

IPRO

It takes a team

INTERPROFESSIONAL PROJECTS PROGRAM

IPRO

Spring 2009 Interprofessional Projects Day

09

1995-2009



ILLINOIS INSTITUTE OF TECHNOLOGY

The IIT Interprofessional Projects (IPRO®) Program

An emphasis on multidisciplinary education and cross-functional teams has become pervasive in education and the workplace. IIT offers an innovative and comprehensive approach to providing students with a real-world project-based experience—the integration of interprofessional perspectives in a student team environment. Developed at IIT in 1995, the IPRO program consists of student teams from the sophomore through graduate levels, representing the breadth of the university's disciplines and professional programs. Projects crystallize over a one- or multi-semester period through collaborations with sponsoring corporations, nonprofit groups, government agencies, and entrepreneurs. IPRO team projects reflect a panorama of workplace challenges, encompassing research, design and process improvement, service learning, the international realm, and entrepreneurship.

IPRO Day

The work of the IPRO teams culminates in the IPRO Day event, which celebrates the students' accomplishments through presentation and exhibit. Held each year in the spring and fall, IPRO Day showcases projects from the current semester, giving members of the IIT community and invited guests the opportunity to speak with the teams about their projects. The teams are evaluated throughout the day by a panel of professionals, faculty, and graduate students, with winners receiving awards of recognition for their efforts.

Spring 2009 IPRO Projects

IPRO 302 Analysis of Water Recovery from Power Plants for Recycling	3
IPRO 303 Operational Considerations in Wind Power Generation: Cost Impact of Equipment Failures and Opportunities for Improved Performance	3
IPRO 304 Innovating Process Improvements in Manufacturing Operations	4
IPRO 306 Value Stream Analysis of the Global Supply Chain for a Plumbing Systems Manufacturer	4
IPRO 307 Intermodal Container Transport System Solutions for the Chicago Region	5
IPRO 309 Educational and Technical Support of Orthotics and Prosthetics Training Programs in Latin America and the United States	5
IPRO 310 Assistive Devices for Blind Swimmers and Other Exercise Activities	6
IPRO 311 IIT Sustainability Branding	6
IPRO 312 Commercial-Scale Composting at IIT	7
IPRO 314 Integrating Building Greening, Adaptive Reuse, and Alumni Social Networking for Queen of Peace High School	7
IPRO 315 Design of a Large-Scale Structure	7
IPRO 316 Design of a Biofuels (Biodiesel and Bioethanol) Production Facility for Renewable-Energy Generation	8
IPRO 317 Silver Nanoparticles as Indicators of Thermal History	8
IPRO 318 Electrode Design for Fuel Cells	8
IPRO 319 New Technologies to Serve Cardiac Arrest Victims	9
IPRO 320 Socio-Professional Networking: Online Teachers Community	9
IPRO 321 Increasing Computer Science Awareness in High Schools and Colleges	10
IPRO 323 Developing a Next-Generation Occupant Engagement System	10
IPRO 324 Power Measurement for Road Bicycles: Toward a Universal Solution	10
IPRO 325 Developing Affordable Water, Energy, and Shelter Solutions for the World	11
IPRO 326 The Modern Business Utility Model for IIT	11

IPRO 327 A Geographically Searchable Local News Aggregator	12
IPRO 328 School Green: Church and School Energy Evaluations.....	12
IPRO 330 Dynamic and Contemporary Science Fair Projects in Chicago Public Schools.....	12
IPRO 331 Global Warming: Study and Community Outreach	13
IPRO 332 Our Energy Future: Multi-Media Education Modules for the High School Classroom	13
IPRO 333 Fab Lab: Creating Design-Prototype Learning Modules at the Museum of Science and Industry.....	13
IPRO 334 Robotic System Applications to Elderly Living Environments	14
IPRO 335 Green Building Design Concepts and Integration	14
IPRO 336 Building Consumer Awareness and Preference for Safe Foods: Creating and Testing a Marketing Strategy for Pasteurized Eggs	14
IPRO 337 Zero-Energy Lab	15
IPRO 338 Web Application for Electrical Contractors for LEED Building Projects.....	15
IPRO 339 Innovating Affordable Shipping Container Housing in Chicago	16
IPRO 340 Design of a Green Community Health Center of the Future	16
IPRO 341 Design and Global Market Analysis of a Tool Product.....	17
IPRO 342 Development of a Real-Time Information System	17
IPRO 343 Improving Communication Quality of the Drive-Thru Experience	17
IPRO 344 Audio Quality and Energy Efficiency for Mobile Devices and Intercoms.....	18
IPRO 345 Logistics and Information Systems to Achieve Process Improvements (Operation Smooth Brews).....	18
IPRO 346 Engine Flywheel Market Research and Business Strategy Development	18
IPRO 349 Solid Corn-Waste Fuel for Cogeneration	19
IPRO 350 Environmental Wood Reclamation Via Creative Arts and Crafts Products (An Entrepreneurial IPRO Project)	19
IPRO 351 Motion Track Studios	20
IPRO 353 Tummi Pals Learning Dolls	20
IPRO 354 eMotion: Wirelessly Conveying Emotion (An Entrepreneurial IPRO Project).....	20
IPRO 355 Enhanced Vision System for Construction Site Safety (An Entrepreneurial IPRO Project)	21

IPRO 302

Analysis of Water Recovery from Power Plants for Recycling

Sponsor/Community Partner

Sargent & Lundy, LLC

Faculty

Don Chmielewski, Chemical and Biological Engineering (chmielewski@iit.edu)

Myron Gottlieb, Office of Technology Transfer and Intellectual Property (gottlieb@iit.edu)

In collaboration with Paul Anderson, Civil, Architectural, and Environmental Engineering (andersonp@iit.edu)

Description:

All generating stations in the United States require a National Pollution Discharge Elimination System (NPDES) permit to discharge process waste water. As environmental regulations become stricter, acquiring or amending an NPDES permit has become more difficult for utilities. One option that many utilities are considering to address this is the elimination of the power plant's wastewater discharge streams entirely by becoming a zero liquid discharge facility. Sargent & Lundy, LLC (www.sargentlundy.com), located in downtown Chicago, has sponsored the IPRO team to explore options to make this possible.

IPRO 303

Operational Considerations in Wind Power Generation: Cost Impact of Equipment Failures and Opportunities for Improved Performance

Sponsor/Community Partner

SmartSignal, Inc.

Faculty

Edmund C Feldy, PE, Industrial Technology and Management (MDI-ecf@sbcglobal.net)

Description:

SmartSignal of Lisle, Ill. (www.smartsignal.com), is a prominent provider of equipment failure warning systems in a variety of industries. SmartSignal's unique solution contains intellectual property that models the behavior of major individual subcomponents (assets) of complex facilities and equipment such as commercial airplanes, electric power generation plants, petroleum refineries, etc. SmartSignal delivers this information via its WatchList Web application, which displays actual versus modeled behavior for critical sensors. This information leads to early warning of mechanical failures, performance problems, and an ongoing indication of the condition of the facility.

Traditional deployments for SmartSignal's products have been in the generation side of plant operations, but emerging clean air regulations and current business pressures (financial returns, regulatory compliance) suggest an opportunity in monitoring such systems. Currently, power generators spend massive amounts of money deploying and operating environmental treatment systems, including scrubbers, SCRs, precipitators, and bag houses. These systems have potential for failure and performance problems similar to the equipment in the generation side of the plant, with drastic ramifications for unplanned downtime and power generation load derates from performance issues. The IPRO team has been assessing this opportunity for SmartSignal.

IPRO 304

Innovating Process Improvements in Manufacturing Operations

Sponsor/Community Partner

A. Finkl & Sons, Inc.

Faculty

William Maurer, Industrial Technology and Management (maurer@iit.edu)

Sheldon Mostovoy, Mechanical, Materials, and Aerospace Engineering (mostovoy@iit.edu)

Description:

A. Finkl & Sons (www.finkl.com) is the world's leading supplier of forging die steels, plastic mold steels, die casting tool steels, and custom open-die forgings. Finkl open-die forgings are produced at its fully integrated production facility in the vicinity of Lincoln Park. Finkl products are distributed domestically and to more than 18 countries around the world.

Finkl has identified two problems for the IPRO team to explore. The first issue is a machining process that uses specialized equipment to machine a surface finish on a final product. Periodically, the cutting tools used to apply the finish break, which creates a quality problem. In addition, this break often remains undetected, wasting time and increasing costs. The goal of the team is to work with Finkl management and evaluate, test, and help implement an appropriate detection system to significantly improve this issue. The second issue is the optimization of the heat-treating process. Specifically, the company is looking for ideas on how to arrange products of various sizes and shapes with identical metallurgy to achieve uniform heat treatment.

IPRO 306

Value Stream Analysis of the Global Supply Chain for a Plumbing Systems Manufacturer

Faculty

John Caltagirone, Industrial Technology and Management (caltagirone@iit.edu)

Sponsor/Community Partner

Sloan Valve Company

Description

Sloan Valve Company (www.sloanvalve.com), a long-standing family owned company, has sponsored an IPRO team to assist in supply chain operations. Sloan Valve wishes to both streamline its processes and increase employee training and understanding of quality control systems.

There are two areas of focus for this project, beginning with an improvement to Sloan Valve's scheduling system. The IPRO team will further integrate the company's processes with their internal system to support production through the procurement and scheduling of materials while optimizing inventory levels, turns, and in-stock levels. Through the development of a new production-scheduling procedure, they hope to achieve a faster turnaround time for product and more accurate tracking of stock, as well as offer the customer a more accurate estimate of delivery time.

The IPRO team's second area of focus is to prepare and deliver a training course associated with a typical quality control system, as well as assist Sloan Valve Company in the execution of a project related to this system to add value in supply chain operations. In this regard, the goal of the team is to use statistical analysis based on the Six Sigma process to improve tracking and transfer of parts between departments through employee training and refinement of a protocol. The aim is to help the company reduce costs and maintain more accurate inventory records.

IPRO 307

Intermodal Container Transport System Solutions for the Chicago Region

Sponsor/Community Partner

Mi-Jack Products, Inc.

Faculty

Laurence Rohter, Civil, Architectural, and Environmental Engineering (rohter@iit.edu)

Description

Intermodal freight, i.e., the movement of containers and trailers by rail, truck, or water carriers, has been the fastest-growing major segment of the United States freight rail industry, rising from 3.1 million trailers and containers in 1980 to 12.3 million in 2006 (AAR statistics, June 2007). In the record-setting year of 2006, 76 percent of intermodal rail traffic was moved in containers, and container movements are expected to double within 10 years.

Chicago is the third largest port in the world for such operations. There are currently 19 intermodal yards in the region, comprising about 700 miles of loading/unloading tracks, spread over approximately 2,200 acres. Rather than expand these in-city facilities, the current approach is to actively research improvements that can quickly optimize performance, with low capital costs and positive environmental benefits, and to explore solutions that can work within the current patchwork of transportation systems and industrial development.

With the sponsorship of Mi-Jack Products (www.mi-jack.com/) of Hazel Crest, Ill., the largest manufacturer and operator of intermodal equipment, the IPRO team has two tasks to complete. The first is a 3D “walk-through” model of the connection to the intermodal site and the proposed route through the intermodal site. The second is a large-scale site plan of the region surrounding the intermodal site to show the impact on the project. This site plan will be developed from data collected on the traffic congestion, environmental issues, and other related issues.

IPRO 309

Educational and Technical Support of Orthotics and Prosthetics Training Programs in Latin America and the United States

Sponsor/Community Partner

Universidad de los Andes, La Escuela Colombiana de Rehabilitacion, Centro Don Bosco, and Laboratorio Gilete, Bogota, Colombia; Bioconcepts, Inc., Burr Ridge, Ill.; Dynamic Orthotics and Prosthetics, Houston; Children’s Memorial Hospital, Chicago; Joliet Junior College Tech Prep Program, Joliet, Ill.; Northwestern University Prosthetics and Orthotics Center, Chicago

Faculty

Kevin Meade, Mechanical, Materials, and Aerospace Engineering (meade@iit.edu)

Description

There is an unusually large need for creating and supporting educational opportunities in orthotics and prosthetics in Latin America as well as in the United States. Over the last five semesters, IPRO 309 teams have developed 19 educational modules treating many of the topics required for training prosthetic/orthotic technicians. These materials are currently being utilized in new programs at Centro Don Bosco in Bogota, Colombia, and at Joliet Junior College in Joliet, Ill.

In the past, the IPRO 309 teams have concentrated on developing the content of the theoretical portion of the curriculum for prosthetic/orthotic technicians. This semester, the project’s emphasis has been on not only technical content but also explicit inclusion of principles of management, teamwork, communication, and ethics for a clinical treatment team consisting of medical professionals, allied health professionals, and engineers. An additional essential aspect will concern the business aspects of prosthetics and orthotics such as procurement, cost estimation, and insurance reimbursements for services.

IPRO 310

Assistive Devices for Blind Swimmers and Other Exercise Activities

Sponsor/Community Partner

Chicago Lighthouse for the Blind & Visually-Impaired

In collaboration with Irish Aquatics Masters/Paralympic Swim Team (a master's swim program at the University of Notre Dame) and electrical engineering design teams at Rose-Hulman Institute of Technology

Faculty

Frank Lane, Psychology (lane@iit.edu)

In consultation with Ken Schug, Biological, Chemical, and Physical Sciences (kschug@msn.com) and David Gatchell, Bio-medical Engineering (dgatchel@iit.edu)

Description

There are 3 million blind or visually impaired people in the United States and another half million in Mexico and Canada. Many of these individuals do not participate or find it too expensive to participate in athletic endeavors because of the physical constraints imposed by their disability. Both from a physical health and mental health perspective, enabling blind and visually impaired individuals to more easily participate in athletic activities is a very worthwhile endeavor and the focus of this IPRO project.

The team has been developing, testing, and implementing active- and/or passive-assistive swimming aids. These devices must be simple in operation and low in cost. Previous teams have built infrared and sonar devices that allow blind swimmers to locate themselves in a pool. While partially functional, these devices do not filter out all the noise and signal attenuation caused by water and swimmers using different strokes. The current team is working to improve these devices and develop better passive ones. It is also working to raise awareness at IIT, at other colleges, and in the general public of the need for blind and visually impaired individuals to exercise through swimming and other physical activities so that they can live healthier and more active lives.

IPRO 311

IIT Sustainability Branding

Sponsor/Community Partner

IIT Department of Communications and Marketing

Faculty

Nancy Hamill Governale, Architecture (hamill@iit.edu)

In consultation with Rae Mindock, Specialist in Renewable Energy and Sustainability

Description

IIT's Department of Communications and Marketing is working with the IPRO Program to develop a visible image of Main Campus that defines IIT's prominence in the realm of energy and sustainability. The spring 2008 IPRO team defined the problem, came up with an overall master plan for implementation, and developed a concept and roadmap for creating sustainable installations on campus called GreenStallations.

The Greenstallation methodology is envisioned as an ongoing learning, exploration, design, build, and demonstration process that actively engages the entire IIT community and those who visit the campus in the world of renewable energy, energy efficiency, and sustainability. GreenStallations will be created through a team design process, giving the university a vehicle to get students involved in creating the overall message and transforming their designs into reality.

IPRO 312

Commercial-Scale Composting at IIT

Faculty

Blake Davis, Architecture (davisbl@iit.edu)

In consultation with Joseph Clair, Director of Campus Energy and Sustainability

Description

Anywhere from 25 to 30 percent of municipal solid waste comes from organics: food and yard waste. With existing municipal landfills closing and new landfills appearing outside of the urban regions, the cost to dispose and transport waste increases significantly each year. Because of this, in addition to traditional paper/glass/metal/plastic recycling programs, large commercial and institutional consumers seek opportunities to expand their landfill diversion practices by instituting organic waste recycling as part of their portfolio.

Using advanced statistical techniques and cost-benefit analysis tools, this IPRO team has been developing recommendations for overcoming legal, political, and market barriers to organic waste management, and with those recommendations, creating a business plan for an IIT venture that could satisfy the composting needs of IIT's Main Campus.

IPRO 314

Integrating Building Greening, Adaptive Reuse, and Alumni Social Networking for Queen of Peace High School

Sponsor

Ellen Jordan Reidy, IIT and Queen of Peace High School Alumna

Faculty

Jim Braband, IIT Stuart School of Business (braband@iit.edu)

Nancy Hamill-Governale, Architecture (hamill@iit.edu)

Description

Queen of Peace High School, located in south suburban Burbank, Ill., is sponsoring an IPRO team to explore creative solutions in a variety of areas that can benefit the students at Queen of Peace in the years ahead. This project is being supported with a generous donation by IIT Trustee Ellen Jordan Reidy, an alumna of IIT Institute of Psychology, IIT Stuart School of Business, and Queen of Peace.

Queen of Peace presently has a wing of the facility that formerly housed the religious sisters who taught in the school. This space, which is expensive to maintain, is now used occasionally for meetings and meals but mostly for storage. The team is investigating possible alternative uses for for-profit and/or nonprofit purposes, as well as looking at remodeling and design for these functions.

Queen of Peace High School aspires to become an institution that is both green and fair trade within the next year. The concept of an alumni-focused social networking initiative could possibly support the implementation of any greening or adaptive reuse projects that require investment. This would involve establishing an online alumni community, as well as expanding the present outreach projects in order to build relationships and financial support for the school.

IPRO 315

Design of a Large-Scale Structure

Faculty

Jay Shen, Civil, Architectural, and Environmental Engineering (shen@iit.edu)

In consultation with Jamshid Mohammadi, Civil, Architectural, and Environmental Engineering (mohammadi@iit.edu) and

Jeff Budiman, Civil, Architectural, and Environmental Engineering (budiman@iit.edu)

Description:

This IPRO team has been working on the design of a 22-story hotel in Oak Brook, Ill., a western suburb of Chicago. The objectives of this IPRO are to design the structure to include, among other things, a green roof and an outdoor area at the top floor; reinforced concrete shear walls forming the core of the building, designed to resist gravity and lateral loads imposed on the structure; and an efficient heating ventilation and air conditioning system, mechanical electrical and plumbing systems, and electrical equipment and accessories.

IPRO 316***Design of a Biofuels (Biodiesel and Bioethanol) Production Facility for Renewable-Energy Generation*****Faculty**

Satish Parulekar, Chemical and Biological Engineering (parulekar@iit.edu)

Description

Renewable energy has attracted considerable attention in the last few years because of increased concerns about global climate change and energy security, which indicate the need for alternative energy choices in addition to fossil fuels. This IPRO team strives to conduct research and develop a process to economically produce a biofuel from widely available renewable resources for widespread usage throughout the world.

The team has been developing a process for a biofuel that meets its objectives and improves upon current methods of production by using homogenous and heterogeneous catalysis under extreme or supercritical conditions in order to improve yield, reaction time, and economic practicality. The team has also been working on designing a reactor for biofuel production using process software such as Matlab and Hysys, and scaling-up the reaction process accordingly to three different capacities.

IPRO 317***Silver Nanoparticles as Indicators of Thermal History*****Faculty**

Victor Perez-Luna, Chemical and Biological Engineering (perezluna@iit.edu)

Description

This IPRO team's primary work has been to prove the merit of using silver nanorods as a thermal history indicator. The extended purpose of the team has been to convert the production of silver nanorods from a batch process to a continuous-flow process.

The team's efforts have been in gaining a deeper understanding of batch process, researching continuous flow processes with an emphasis on microreactors, and designing and simulating a continuous flow process for production of silver nanorods with the aid of computer simulation software.

IPRO 318***Electrode Design for Fuel Cells*****Faculty**

Vijay Ramani, Chemical and Biological Engineering (ramani@iit.edu)

Description

Polymer electrolyte fuel cells (PEFCs) will play a key role in sustainable energy economies of the future. Given their modular nature and high efficiencies, they are being considered for both stationary distributed power and transportation applications. The United States Department of Energy (DOE) is leading efforts to advance the state of PEFC technology to facilitate commercialization. Per DOE's targets/predictions, PEFC-powered automobiles are no more than a decade away.

This IPRO team has been working on the design of hydrogen-oxidation and oxygen-reduction electrodes for a polymer-electrolyte fuel cell, including a performance analysis of state-of-the-art electrodes; identifying key challenges in cost, performance, and durability; investigating approaches to minimize degradation while maintaining or enhancing performance (based on modeling); and experimentally validating optimal design.

IPRO 319

New Technologies to Serve Cardiac Arrest Victims

Faculty

Francisco Ruiz, Mechanical, Materials, and Aerospace Engineering (ruiz@iit.edu)

Description

Many people die each year of sudden cardiac arrest, sometimes without an underlying cardiac condition. This IPRO team will study technologies that may increase survival rates at different stages in the treatment of such victims: the use of first aid, emergency medical personnel, and emergency room procedures

The team has been investigating the viability of using full-body oscillation as an alternative to CPR for prolonging the time before brain damage occurs. Specifically, this team has researched and tested how the oscillation affects blood flow and ventilation, and has developed plans for an oscillator that can be produced and used in the field to save lives.

Studies have shown that the attempt to restart the heart using shock damages brain cells, causing life-threatening or permanent damage to the brain; however, if body temperature is brought down by a few degrees, the damage to the brain can be avoided. The team also aims to design a cooling method that is portable, harmless to the human body, cost-effective, and environmentally friendly.

IPRO 320

Socio-Professional Networking: Online Teachers Community

Sponsor/Community Partner

Chicago Public Schools

Faculty

Jim Braband, IIT Stuart School of Business (braband@iit.edu)

Scott Gehrs, Information Technology and Management (gehrs@iit.edu)

In consultation with Kevin Hall, Chicago Public Schools

Description

Schools and teachers are under tremendous pressure to improve performance as measured by standard test scores. With tight budgetary constraints and a difficult set of demographics, the Chicago Public Schools (CPS) are particularly challenged. The 50,000 K–12 teachers in the CPS system carry a significant burden that puts a strain on their personal time and resources. The problem is exacerbated by the large number of new teachers entering the system each year and a high turnover rate. Little time exists during the school day to provide effective face-to-face mentoring or for established teachers to share best-practices and class-management techniques with one another. Continuing education courses are highly treasured for their networking value but are few and far between in the normal course of a teacher's career. The problem begs for a virtual solution.

This IPRO team is working to establish a self-sustaining online community of CPS teachers that could be expanded in the near term to include all K–12 programs in Illinois. This online community of teachers could allow virtual mentoring and electronic sharing of best practices, classroom experiences, individual teaching materials, and more. It could also provide social networking among teachers. The team will investigate establishing this as a not-for-profit business outside the auspices of the respective boards of education.

IPRO 321

Increasing Computer Science Awareness in High Schools and Colleges

Sponsor/Community Partner

Chicago Chapter of the Computer Science Teachers Association (CSTA-Chicago)

Faculty

Matthew Bauer, Computer Science (bauerm@iit.edu)

Cindy Hood, Computer Science (hood@iit.edu)

Description

This IPRO team's goal is to get high school students excited about the field of computer science and to ultimately increase the number of students in the Chicago area enrolled in high school- and college-level computer science courses. The team will accomplish this by debunking myths and increasing the understanding of what computer science and computational thinking entails, explaining and providing evidence for why computer science is important, and emphasizing the importance of attracting women and underrepresented minorities to computer science.

IPRO 323

Developing a Next-Generation Occupant Engagement System

Faculty

Dirk Denison, Architecture (denison@iit.edu)

In collaboration with T. J. McLeish, Architecture; Alex Flueck, Electrical and Computer Engineering; Joseph Clair, Director of Campus Energy and Sustainability; and Jeremy Alexis, Institute of Design

Description

This IPRO team will lay the foundation for the development of an Occupant Engagement System consisting of a central-user interface and peripheral energy use monitoring and control devices. The system, applied first in a residential setting, will track usage for the residence, provide real-time pricing information, and engage the user prior to activating energy-using devices and equipment. Additionally, the system will compare the occupant's usage information against adjacent users and provide real-time feedback of the occupant's relative energy intensity. Incorporating elements of human psychology, design, and architecture, the team will establish guidelines for the eventual system that address not only the technical aspects of creating and applying such a system but the human elements as well.

Although recent pricing signals in the energy market have caused people to make changes in their usage patterns, these changes often compromise the quality of life of the user—a sacrifice in order to “make it through.” Application of the system developed as a result of this IPRO team will stimulate a change of practice, allowing users to insulate themselves from the cost impacts of energy usage while maintaining or improving their quality of life.

IPRO 324

Power Measurement for Road Bicycles: Toward a Universal Solution

Sponsor/Community Partner

Software Technologies Group, Inc.

Faculty

Dietmar Rempfer, Mechanical, Materials, and Aerospace Engineering (rempfer@iit.edu)

In collaboration with Sheldon Mostovoy, Mechanical, Materials, and Aerospace Engineering (mostovoy@iit.edu) and Guillermo Atkin, Electrical and Computer Engineering (atkin@iit.edu)

Description

Professional athletes as well as many serious hobby athletes and recreational cyclists have great interest in measuring their mechanical power output on a bicycle. A number of solutions to measure this quantity are available, but all of them have

at least one or more drawbacks. Almost all of the solutions require a very substantial investment of up to several thousand dollars, and the ones that are inexpensive are of questionable accuracy. In addition, most of the systems that are available on the market cannot be retrofit to existing complete bicycles but require the replacement of parts like the rear wheel or the crankset. For a high-end road bicycle, these parts alone are typically a couple of hundred dollars.

This IPRO team has been developing a system that measures the applied torque at the crankset. In contrast to existing solutions, the aim of this project is to retrofit a system to existing cranksets, obviating the need to abandon parts that the bicyclist already owns. According to preliminary tests done at IIT, this can be done, in principle, using sets of quite inexpensive strain gauges. It is anticipated that the team will be able to assemble a power measurement system that will cost a small fraction of what currently available systems cost.

IPRO 325

Developing Affordable Water, Energy, and Shelter Solutions for the World

Sponsor/Community Partner

National Collegiate Inventors and Innovators Alliance (NCIIA)
Acara Institute

Faculty

Ken Schug, Biology, Chemistry, and Physical Sciences (kschug@msn.com)
Margaret Huyck, Psychology (mhhuyck@sbcglobal.net)
Linda Pulik, Institute of Design (pulik@id.iit.edu)

Description

This IPRO team is focusing on water and shelter solutions for the world's 2 billion rural poor who live on less than \$3 per day. Team members are working to design, create, and field test solutions that can be built, used, and maintained by local people with local materials at a construction cost of less than \$5.

The team is divided into two subteams. One is a cooperative group of students whose aim is to develop a good understanding of the water problems affecting the people who live in the slums of Mumbai to provide a human-centered and sustainable solution. The other team is working on shelter solutions for people living in the high Andes region of Peru.

IPRO 326

The Modern Business Utility Model for IIT

Faculty

Joseph F. Clair, Director of Campus Energy and Sustainability (clajjos@iit.edu)
George Nassos, IIT Stuart School of Business (gnassos@stuart.iit.edu)

Description

Managing and delivering energy transfer will pose one of the greatest challenges and opportunities of our century. In the last century, energy utilities held monopoly status with varying degrees of oversight from governments. The modern utility must have a broader goal of providing energy transfer to maintain an individual's quality of life, while promoting overall energy efficiency so as to obtain a more natural interface with our natural resources. Accomplishing this in the current and future business environments will be difficult.

IIT manages its own electricity and steam distribution, and brokers commodity prices for all of its stakeholders. This unique situation provides an opportunity to rethink and restructure the approach to utility management. After performing research and analyses, this IPRO team will propose a business model for the modern utility. Incorporating change-management analysis and risk-management tools, participants will recommend a new model for addressing the present and preserving the future.

IPRO 327

A Geographically Searchable Local News Aggregator

Faculty

Wai Gen Yee, Computer Science (yee@iit.edu)

In collaboration with Ophir Frieder, Computer Science (frieder@iit.edu)

Description

This IPRO team has been focusing on the design and development of a geographic search engine for local online media. The goal of this system is to allow users to search for the content that most interests them—news that relates to their immediate environment (known as “hyperlocal” in the news industry), national news, or anywhere in between.

The unique features of the proposed system are that it: (a) crawls a set of news from various news services; (b) associates each news article with entities and physical locations; and (c) allows complex search via a user-tunable geographic location, time, entity, or any combination of these features. This search engine can be directly used for a variety of purposes, including general interest, recreation, marketing, and intelligence.

IPRO 328

School Green: Church and School Energy Evaluations

Sponsor/Community Partner

In collaboration with Vincent Cushing, Clean Urban Energy (www.CleanUrbanEnergy.com)

Faculty

Jim Braband, IIT Stuart School of Business (braband@iit.edu)

Nancy Hamill Governale, Architecture (hamill@iit.edu)

Description

Churches and schools on the South Side and West Side of Chicago are incurring extraordinary energy expenses. Their buildings and their heating ventilation and air conditioning systems are typically dated, not well-documented, and inefficient. Their energy operations and maintenance are generally poor because they lack the funds to afford a building engineer or a quality maintenance program, and church/school administrators have very little energy-management expertise. In addition, these institutions do not have the capital or operating dollars to afford a repair.

The goal of this IPRO team is to develop a self-sustaining, self-help, nonprofit program for church/school institutions that draws the attention of energy professionals to review a church/school energy situation and identify cost-saving options.

IPRO 330

Dynamic and Contemporary Science Fair Projects in Chicago Public Schools

Sponsor/Community Partner

Chicago Public Schools

Faculty

Michael Pelsmajer, Applied Mathematics (pelsmajer@iit.edu)

In consultation with Greg Fasshauer, Applied Mathematics (fasshauer@iit.edu)

Description

Many students in middle schools and high schools in the United States regularly score worse than students in any other nation on math and science standardized tests. Factors that contribute to this are the lack of available math and science resources that could help students, parents, and teachers. As a consequence, Chicago Public Schools (CPS) students regularly struggle to complete science fair projects successfully.

This IPRO team has been working to create an online bank of math-centric projects for future science fair participants in the CPS system. In general, it is felt that there is a tremendous opportunity to help CPS students identify and develop age level-appropriate science projects that address interesting contemporary problems and fields of inquiry.

IPRO 331

Global Warming: Study and Community Outreach

Faculty

Peter Lykos, Biological, Chemical, and Physical Sciences (lykos@iit.edu)
In collaboration with Lidia Calcaterra, Biological, Chemical and Physical Sciences

Description

People are bombarded by different facts about global warming. New technologies and information are presented every day, making it virtually impossible to be correctly informed and up-to-date. Many people also believe that they will not see the effects of global warming in their lifetime, so they do not pay close attention to new developments.

This IPRO team has been working to inform the general public on correct and current information on global warming from credible sources. Its goal is to increase awareness by presenting to larger and more diverse audiences. The team has been investigating how to locate target audiences and the best methods to reach them, and preparing content for dynamic and effective presentations.

IPRO 332

Our Energy Future: Multi-Media Education Modules for the High School Classroom

Sponsor/Community Partner

Chicago Public Schools and De La Salle Institute

Faculty

Jim Braband, IIT Stuart School of Business (braband@iit.edu)

Description

There is no simple description of energy and the many roles it plays in our daily lives. We could describe it as both the literal and figurative forces that drive our entire world. Because of this crucial role, demands on energy continue to increase, while future sources of energy remain uncertain. The philosophy behind IPRO 332 is that people should be sufficiently educated about their own energy choices to be able think critically about the corresponding consequences.

Most teachers do not have the capacity to sort through all the available information on energy in order to teach students from an objective viewpoint. The National Energy Education Development (NEED) Project has developed curriculum materials to assist teachers with educating their students about the science, sources, uses, and conservation of energy in everyday life. The objectives and accomplishments of NEED are a model for this IPRO team as it strives to develop ways of providing energy education with an impartial point of view.

IPRO 333

Fab Lab: Creating Design-Prototype Learning Modules at the Museum of Science and Industry

Sponsor/Community Partner

Museum of Science and Industry

Faculty

David Gatchell, Biomedical Engineering (dgatchell@iit.edu)

Description

What happens when one encounters a Fab Lab within a cultural institution such as the Museum of Science and Industry (MSI)? The Fab Lab (fabrication laboratory) is a small-scale workshop with the tools to make almost anything. This includes technology-enabled products generally perceived as limited to mass production (machines for rapid prototyping). The Fab Lab concept was initiated by Massachusetts Institute of Technology in order to bring the tools associated with idea-to-design-to-prototype process to the average person via storefront Fab Labs, and has grown to represent a network of Fab Labs in various locations around the world.

MSI currently has three potential audiences that it aims to engage in the Fab Lab: individual museum guests, school groups, and science minors/achievers. The team has been investigating the range of project-based learning opportunities within the Fab Lab and designing, developing, demonstrating, and testing learning modules that tap the power of Fab Lab. The resulting activities and projects will be able to capture the imagination of all participants using Fab Lab's design software and fabrication machines: the laser cutter, vinyl cutter, Modela milling machine, and Shop Bot CNC Router.

IPRO 334

Robotic System Applications to Elderly Living Environments

Faculty

Keiichi Sato, IIT Institute of Design (sato@id.iit.edu)
Xian-He Sun, Computer Science (sun@iit.edu)

Description

Robotics technologies have been advancing to the level where they can be effectively deployed in various application domains. Yet the ways robots enter our daily life and the ways they interact with humans have not been well-explored. One of the highly promising areas for robot applications is health care and elderly care service.

This IPRO team has been building a prototype robot system for selected applications in the health/elderly care area. Software development includes modules for dynamic mapping, location awareness, task control, human-interface, and multi-agent collaboration. Hardware development includes adaptation and modification of the selected robotic system prototyping platform and additional feature development.

IPRO 335

Green Building Design Concepts and Integration

Faculty

Jeff Budiman, Civil, Architectural, and Environmental Engineering (budiman@iit.edu)
Jay Shen, Civil, Architectural, and Environmental Engineering (shen@iit.edu)

Description

This IPRO team has been working to produce an art studio space in Chicago with an energy-saving design in mind. The scope of the project spans structural, architectural, foundation, heating ventilation and air conditioning system, and lighting and electric system designs, as well as building cost estimating and professional ethics. The team has been applying principles associated with green design concepts, energy sustainability, post-occupancy comfort, acoustic design issues, smart building concepts, health issues (abatement of mold- and allergy-causing agents), and safety considerations.

IPRO 336

Building Consumer Awareness and Preference for Safe Foods: Creating and Testing a Marketing Strategy for Pasteurized Eggs

Sponsor/Community Partner

National Pasteurized Eggs, Inc.

Faculty

Jim Braband, IIT Stuart School of Business (braband@iit.edu)
In consultation with Sue Mueller, IIT Stuart School of Business (muellers@iit.edu)

Description

According to the Centers for Disease Control, 40,000 salmonella illnesses are reported every year and possibly 30 times this number go unreported or are misdiagnosed. Evidence suggests that the consumer is either unaware of this risk or is willing to ignore it. A safe and patented option now exists for making eggs safe from salmonella and has sold very well to food service companies; however consumer sales are almost nonexistent, despite a presence in stores such as Jewel or Dominick's in the Chicago area, where the eggs are marketed under the Davidson brand. What are the issues hindering consumer acceptance and what steps should the company take to succeed in the consumer market?

The team has been investigating the egg-purchasing decisions of consumers and determining the characteristics of the ideal customer for the safe egg product. Additionally it has been attempting to uncover what it will take to deliver enhanced awareness, understanding, and then, support for a product that is today's "undiscovered" safe choice for consumers.

IPRO 337***Zero-Energy Lab*****Sponsor/Community Partner**

United States Department of Energy/Environmental Protection Agency Labs 21, KSA Lighting, Lithonia Meccho Shade, and IIT Department of Facilities

Faculty

Nancy Hamill-Governale, Architecture (hamill@iit.edu)

Description

When analyzing the energy consumption in buildings built within the last 50 years versus buildings built before the widespread application of mechanical air conditioning and mechanical ventilation, it is readily apparent that older buildings offer significant opportunities for an energy-efficiency study.

The team has been refining the design concept for a Zero-Energy Lab to be constructed on the fourth floor of Machinery Hall on IIT's Main Campus. The overall design of the space will result in utilization of renewable energy created through photovoltaics, solar thermal, natural daylighting, and natural ventilation through operable saw-tooth roof windows. The space will utilize low-energy consuming lighting systems with building integrated reflectance, light scoops, composting toilets, and other systems designed to add to the zero-energy aspect of the lab.

IPRO 338***Web Application for Electrical Contractors for LEED Building Projects*****Sponsor**

Electrical Contractors Association of the City of Chicago

Faculty

Dan Tomal, Industrial Technology and Management (drtomal@aol.com)
In consultation with Keith McKee, Industrial Technology and Management (mckee@iit.edu) and Mazin Safar, Industrial Technology and Management (safar@iit.edu)

Description

As societies become more environmentally conscious, they are becoming increasingly motivated to encourage and even mandate the use of green technologies in the design and construction of private and commercial structures. Working with the Electrical Contractors Association of City of Chicago (www.ecachicago.com), the team has been focusing on

helping electrical contractors meet these technological challenges by investigating requirements, costs, and challenges of integrating green technology options and the implications for contractor training and education as well as bid preparation and budgeting.

The team's ultimate goal is to develop a template for a website to host a user-friendly online database of green technology information for the contractors. The site will provide data on green electrical products with return on investment and requirements for meeting various levels of LEED green certification.

IPRO 339

Innovating Affordable Shipping Container Housing in Chicago

Sponsor

Faculty

Blake Davis, Architecture (davisbl@iit.edu)

Mike Glynn, Architecture (mpgalfa@aol.com)

Description

Due to the rapidly accelerating cost of housing, each year a smaller percentage of the population is able to afford new housing. This IPRO team has been investigating using shipping containers as a way of producing low-cost housing for low-income people on the South Side of Chicago.

In previous semesters, IPRO teams produced units for the equivalent of \$8,000/unit to meet the needs of *maquiladora* workers in Juarez, Mexico. The units were required to fit within the space of a single shipping container (approximately 8' x 40') that were then organized into building blocks on 100 m x 100 m sites. The current team has been investigating a more spacious housing type that will meet the needs of elderly and low-income workers on the South Side of Chicago. This housing type utilizes several shipping containers, is two to three stories high, and must fit on a standard Chicago city lot.

IPRO 340

Design of a Green Community Health Center of the Future

Sponsor/Community Partner

ACCESS Community Health Network

Faculty

Judith Gregory, IIT Institute of Design (judithg@id.iit.edu)

Linda Pulik, IIT Institute of Design (pulik@id.iit.edu)

Description

ACCESS Community Health Network (www.accesscommunityhealth.net) is a nonprofit, mission-driven organization that provides comprehensive ambulatory care health services to the medically underserved and uninsured through the Chicago metropolitan region. ACCESS is the largest network of community health centers in the nation, operating 50+ health centers serving more than 200,000 individuals through 800,000 medical visits annually. One-fourth of ACCESS patients have no health insurance, paying on a sliding-fee scale.

This IPRO team has been focusing on creating solutions that serve the ACCESS mission of providing quality health care to all, regardless of health status or ability to pay. Since 2004, a series of IPRO teams has focused on research, development, and demonstration of new information system designs, and improvements for several different patient-service programs. Currently, the team has been implementing the formative stages of a user-centered design process by developing and prototyping design concepts for three ACCESS Community Health Centers.

IPRO 341

Design and Global Market Analysis of a Tool Product

Sponsor

Versatility Tool Works

Faculty

William Maurer, Industrial and Technology Management (maurer@iit.edu)

Description

This IPRO team has been focusing on designing an improved drawer system for a new extremely large industrial-strength tool box. Each drawer is designed to hold 100 to 200 pounds of tools without any deflection. The team will also develop an analysis of the global business opportunity that this product represents for its sponsor, Versatility Tool (www.versatilitytool.com).

IPRO 342

Development of a Real-Time Information System

Sponsor/Community Partner

Midwest Steel & Services, Inc.

Faculty

William Maurer, Industrial and Technology Management (maurer@iit.edu)

Description

Midwest Steel & Services, a growing company, purchases and coverts plate steel into mold and die bases for the plastic and steel industries. Their competitive advantage is in their ability to deliver finished products in six to seven days, where most competitors at a minimum require several weeks. Key to the company's success is its ability to make smart purchases and track performance within tight cost controls.

The company's present software and internal processes are not sufficient to meet business needs, and it has sponsored the IPRO team to assist in improving this issue. The team has been performing both a systems review as well as interviews of Midwest Steel staff to come up with a viable solution.

IPRO 343

Improving Communication Quality of the Drive-Thru Experience

Faculty

Matthew Bauer, Humanities (bauerma@iit.edu)

In consultation with Kathryn Riley, Humanities (riley@iit.edu) and Thomas Wong, Electrical and Computer Engineering (wong@iit.edu)

Description

The 2007 Quick-Service Restaurant Consumer Drive-Thru Preference Survey found that "speaker communication" was ranked as "important" by 69 percent of those surveyed. Moreover, "communications via speaker" received only a 62 percent satisfaction rate from those surveyed. Thus, in the area of communication, a 7+ point spread exists between consumer ratings of importance and satisfaction, indicating a critical need (by industry standards) for improvement. However, little systematic research has been conducted concerning the sources of these communication problems.

At issue is the relative contribution of four communication factors: (1) acoustics, i.e., problems related to the devices used to convey the speech signal at the drive-thru; (2) culture, i.e., problems related to intercultural communication and comprehensibility problems of non-native speakers (either employees or customers); (3) cognition, i.e., problems related to the absence of multiple modalities for the speech signal; and (4) human-technology interaction, i.e., problems related to

customer interfaces used for ordering. The team has been conducting preliminary research into each of these areas and to formulate recommendations about which communication factor(s) might play the most important role(s) in the drive-thru experience.

IPRO 344

Audio Quality and Energy Efficiency for Mobile Devices and Intercoms

Faculty

Thomas Wong, Electrical and Computer Engineering (wong@iit.edu)

In consultation with Matthew Bauer, Humanities (bauerma@iit.edu) and Kathryn Riley, Humanities (riley@iit.edu)

Description

This IPRO team has been assessing the performance of the audio system installed in a post structure as employed in a drive-through facility. It is working in tandem with IPRO 343 to reach an immediate goal: a set of guidelines for the implementation of an intercom system that will meet with the requirements for good quality speech communication under a range of ambient conditions in an outdoor setting. A longer-term objective is to incorporate adaptive measures so that noise cancellation and sound-level optimization can be realized.

IPRO 345

Logistics and Information Systems to Achieve Process Improvements (Operation Smooth Brews)

Sponsor/Community Partner

Euclid Beverage

Faculty

Phillip Lewis, Industrial Technology and Management (lewisp262@aol.com)

Description

Euclid Beverage is a large beverage distributor operating in the western suburbs of Chicago. The company distributes more than 50 different brands of beverages to thousands of customers in western and northern Illinois and eastern Iowa. Euclid Beverage utilizes a software system called MOTEC that is designed for use in beverage distribution enterprises. Warehouse employees use lift trucks, scanning devices, on-board computers, and voice recognition equipment to help them pick and deliver ordered beverages to trucks. This IPRO team has been evaluating the company's use of the system and the systems' benefits. It has also been creating ideas for efficiency improvement and verification that the system is being used effectively.

IPRO 346

Engine Flywheel Market Research and Business Strategy Development

Sponsor/Community Partner

DACO, Inc.

Faculty

Phillip Lewis, Industrial Technology and Management (lewisp262@aol.com)

Description

DACO, Inc. (www.dacoinc.com) is a precision machining company that is skilled in machining large metal castings. Currently, it desires to expand its customer base but has limited marketing resources. This IPRO team has been working to evaluate global opportunities where DACO could be a supplier of large machined castings to new customers.

The team has had a dual focus: a competitive analysis of DACO competitors, and a global market research effort to identify new products, potential customers and new markets. The team has also been evaluating DACO marketing tactics and strategies in an effort to assist the company in determining ways for it to pursue the new business opportunities the team discovers.

IPRO 349

Solid Corn-Waste Fuel for Cogeneration

Sponsor/Community Partner

Kern Entrepreneurship Education Network (KEEN), a program of the Kern Family Foundation

Faculty

Don Tijunelis, Industrial Technology and Management (tijunelis@sbcglobal.net)

In consultation with Keith McKee, Industrial Technology and Management (mckee@iit.edu) and David Pistrui, IIT Stuart School of Business (pistrui@iit.edu)

Description

Effectively, any type of biomass can be burned as a solid fuel. There has been extensive research and development into the use of biomass to produce biodiesel and ethanol but almost no consideration has been given to its use as a solid fuel. The potential is demonstrated since 2 percent of the electricity used in Illinois is, in fact, generated by using waste biomass generated by manufacturing operations.

The team has been creating a system requirements document that specifies the process and equipment, their source, ordering requirements, assembly procedure, demonstration site, and start-up plan for cogeneration of heat and power (CHP) from solid fuel based on corn waste (stover).

IPRO 350

Environmental Wood Reclamation Via Creative Arts and Crafts Products (An Entrepreneurial IPRO Project)

Sponsor/Community Partner

Illinois Emerald Ash Borer Wood Utilization Team

Faculty

Nik Rokop, IIT Jules F. Knapp Entrepreneurship Center (nrokop@iit.edu)

John Stoner, IIT Stuart School of Business (stoner@iit.edu)

Description

The emerald ash borer (EAB) has been identified as a causative agent in ash tree mortality and decline. This penny-sized green menace has wreaked havoc on millions of ash trees in the Midwest, and if not controlled, could potentially wipe out the ash tree species in North America. Infested ash trees eventually die and must be removed; however, the wood remains unaffected.

The team's sponsor, the Illinois EAB Wood Utilization Team (WUT), is a part of the Illinois Emerald Ash Borer Wood Utilization Network, a network of more than 100 people working with ash trees affected by the EAB. The team has been working with the WUT to design and perform market feasibility studies for municipally harvested timber for several Chicago-area suburban municipalities. It has been researching companies, nonprofit organizations, schools, and government entities that are interested and able to use the timber.

IPRO 351

Motion Track Studios

Faculty

James Braband, IIT Stuart School of Business (braband@iit.edu)

Description

Motion Track Studios is a convenient and affordable audio-recording service that records its customers in their preferred environment, whether it is their home, workplace, live show, etc. This service caters to an emerging market of songwriters who cannot afford the premium price of a traditional recording studio and lack the equipment or expertise to do it themselves.

The value provided in Motion Track Studios is in its affordability and convenience. Traditional recording studios have invested millions of dollars into studio space, professional engineers, and quality equipment to provide the best sounding product. Motion Track Studios utilizes the essential equipment needed to create a quality recording in the customers' preferred environment.

IPRO 353

Tummi Pals Learning Dolls

Sponsor/Community Partner

All 4 Kisz Enterprises

In collaboration with the Chicago 1st Black Inventors/Entrepreneurs Organization

Faculty

James Braband, IIT Stuart School of Business (braband@iit.edu)

Dave Winkin, IIT Jules F. Knapp Entrepreneurship Center (dwinkin@iit.edu)

Description

All 4 Kidz Enterprises is a minority and woman-owned business based in Homewood, Ill., that specializes in providing multicultural learning aids and children's books with audio CDs for children ages two and up. The company's mission is to provide young children with books and toys that will enhance their learning and broaden their thinking. To that end, it has developed a concept for a line of learning doll called Tummi Pals. The team has been working on developing a business plan and an action plan for prototype development of the dolls and accessories that will accompany them.

IPRO 354

eMotion: Wirelessly Conveying Emotion (An Entrepreneurial IPRO Project)

Faculty

Jim Braband, IIT Stuart School of Business (braband@iit.edu)

Vida Winans, Computer Science (winans@iit.edu)

Description

In an increasingly mobile world, the ability to stay in touch has failed to transcend the realm of the auditory and visual. One of the strongest emotions is the caring that is shared between friends and loved ones, and it is very important to express these feelings. This can be difficult for some groups to do, particularly "tween" girls, who are eager to share and convey emotions in a simple, remote manner but do not have easy access to the communication vehicles used so extensively by those older than them, such as My Space and cellular phones/text messaging.

This IPRO team has been developing the Best Friends Forever Necklace, which aims to keep tweens in touch, in style, and independent through wirelessly transmitted implicit messages that take on the form of lights and controlled rhythmic vibrations. Prototyping, revising, and continual consumer-use feedback through focus groups will ensure that this venture is heading in the right path toward business viability.

IPRO 355

Enhanced Vision System for Construction Site Safety (An Entrepreneurial IPRO Project)

Faculty

John Stoner, IIT Stuart School of Business (stoner@iit.edu)

Jim Burstein, IIT Stuart School of Business (burstein@iit.edu)

Description

Currently, heavy equipment operators must rely upon wooden stakes and quickly disappearing spray-painted lines, both of which are based upon paper records, to ascertain the location of buried utility lines. The social costs of errors include the death of construction workers and the loss of utility service—such as telephone access—to emergency services. The economic costs are related to the inefficient use of expensive labor and capital equipment.

This IPRO team has been optimizing a working augmented reality system that provides construction workers with color-coded location information regarding sub-terrain utilities such as gas, water, electricity, telephone, and cable television. The students have also been completing the formation of an integrated business plan that includes marketing, financial, and legal analyses..

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American Society of Civil Engineers
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