tech. 2nd Yr course, Instructor: Prof. H. Nanavati)

   ⊛ Experimental and Computational Methods in Chemical Engineering (M. Tech. 1st Semester course)

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Annexure - V: Research Summary

Over the recent years, our research has been focused on the investigation of role of non-Newtoian fluid rheology on the hydrodynamics and heat transfer in model flow configurations such as bluff bodies and microchannels using the computational fluid dynamics (CFD) tools. The CFD tools/techniques utilized in our research work includes FLUENT, In-house FVM (finite volume method) based solvers, In-house FDM (finite difference method) based solver, In-house stabilized FEM (finite element method) based solvers, In-house LBM (Lattice Boltzmann) based solver (under development) and In-House Meshfree method solver (under development), etc. A brief overview of our research work is as follow:

⊛ **Recent Developments:**

Recently, a numerical method entitled "*Deforming-Spatial-Domain/Stabilized Space-Time (DSD/SST) method in computation of non-Newtonian fluid flow and heat transfer with moving boundaries*" has been developed. For more details, see DOI: 10.1007/s00466-013-0905-0

⊛ **Convective Hydrodynamics of Non-Newtonian Fluid Flow Across Bluff Bodies:**

The influences of non-Newtonian fluid rheology on the hydrodynamics of convective flow across bluff bodies have been elucidated for various model flow configurations including the confined/unconfined cross-flow over a single cylinder of circular and elliptical cross-sections and for the two circular cylinders in a tandem arrangement, etc. The appropriate forms of the equations of continuity, momentum and thermal energy in conjunction with non-Newtonian fluid viscosity model are solved using an finite volume method (FVM) based in-house CFD solver and using commercially CFD software (FLUENT). In particular, the influences of the non-Newtonian fluid rheology, flow governing parameters (Reynolds number, Prandtl number, buoynacy parameter) and geometrical flow configurations (confined/unconfined) on the detailed kinematics of flow (streamline, vorticity, pressure and isotherm contours; local pressure, local vorticity and local Nusselt number profiles) and global flow and heat transfer characteristics (individual and total drag coefficients and average Nusselt number) have been studied to gain physical insights into the nature of flow. The numerical results have been used to developed simple predictive closure relationship as a function of dimensionless parameters.

This information is essential to delineate the dead zones and local hot/cold regions which helps achieve uniform product quality especially during the thermal processing of temperature sensitive materials (such as polymers, food-products). Reliable values of the gross engineering parameters including drag coefficient and Nusselt number encompassing wide ranges of the flow governing parameters and non-Newtonian flow parameters are also needed in process design calculations.

⊛ **Microfluidics:**

In the field of microfluidics, our research has been primarily focused on the investigation of the electrokinetic effects in the pressure-driven flow of Newtonian/non-Newtonian fluids through electrically charged microfluidic devices (uniform and non-uniform microchannels) of different cross-sections by using an in-house computational fluid dynamics (CFD) solver, which is a hybrid solver based on the finite-difference and finite-volume methods. Governing flow equations, namely, Navier-Stokes equations in conjunction with electrical body forces and non-Newtonian fluid viscosity, Nernst-Planck equation and Poisson-Boltzmann equation have been solved to investigate the electroviscous effects (i.e., influence of the uniformly charged microchannel wall and the Debye parameter) and role of non-Newtonian fluid rheology on the flow field (i.e., flow patterns, electrical potential field, ion concentrations field), pressure drop and apparent viscosity in the electrolyte liquid flow at low Reynolds numbers.

It is important to know this information as the microchannel flow characteristics deviates from the macroscale flows due to the increasing importance of surface-based phenomena (capillary, wetting, surface tension, electrokinetic effects) and rarefaction effects (velocity slip and surface temperature jump) at micrometer scales, the relative importance of the forces that can influence fluid flow is different at the length scales of these devices (typical characteristic length 10 to 200 μm). Therefore, an understanding of liquid flow characteristics is a pre-requisite for the successful optimal design and precise control of the microfluidic devices for their ability to transport, manipulate and process fluids (generally aqueous based solutions) at very small scales.