

# THEHAZHAN K. PONNAIYAN

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## OBJECTIVE

Aiming to advance knowledge through excellence in learning, discovery and engagement, by working in a challenging and synergistic student-centered, community-driven and industry-partnered teaching and research environment.

## EDUCATION

### **Ph.D. (Chemical Engineering)**

The University of Toledo, Ohio, USA (*CGPA: 4.0/4.0*)

Fall 2016

### **M.S. (Advanced Chemical Engineering)**

Imperial College, London, UK (Overall Performance: *Distinction*)

Sept 2006

### **M.B.A. (Entrepreneurship & Economic Forecasting)**

Cardiff University, Cardiff, UK (Overall Performance: *Distinction*)

Sept 2004

### **B.Tech. (Chemical Engineering)**

Anna University, Chennai, India (Overall *GPA: 9.3/10*)

May 2003

## TEACHING EXPERIENCE

### **Lecturer - Department of Chemical Engineering, University of Toledo**

2015-

### **Lab Courses:**

#### **Chemical Engineering Laboratory I (CHEE 4500)**

#### **Chemical Engineering Laboratory II (CHEE 4550)**

- An experimental study of the design and performance of selected chemical engineering process equipment, with emphasis on heat transfer, mass transfer, fluid mechanics, separations, reaction kinetics, and process control.
- Practical application of theory in mathematics, science, and engineering in a lab setting.
- Maintenance of lab equipment and instruments.
- Development of new experiments that involve **designing** (Solidworks®) and **3-D printing** chemical engineering unit operations.

### **Theory Courses:**

#### **Chemical Engineering Process Economics & Design I (CHEE 4520)**

- Fundamentals of chemical equipment and process design
- Introduction to simulation and flow-sheeting techniques and software (Aspen plus).
- Plant safety and ethics.
- Market analysis, cost estimation, decision-making, and cash flow analysis.

#### **Introduction to Engineering, Chemical Engineering Module (MIME 2980)**

- Fundamentals of chemical engineering taught to high school seniors for college credit.
- Combination of lectures, discussions, and simple lab experiments.

#### **Chemical Engineering Thermodynamics II (CHEE 2330)**

- Building up on fundamentals from Thermodynamics I.
- Theories and models of phase equilibria.
- Fundamentals of chemical reaction equilibrium.

### **Mass and Energy Balance (CHEE 2010)**

- Introduction to the principles and techniques used in chemical engineering.
- Basic concepts of mathematics, physics, and chemistry are applied to solving problems involving stoichiometry, material balances, and energy balances.

### **Professional Development (CHEE 1010)**

- Social protocol and ethics in industry.
- Resume writing, oral presentation and interview skills in preparation for the Co-Op experience.
- Review of resource materials for technical and non-technical individual learning.

### **Graduate Teaching Assistant – Dept. of Chemical Engineering, University of Toledo**

**2007-08**

#### **Chemical Engineering Thermodynamics I (CHEE 2230)**

#### **Process Dynamics and Control (CHEE 3400)**

#### **Chemical Process Economics and Design (CHEE 4520)**

#### **Chemical Engineering Laboratory II (CHEE 4550)**

- Weekly office hours to answer student questions.
- Customized tutoring/classroom sessions for students outside of office hours, upon request.
- Graded homework, tests and projects.
- Assisted in providing instructions on how to conduct different lab experiments.

### **Expertise in Novel Pedagogy Methods**

#### **Video Coding for Project-Based Science (PBS) – Judith Herb College of Education, University of Toledo**

**2012-13**

- Developed, formatted and edited supplemental online teaching resources for the companion website of the text book "Teaching Science in Elementary and Middle School - A Project-Based Approach." Video documentation of science classroom teaching practices; Greenhills School, Ann Arbor, MI.
- Transcribed and coded 2 semesters of classes using NVivo 9, based on key attributes of Project-Based-Science (PBS).

#### **Co-Instructor for Skills Building Workshop - Judith Herb College of Education, University of Toledo**

**2012**

- Conducted summer workshop for teacher leaders from public and private schools in the Toledo area.
- Provided training in analyzing PBS classroom teaching methods and developing lesson plans.

#### **Graduate Teaching Assistant – Judith Herb College of Education, University of Toledo**

**2012**

#### **Project-Based Science CI 5890 (LEADERS\*) and CI 5980 (IMPACT#)**

- Teaching teachers how to teach science using a project-based approach
- Setting up and maintaining the science lab as well as outdoor experiments for teacher leaders.
- Demonstrated science lab experiments and evaluated class projects.
- \*LEADERS - Leadership for Educators: Academy for Driving Economic Revitalization in Science (NSF grant)
- #IMPACT - Inquiry Masters Program for Teachers Advancing Content (U.S. Dept. of Education grant)

#### **Basic Educational Psychology: Science Leadership & Professional Development Design (EDP 7110)**

- Evaluated projects and class presentations.
- Maintained a record of attendance and grades.

### **RESEARCH EXPERIENCE**

#### **Research Assistant – The University of Toledo, Ohio**

**2008-12**

#### *Aspects critical to advancing IL pretreatment technique for lignocellulosic biomass conversion*

- Pretreatment of biomass with ionic liquids followed by enzymatic hydrolysis.
- Recovery and recycle of ionic liquids: thermodynamic aspects, and design of separation equipment.
- Characterization of lignocellulosic biomass substrates and lignin residues.

*Effect of porosity & yield strength on the dissolution rate of tablets & granules*

- Formulation of food (flavor cubes) & pharmaceutical products (fever suppressers)
- Characterization of prepared samples (porosity & yield strength), and assessment of dissolution rates.

**Research Assistant – Cardiff University, Cardiff, UK***Importance of personnel management for Total Quality Management (TQM) in manufacturing units*

- Case studies in chemical and automobile manufacturing units
- Extensive surveys (opinion poll, questionnaires, and personal interviews)
- Assessment of organizational structure & its impact on work efficiency & group dynamics.

**PUBLICATIONS & PRESENTATIONS**

- Thehazhnan Ponnaiyan, Constance Schall and Sasidhar Varanasi, “Recovery of ionic liquid following biomass pretreatment: a novel method for VLE data generation for evaporative separation” Industrial & Engineering Chemistry Research, 2016, publication pending.
- Thehazhnan Ponnaiyan and Sasidhar Varanasi, “Isolation and characterization of High Quality Lignin from IL Pretreated Biomass Using New Generation Enzymes” 33<sup>rd</sup> Symposium on Biotechnology for Fuels and Chemicals, SIM, May 2-5, 2011, Seattle, WA.
- Akin Shittu, Thehazhnan Ponnaiyan and Sasidhar Varanasi, “Catalytic Conversion of Hemicellulose Sugars to Furfural in Ionic Liquid Media” AICHE Conference, Nov 7-12, 2011, Salt Lake City, UT.
- Thehazhnan Ponnaiyan and Sasidhar Varanasi, “Integrated biorefineries: Isolation of Lignin from IL Pretreated Biomass for the Production of Value Added Lignin By-Products” AICHE Conference, Nov 7-12, 2010, Salt Lake City, UT.
- Thehazhnan Ponnaiyan and Sasidhar Varanasi, “Performance of New Generation of Cellulase Enzymes in Combination with Esterases on IL Pretreated Corn Stover” 32nd Symposium on Biotechnology for Fuels and Chemicals, SIM, Apr 19-22, 2010, Tampa, FL.
- Thehazhnan Ponnaiyan, Constance Schall and Sasidhar Varanasi, “An Assessment of the Recovery and Recycle of Ionic Liquids (ILs) Following Lignocellulosic Biomass Pretreatment” AICHE Conference, Nov 8-13, 2009, Nashville, TN.
- Thehazhnan Ponnaiyan, Constance Schall and Sasidhar Varanasi, “Evaporative Separation of Ionic Liquid following Biomass pretreatment: Generation of Required Thermodynamic Data” AICHE Conference, Nov 8-13, 2009, Nashville, TN.
- Thehazhnan Ponnaiyan, Constance Schall and Sasidhar, “Pretreatment of Lignocellulosic Biomass using Ionic Liquids for Production of Ethanol” 31st Symposium on Biotechnology for Fuels and Chemicals, SIM, May 3-6, 2009, San Francisco, CA.
- Fei Zhao, Thehazhnan Ponnaiyan, Constance Schall, Sasidhar Varanasi and Jared Anderson, “Determination of Ethanol in Ionic Liquids Using Headspace Solid-Phase Microextraction-Gas Chromatography” Analytical & Bioanalytical Chemistry, Vol. 392 (7-8), Dec 2008, pp.1271-1275.
- Dharmendra M, Ponnaiyan T and Rajendran M, “Free radical polymerization of methyl methacrylate in the presence of phase Transfer Catalyst” *International Journal of Polymeric Materials*, Vol.53 (1), Jan 2004, pp.95-103.

**INSTRUCTIONAL SOFTWARE SKILLS**

Aspen Plus, Solidworks, Design Expert, Minitab, SPSS, Unix, NVivo, Atlas.

**ANALYTICAL & EXPERIMENTAL EXPERTISE**

- Chromatographic Techniques: Fourier Transform Infrared Spectroscopy (FTIR), Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC), Solid Phase Micro-Extraction (SPME) with GC, Gel Permeation Chromatography (GPC).
- Spectroscopic Techniques: Mass Spectroscopy (MS), Nuclear Magnetic Resonance (NMR), Ultra Violet (UV) Spectroscopy.
- Thermo Analytical Techniques: Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC).
- Others: X-Ray Diffraction (XRD), Karl Fisher Titration.

## **INDUSTRIAL WORK EXPERIENCE**

### **Marketing Manager – Amougaa Tradelink Inc., Dubai, U.A.E.**

**2004–05**

- Consumer products, metal scrap and iron ore trading.
- International customer liaison officer.

### **Process Engineer & Signatory Director- EFFAA Healthy Life Pvt. Ltd., Chennai, India**

**2003-**

- Floor supervisor, modified-starch manufacturing division.
- Partial computerization of process flow & troubleshooting operations.

## **HONORS**

- International Student of the Year Award, University of Toledo (2010-11).
- 1st rank, Department of Chemical & Environmental Engineering, University of Toledo, (2007-).
- Outstanding Teaching Assistant (TA) Award, University of Toledo (2007-08).
- Shell Centenary Chevening Scholarship Recipient, Imperial College (2005).
- Won several awards in research conferences. Notable awards include:
  - UT Midwest Graduate Research Symposium – 1<sup>st</sup> Place (2011).
  - Cleveland State Interdisciplinary Research Conference (CSIRC)– 1<sup>st</sup> Place (2010).
- Won several interschool and state-level awards in painting, sketching, and essay writing (English and French).

## **LEADERSHIP ACTIVITIES**

- Faculty Advisor, Asha for Education, Toledo Chapter, (2015-).
- Co-founder, Ohio Board of Engineering Graduate Students, (2011-).
- President, Graduate Student Association, (University of Toledo, 2009-10).

## **LANGUAGES**

English, Tamil, French.

## **COMMUNITY SERVICE**

Consistent blood donor: donated 36 units of blood till date.