

Ranjeet Kumar

CONTACT INFORMATION	1415 Engineering Drive, Madison, WI 53706	Email: rkumar32@wisc.edu Web: https://www.researchgate.net/profile/Ranjeet_Kumar26
RESEARCH INTERESTS	Control, Scheduling, Energy Systems	
EDUCATION	University of Wisconsin-Madison , Madison, WI Doctor of Philosophy, Chemical and Biological Engineering Advisors: Prof. Victor Zavala, Prof. Christos Maravelias GPA: 4.0/4.0 Indian Institute of Technology Bombay , Mumbai, India Bachelor of Technology with Honours, Chemical Engineering GPA: 9.00/10	Sep '15 - Present Jul '10 - Aug '14
INTER-NATIONAL WORKSHOP	11th Indo-German Winter Academy, CSIR-CMERI Durgapur, India <ul style="list-style-type: none">Represented IIT Bombay at the 11th Indo-German Winter Academy organized by University of Erlangen-Nürnberg and IIT Kharagpur. Presented a seminar on ‘The Derivations of the Navier-Stokes Equations’ to an international panel of 5 professors and 16 students.	Dec '12
RESEARCH EXPERIENCE	Stability of Freely Falling Liquid Curtains FMP Technology GMBH, Erlangen, Germany <i>Guide:</i> Prof. F. Durst, CEO, FMP Technology and Professor Emeritus, FAU Erlangen-Nürnberg <ul style="list-style-type: none">Investigated the stability of downward-falling liquid film flows which find application in curtain-coating mode to coat thin liquid films on plane substrates.Film thickness, velocity and mass flow rate of a downward facing liquid film were measured, starting close to the exit of a slot die producing the liquid film. The die was constructed to produce a “slot-guided” fluid flow from the slot inlet down to the exit, resulting in a parabolic velocity profile, before it turns into the falling film.The stability of the falling film was tested with and without side-guides. A “super-stability” was observed that allowed “stable films” to be produced at mass flow rates below the Brown-Taylor criterion¹. Quantified the minimum mass flow rate for producing “stable curtains” by steadily lowering the flow rate up to verge of instability.Developed an analytical explanation for the “super-stability” of the liquid film that the surface tension forces between the side guides and the fluid provide the extra stability to the curtain. Hofmeister Effect of Ions on Polymer-surfactant Complexation Hindustan Unilever Ltd. R&D Center, Bangalore, India <i>Guide:</i> Dr. S. J. Suresh, Global R&D Director, Superior Cleaning Systems, Unilever <ul style="list-style-type: none">Hofmeister effect² of ions involves salting-out and salting-in of inter-polymer complexes (IPCs), however little is known on the effect of salts on polymer-surfactant complexes (PSCs). The study investigated complexation characteristics of a PSC of Poly-acrylic Acid and Brij35 in presence of NaSCN, NaCl, NaI and Na₂SO₄ respectively.Determined the solubility points based on turbidity measurements to study phase behavior of the PSC in presence of salts. Plotted solubility charts for the PSC to determine the degree of salting-out and salting-in in the presence of respective salts.Studied the effects of water re-structuring on solubility and hydrophobicity of the PSC. Employed fluorescence spectroscopy to study the changes in hydrophobicity of the micro-environment of PSC caused by the electrolyte ions.	May '13 - Jul '13 May '12 - Jul '12

¹D. R. Brown, Journal of Fluid Mechanics, 1961

²Y. Zhang, P. S. Cremer, Current Opinion in Chemical Biology, 2006

Biodiesel Production from Waste Vegetable Oil

May '11 - Apr '12

Project Biosynth, Department of Chemical Engineering, IIT Bombay

Guide: Prof. Sanjay Mahajani, IIT Bombay

- With the vision of meeting the campus energy needs, this project was initiated by a team of students to design and install a self-sustained biodiesel plant, with a capacity of 250 L/batch.
- R&D - Planned R&D works to find optimum oil-methanol ratio in transesterification step to maximize conversion of triglycerides to biodiesel.
- Plant Commissioning - Participated in the commissioning of Biodiesel Plant set up in the institute campus. Performed hydro and pressure-test of equipments and pipelines in the plant.
- First Plant Run - Conducted the first biodiesel plant run in the campus in February 2012. First batch successfully produced 150 liters of biodiesel from waste vegetable oil.
- Life Cycle Assessment - Prepared a detailed LCA report for comparison of biodiesel and diesel, presented at Industrial Green Chemistry World 2011 in Mumbai.

INDUSTRIAL
EXPERIENCE**Graduate Engineering Trainee, Reliance Industries Ltd., Hazira**

Jul '14 - Jun '15

Guide: Dhanraj Javare, RIL Hazira Manufacturing Division

- Completed the induction programme for GETs; undertook Safety and Fire Training for working at a petrochemicals and polymers manufacturing site and visited many plants to understand the on-site manufacturing processes.
- Acquired On-The-Job Training in Vinyl Chloride Monomer Plant at RIL Hazira. Got introduced to plant specific emergency and safety systems and studied the Process Flow Diagrams and Piping & Instrumentation Diagrams. Future job includes study of the operating manuals, understanding the control systems and to acquire field training.

ACADEMIC
PROJECTS**Butyl Acetate Plant Design**

Jan '14 - Apr '14

Guide: Prof. Ranjan K. Malik and Prof. Ravi D. Gudi, IIT Bombay

- Designed a conceptual flowsheet for butyl acetate synthesis based on extensive literature survey on industrial manufacturing technologies. Introduced process intensification by reactive distillation for improved conversion in equilibrium-limited reaction and saving capital costs.
- Simulated the flowsheet in ASPEN Plus by identifying optimum process parameters. Performed multivariable parametric sensitivity analysis and detailed economic analysis of the plant.
- Our project was selected as the best UG Design Project for its novelties and is to be presented at Chemcon, the annual session of Indian Institute of Chemical Engineers.

Pole Placement Controller for a Single Board Heater System

Jan '14 - Apr '14

Guide: Prof. Kannan M. Moudgalya, IIT Bombay

- As part of Digital Control course project, performed numerous virtual experiments on the Single Board Heater System (SBHS) hosted on IIT Bombay servers. SBHS is a Multiple Input Single Output (MISO) system with two inputs - heating rate and fan speed, and a single output - temperature.
- Carried out system identification using optimization tool in Scilab, modeling the SBHS as a Single Input Single Output (SISO) system with fan speed kept constant during experiments. Implemented a robust Pole Placement Controller on the SBHS to control its temperature at a desired steady state by manipulating heating rate at constant fan speed.

Multivariate Data Modeling

Feb '13 - Apr '13

Guide: Prof. Mani Bhushan, IIT Bombay

- Developed a model for predicting salaries of baseball pitchers in Major League Baseball by incorporating multivariate statistical data handling techniques in MATLAB. Past data of pitchers performance statistics, teams performance statistics and salaries were provided. Processed and split these data for model estimation and model validation.
- Used multivariate linear regression to build the model and predict future salaries. Validated performance of the model after removing outliers and demonstrated it with residual plots.

EXTRA-
CURRICULAR
ACTIVITIES

- **Volunteering** - Volunteer of Asha for Education-Madison Chapter, a non-profit voluntary organization dedicated to bring socio-economic change in India using the medium of education.
- **Coordinator, Techfest 2012** - Conducted the competition The Amazing Race during Techfest 2012, the annual science and technology festival of IIT Bombay.
- **Coordinator, Mood Indigo 2011** - Responsible for infrastructural and executional support for events held at Lecture Hall Complex during Mood Indigo 2011, the annual cultural festival of IIT Bombay. Finalized the deal with an LED company as the LED partner of Mood Indigo.
- **Sports** - Represented the hostel for Hockey in the Freshers' Inter-Hostel Sports Tournament in 2010 and Sophomores' Hockey General Championship in 2011.
- **Literary Arts** - Participated in various quizzes organized as part of the Institute Quiz League by the Institute Literary Arts Club, also won the 1st place in Sports Quiz in 2010.