Chapter 2: SCHOOL OF ENGINEERING AND TECHNOLOGY

2.1 Mission

In line with the mission of the Institute, the mission of the School of Engineering and Technology is:

To develop highly qualified engineers and technologists who play leading roles in promoting the region’s industrial competitiveness in its integration into the global economy.

2.2 Thematic Groups, Fields of Study, and Multidisciplinary Programs

Information and Communications Group

Information and communications reflect the essential importance of access, connectivity and sharing. This collaboration on the creation of relevant knowledge provides economic opportunity and empowerment for all peoples of the region.

- Computer Science (CS)
- Information Management (IM)
- Remote Sensing and Geographic Information Systems (RS-GIS)
- Telecommunications (TC)
- Information and Communications Technologies (ICT)*

Industrial System Engineering Group

For several decades, AIT has served the development of the region by equipping young engineers with high-tech knowledge required for working in a complex industrial environment. Since its inception, the Industrial Systems Engineering (ISE) program at AIT has contributed to this mission by focusing on industrial competitiveness and innovation for sustainable growth of the region. ISE program acts as an umbrella for four fields of study:

- Design and Manufacturing Engineering (DME)
- Industrial Engineering and Management (IEM)
- Mechatronics (MEC)
- Microelectronics (MIC)
- Automotive Design and Manufacturing (ADM)*

Civil and Infrastructure Engineering Group

Since the start of AIT, civil engineering fields have acted as a catalyst in advancing modern methodologies, emerging technologies and innovative materials for the design and construction of safe and economical infrastructure in the region.

- Construction, Engineering and Infrastructure Management (CEIM)
- Geotechnical and Geoenvironmental Engineering (GTE)
- Structural Engineering (STE)
- Transportation Engineering (TRE)
- Water Engineering and Management (WEM)
- Geosystem Exploration and Petroleum Geoengineering (GEPG)*

*Interdisciplinary Areas

2.3 Strategic Signature Areas

The changing landscape of engineering requires graduates to have not only the traditional technical knowledge of their predecessors, but also a new set of broader skills that will meet the demands of fast-moving, global and multidisciplinary environments. Engineers must now learn to understand and apply several disciplines to solve complex problems, adapt to new technology and rapidly changing situations,
combine ideas to synthesize creative solutions, and learn to work in teams using excellent communication skills.

Although all fields of study at the School of Engineering and Technology cut across traditional disciplines, in order to better serve the present needs of the region, the school has identified several “Strategic Signature Areas” to further enhance the multidisciplinary offerings. The education, research and outreach activities across the disciplinary walls of traditional fields of knowledge of our faculty will drive these offerings. These courses build on several new and existing disciplines without focusing on one of the traditional fields that are already offered at AIT. A number of strategic multidisciplinary areas have been planned to help the sustainable economic and societal developments in the region as well as for its long-term industrial competitiveness. The two existing areas already under operation are:

- Information and Communications Technologies (ICT)
- Geosystem Exploration and Petroleum Geoengineering (GEPG)

New strategic multidisciplinary areas to be launched in 2006-2007:

- Advanced and Nano Material Technologies (ANM)
- Automotive Manufacturing Engineering (AME)
- Disaster Engineering and Management (DEM)
- Offshore Technology and Management (OTM)
- Supply Chain Management and Logistics (SCL)
- Technology Venture and Entrepreneurship (TVE)
- Integrated Water Resources Development (IWRD)

2.4 Academic Outreach Centers

The School of Engineering and Technology has a wealth of innovative and untapped knowledge database from its masters and doctoral research activities. Many academic outreach centers are set up to transform the knowledge to serve industrial and societal needs. These academic outreach centers will also serve to tap the practical aspects and the society impacts of the knowledge and technology back to the classroom, as well as connect the school with the world, outside the acade me. The academic outreach centers in the School of Engineering and Technology are:

Asian Center of Engineering Computations & Software (ACECOMS)

ACECOMS carries out research in engineering computations, develops and promotes computer software tools for engineering applications, and conducts training in the effective use of latest computing technology. With 29 satellite centers in 21 cities in Asia and other regions, ACECOMS carries out research in engineering computations, develops computer software tools for engineering applications and conducts training in the effective use of latest computing technology. Visit ACECOMS: http://www.acecoms.ait.ac.th/

Asian Center for Soil Improvement and Geosynthetics (ACSIG)

Most capital cities in Southeast Asia are located in lowland areas with associated soft ground problems. ACSIG provides a strategic location for advanced technological education, researches and outreach activities on the application and effective utilization of ground improvement techniques. Visit ACSIG: http://www.set.ait.ac.th/acsig/

Asian Center for Transportation Studies (ACTS)

The need to address pressing problems in transportation-related issues in Asian cities, and anticipated trends brought about by modernization underscores the importance of the Asian Center for Transportation Studies. ACTS activities include modules on intelligent transportation systems, traffic simulation, freight transport, urban road safety and road safety audit. Visit ACTS: http://www.set.ait.ac.th/acts/
Geoinformatic Center

Geoinformatic Center is dedicated to development and promotion of remote sensing research and activities in Asia-Pacific. Its mandate is to share satellite data, research results and experiences with researchers in the region. Various research facilities are established especially, NOAA AVHRR receiving station and Terra/Aqua MODIS receiving station to support research on global environmental study. Visit Geoinformatic Center: http://www.geoinfo.ait.ac.th/

Habitech Center (HABITECH)

The Habitech System is an innovative construction process implemented widely for housing, institutional and commercial building projects in the region. Its activities include research and outreach activities such as training in production and construction, provision of services associated with projects implemented by various organizations, agencies or the private sector.


International Ferrocement Information Center (IFIC)

IFIC coordinates the activities of the International Ferrocement Society (IFS) including publication of an in-house Journal of Ferrocement, conducting continuing education courses, and sponsored research projects. Its members include engineers, architects, students, researchers and all those interested in low-cost construction materials. Visit IFIC: http://www.sce.ait.ac.th/ific/

Regional Network Office for Urban Safety (RNUS)

The Regional Network Office for Urban Safety (RNUS) is a collaborative center jointly operated by the AIT and the University of Tokyo. Its priority task is the promotion of urban safety engineering utilizing advanced engineering technologies including remote sensing and GIS. Visit RNUS: http://www.set.ait.ac.th/rnus/

Thailand Accident Research Center (TARC)

The Accident Research Center is an offspring of MOTC’s Road Safety Master Plan acknowledging the lack of information on accidents in Thailand and the need to establish TARC. The support of TARC comes jointly from Department of Highways, Volvo Car Corporation and AIT. TARC provides academic back up and a base for road safety research. Visit TARC: http://www.tarc.ait.ac.th

AIT Center of Excellence in Nanotechnology (COE)

The Center of Excellence in Nanotechnology is jointly supported by Thailand’s Nanotechnology Center (NANOTEC) and AIT to cultivate and foster multidisciplinary activities including research and education in the applications of nanotechnology in the developing world. Visit COE: http://www.nano.ait.ac.th/

2.5 School Governance

Dean of School

WORSAK KANOK-NUKULCHAI, BEng (Hon), Chulalongkorn Univ, Thailand; MEng, AIT, Thailand; PhD, Univ of California (Berkeley), USA. 
Professor (Computational Mechanics; Finite Element Methods; Tall Building Static and Seismic Analysis; Bridge Engineering; Microcomputer Software for Structural Engineering; Genetic Algorithms; Nonlinear Analysis of Structures and Continua; Plate/Shell Structures; Engineering Education; Nanomechanics)
Associate Deans

JOYDEEP DUTTA, PhD, IACS, Calcutta Univ, India; BSc (Hon), MSc, North Eastern Hill Univ, India.

**Associate Professor**
Functional materials, nanomaterials, Nanoparticles, self-organisation, Biomimetic processes, Polyelectrolyte deposition, Gas sensors, Bio-sensors, optoelectronic devices

PANNAPA HERABAT, BS, MS, PhD, Carnegie Mellon Univ, USA.

**Assistant Professor**
Infrastructure Management; Asset Management Systems; Pavement Management System(PMS); Bridge Management System(BMS); Infrastructure Engineering Economics; Computer-Aided Engineering Management; Geographic Information Systems (GIS); Engineering Database Systems
Chapter 3: SET - COMPUTER SCIENCE and INFORMATION MANAGEMENT FIELDS OF STUDY

3.1 Introduction

Computer Science

This field of study fosters high level teaching and research in computer science and aims to meet the growing regional demand for persons skilled in various aspects of computing. One focus is on educating educators who can, in turn, effectively disseminate knowledge and skills to more people.

The core curriculum in computer science covers all aspects of computing, with the faculty particularly active in artificial intelligence, software engineering, networking and information systems. The field of study also endeavors to enhance teaching and research activities in computer architectures, object orientation, neural networks, multimedia and other rapidly-evolving areas in computer science.

The courses and research topics range from those addressing the practical problems of applications development, to those dealing with the abstract and theoretical issues of computer science and advanced computing. Students are also encouraged to take courses and conduct research in areas of Computer Science which interact with Information Management, Industrial Engineering, Manufacturing Systems Engineering, Telecommunications, Mechatronics and other fields of study covered at the Institute.

Information Management

This field of study is a strategic response to society's changing needs. It will continue to evolve as organizations cope with the proliferation and complexity of new information technologies and services. It is the first of its kind in Southeast Asia.

Information is an essential resource for academic excellence, competitiveness in business and industry, scientific progress, and national development. Like any other resource, information must be managed. High-quality sources must be located, and arrangements must be made for access to timely, accurate, appropriate, and cost-effective information. Technological advances in telecommunications and the hardware and software of computing can be utilized to provide the optimum access to information.

The need for information management skills in government and private organizations is increasingly recognized. People knowledgeable in methods of facilitating information collection, dissemination, and use are in demand. Such persons should also be skilled in identifying information needs and in accessing, repackaging, and presenting information in such a way that it can be utilized in support of the objectives of the users.

The Information Management curriculum is designed to prepare students to respond to four basic challenges confronting organizations today:

- Planning the effective use of information and communication technologies within organizations;
- Developing corporate and government policies to maximize the benefits resulting from the widespread use of these technologies;
- Improving the strategic management of information resources in business, government, and non-profit organizations; and
Computer Science and Information Management Fields of Study

- Increasing the productivity and creativity of managers and executives who work with information resources.

3.2 Research Facilities and Laboratories

Organized around ten Unix servers, some of them being multiprocessors, CSIM network comprise about 60 micro-computers, running desktop and engineering applications, scientific and research software and programming languages, with full access to the Internet. Through A3 project, a broadband satellite link is available to Japan and other countries in the region. This link is primarily dedicated for research activities in the field of internetworking, like the new generation of Internet IPv6, distributed education, video conferencing, and unidirectional routing. Dedicated laboratories are set-up with specialized equipments. Full wireless coverage in the building allows students to conveniently work with their personal notebook computers.

3.3 Faculty and Research Staff

Full-time Faculty

DENCHO N BATANOV, BSc, MSc, PhD, Technical Univ, Sofia, Bulgaria. Professor (Computer Aided Design; Computer Aided Manufacturing; Computer Integrated Manufacturing; Knowledge - Based Expert Systems; Object Orientation; Software Engineering)

PHAN MINH DUNG, MSc, PhD, University of Technology, Dresden, Germany. Professor (Artificial Intelligence; Database Systems Development; Expert Systems; Geographic Information Systems; Knowledge Engineering; Multimedia; Natural Language Processing)

PETER HADDAWY, BA, Pomona College, Claremont, USA; MSc, PhD, Univ of Illinois, Urbana, USA. Professor and Vice President for Academic Affairs

KANCHANA KANCHANASUT, PhD, MSc, Computer Science, University of Melbourne, Australia; Graduate Diploma, Computer Science, BSc Mathematics, University of Queensland, Australia. Professor, DEC Director, and IntERLab Director (Algorithms; Logic Programming; Networks) [Constraint-Based Programming Languages; Real-time Systems; Computer Networking Applications]

PHAN MINH DUNG, MSc, PhD, University of Technology, Dresden, Germany. Professor (Artificial Intelligence; Database Systems Development; Expert Systems; Geographic Information Systems; Knowledge Engineering; Multimedia; Natural Language Processing)

PETER HADDAWY, BA, Pomona College, Claremont, USA; MSc, PhD, Univ of Illinois, Urbana, USA. Professor and Vice President for Academic Affairs

KANCHANA KANCHANASUT, PhD, MSc, Computer Science, University of Melbourne, Australia; Graduate Diploma, Computer Science, BSc Mathematics, University of Queensland, Australia. Professor, DEC Director, and IntERLab Director (Algorithms; Logic Programming; Networks) [Constraint-Based Programming Languages; Real-time Systems; Computer Networking Applications]

VILAS WUWONGSE, DEng Systems Science, MEng Control Engineering, BEng Control Engineering, Tokyo Institute of Engineering, Japan. Professor and Vice President for External Relations (Artificial Intelligence; Database Systems Development; Expert Systems; Geographic Information Systems; Knowledge Engineering; Multimedia; Natural Language Processing) [Expert Systems; Computational Linguistics; Applications of Micro Computers; Multimedia; Databases]

VATCHARAPORN ESICHAIKUL, BAcc, Chulalongkorn Univ, Thailand; MBA, Oklahoma State Univ; PhD, Kent State Univ, USA. Associate Professor

SUMANTA GUHA, MS, PhD, University of Michigan, Ann Arbor, USA; PhD, Indian Statistical Institute, Calcutta, India; BSc, MSc, University of Calcutta, India. Associate Professor (Electronic Data Interchange; Global Information Systems; Hypertext/Hypermedia; Management of Information Technology) [Computational Geometry; Computer Graphics; Computational Topology; Robotics (motion planning); Algorithms in general]
Visiting Faculty

PAUL JANECEK, BSEE, US Military Academy; MSc, Univ of London, UK; PhD, Swiss Federal Inst of Tech, Switzerland. 
Visiting Lecturer

3.4 Completed Grant and Sponsored Research

AP* Retreat Secretariat
Duration: 1 September 2003 to 31 December 2005
Investigator: Prof Kanchana Kanchanasut
Sponsor: Asia Pacific Network Information Centre, Australia
Total Contracted Amount: Baht 785,000

Automated Brokering for B2B E-Commerce
Duration: 1 May 2002 to 31 December 2005
Investigator: Prof Peter Haddawy
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 950,000

Destination Management for E-tourism in Thailand
Project Description: E-Tourism is one of the fastest growing E-Business sectors in Thailand. In order to promote E-Tourism, there is a need to find an effective approach to manage destinations. Electronic destination, operated by destination management organizations, help to improve downstream information flows with respect to quality, content presentation, speed, and accessibility. The aim of this project is to propose an electronic destination, supported by DMOs, for Thailand.
Duration: 1 April 2003 to 30 June 2005
Investigator: Dr Vatcharaporn Esichaikul
Collaborator: Sukhothai Thammathirat Open University, Thailand
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 950,000

IP Broadcast over Satellite Link
Project Description: The project is to study the requirements in order to provide reliable communication service using unidirectional satellite broadcast without the acknowledgement from the recipients. From these requirements, a modeling of a protocol will be designed and implemented. The model will be tested and adjusted according to its scalability factor.
Duration: 1 March 2003 to 30 June 2005
Investigator: Prof Kanchana Kanchanasut
Collaborators: Dr Sukumal Imudom and Dr Surasak Sanguanpong, Kasetsart University, Thailand
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 760,000

V-Class Software Development
Project Description: VClass is an Learning platform developed by the Distributed Education Center (DEC), intERLab, at the Asian Institute of Technology (AIT). It is specifically designed for delivering on-line courses by two different methods through virtual classroom learning or virtual class on demand.
Duration: 1 January 2003 to 31 December 2005
Investigator: Prof Kanchana Kanchanasut
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 2,844,730

Web community and Knowledge-based Intelligent System for Supporting Customer Relationship Management for Thai SME
Project Description: Small and Medium Enterprises (SME) are the root of Thai economy and play substantial role for its success. Since the customers are the major source of companies revenue the relationships with customers are critical for successful business processes. This project has the main objective to develop a prototype of Collaborative Web-based environment (Web Community) and Knowledge-Based/ Expert system with CRM (Customer Relationship Management) related contents suitable for Thai SME. It is expected that the Web community to improve the communication between practitioners on one hand and practitioners and experts on the other, for exchanging CRM-related knowledge. It is expected also that the system provide required knowledge and best practice to the managers of Thai SME.
Duration: 1 October 2004 to 31 October 2005
Investigator: Prof Dencho Batanov
Collaborator: Dr Anongnart Srivihok, Kasetsart University, Thailand
Sponsor: Royal Thai Government / Thailand SME
Total Contracted Amount: Baht 868,000

3.5 Ongoing / In Progress Grant and Sponsored Research

A Collaborative Intelligent Tutoring System for Medical Problem-Based Learning
Project Description: Our proposed work will combine concepts from ITS with those from CSCIL to develop an intelligent group-based medical PBL system. Our proposed work departs from previous efforts to incorporate user modeling into computer supported collaborative environments by focusing on modeling individual and group problem solving behavior. The techniques will be implemented using client/server combination and will incorporate a multi-modal interface that integrates text and graphics so as to provide a rich communication channel between the students and the system, as well as among students in the group.
Duration: September 2004 to August 2005 (extended to March 2006)
Computer-Aided Learning Program for Health Professional Students in Diabetes Patient History Taking

Project Description: The development of the multimedia computer program (CAL) for health care professional students/diabetes patient history taking skills. The process is divided into 2 parts: 1) the development of the program via Authorware Professional version 7.1 which installed the contents of the chronic disease including; underlying disease, medication history, social and family history, diet, and exercise there are some video clips inserted into the program.

Duration: September 2004 to August 2005 (extended to March 2006)

Investigator: Prof. Peter F. Haddawy
Sponsor: Royal Thai Government Joint Research Fund 2004
Total Contracted Amount: Baht 156,000

3.6 Publications

Refereed Journals


Refereed Books / Chapters


AI-10
Conference Proceedings


Iwaihara, M, Chatwickiechais, S, Anutariya, C and Wuwongse, V, Relevancy Based Access Control of Versioned XML Documents, Proceedings of the 10th ACM Symposium on Access Control


3.7 Doctoral Students’ Dissertation

Computer Science

Active Networks Technology and Dynamics QoS
by Tippyant Tansupasiri
Supervisor: Prof Kanchana Kanchanasut

Adaptive Quality-of-Service Routing for the Internet
by Kitt Tientanopajai
Supervisor: Prof Kanchana Kanchanasut

An Agent Model for Computer Performance Enhancement
by Poonphon Suesawaluk
Supervisor: Prof Ramakoti Sadananda

Cellular Automata—Studies in Critical Densities
by Srilop Supratid
Supervisor: Prof Dencho N Batanov

Converting Text Description to Object Model Using Ontologies
by Waralak Vongdoiwang
Supervisor: Prof Dencho N Batanov

Information Management

Communicating Customer Trust in E-Commerce through Website Design
by Penmanee Rattanawicha
Supervisor: Dr Vatcharaporn Esichaikul

Intelligent Tutoring for Medical Problem-Based Learning
by Sirwan Suebnukam
Supervisor: Prof Peter F Haddawy

Recurrent Neural Networks as Forecasting Models
by Suwarin Pattamavornkun
Supervisors: Dr Manulkid Pamichkun and Prof Huynh Ngoc Phien
3.8 Masters Students’ Theses and Research Studies

**Computer Science**

**Access Control in Outlook Application**
by Nguyen Dinh Han
Supervisor: Prof Phan Minh Dung

**Access Control with Spatial/Temporal Information**
by Chalid Nalampoon
Supervisor: Prof Vilas Wuwongse

**Access Control with Versioning and Timing in Digital Repositories**
by Satja Hongyok
Supervisor: Prof Vilas Wuwongse

**Agent-Based Simulation of Trade in Barter Trade Exchanges**
by Nattiya Kanhabua
Supervisor: Prof Peter Haddawy

**An Integrated Open Framework for Mining Sensor Data**
by Ren Jianli
Supervisor: Dr Vatcharaporn Esichaikul

**A Practical Approach towards Server-Less Group Member Authentication Protocol for Mobile Ad Hoc Network**
by Md Musif Rahman
Supervisor: Prof Kanchana Kanchanasut

**A Robust Document Layout Analysis Algorithm for Vietnamese Documents**
by Nguyen Duc Thanh
Supervisor: Dr Nitin V Afzulpurkar

**A Strand-Based Analysis of the Protocol TLS**
by Parinya Chalermsook
Supervisor: Prof Phan Minh Dung

**A Trustable Anti-Spamming Simple Mail Transfer Protocol Model**
by Pham Viet Tan
Supervisor: Prof Phan Minh Dung

**A Web-Based Model Using Learning Objects for Teaching and Learning Classes and Instances in C++ and JAVA**
by Nguyen Dieu Huong
Supervisor: Prof Dencho N Batanov

**Computer Recognition of Sketch Annotations**
by Ratspoom Waranasat
Supervisor: Prof Peter Haddawy

**Content Packaging and Delivery of Learning Objects for Teaching and Learning through Web**
by Kamal Thakor
Supervisor: Prof Dencho N Batanov

**Convex Polygon Recognition**
by Kieu Trong Khanh
Supervisor: Dr Sumanta Guha

**DIP-MIP: Distributed Individual Paging Extension for Mobile IP in IP-Based Cellular Networks**
by Chuoan Chansophea
Supervisor: Dr Sumanta Guha

**E-Learning and Session Initiation Protocol (SIP)**
by Andrey Kuprianov
Supervisor: Prof Kanchana Kanchanasut

**Extending Fixed Internet with Wireless Ad-Hoc Networks**
by Sverre Rakkenes
Supervisor: Prof Kanchana Kanchanasut

**Facial Expression Recognition and Its Degree Estimation Using Fuzzy Clustering Algorithm on Gabor-PCA Features**
by Md Ashraful Amin
Supervisors: Dr Nitin V Afzulpurkar
             Dr Vatcharaporn Esichaikul

**Fast Mobile IPv6 for Real-Time Streaming Media**
by A K M Mahtab Hossain
Supervisor: Prof Kanchana Kanchanasut

**Gateway Selection Based on Gateway Load in Ad Hoc/Infrastructured Environment**
by Ahmed Waliullah Kazi
Supervisor: Prof Kanchana Kanchanasut

**Implementing the SWAP-GA Model in Cluster Computers**
by Md Shamin Akhter
Supervisors: Dr Kiyoshi Honda
             Dr Putchong Uthayopas

**Integrating an Intelligent Agent and Learning Objects to Improve Content Management in Web-Based Teaching and Learning**
by Wang Qing
Supervisor: Prof Dencho N Batanov

**IP Packet Loss and Recovery over Unidirectional Satellite Network**
by Mohammad Abdul Awal
Supervisor: Prof Kanchana Kanchanasut
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<th>Title</th>
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<td>Ngo Tuan Anh</td>
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<td>Prof Vilas Wuwongse</td>
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<td>Tian Hong Duong</td>
<td>Dr Vatcharaporn Esichaikul</td>
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Learning Object-Based Support of a Teaching and Learning Input-Output Mechanism in Object Oriented Programming
by Vipul Shah
Supervisor: Prof Dencho N Batanov

Learning Objects for Teaching and Learning Object-Oriented Perl Programming
by Phan Van Nam
Supervisor: Prof Dencho N Batanov

Modeling Company Spending Behavior with Time Series Neural Networks
by Tran Vinh
Supervisor: Prof Peter Haddawy

Network Effects of the Internet on Native Languages and Implications for the Digital Divide
by Mayuna Badela
Supervisor: Dr Vatcharapom Esichaikul

Ontology-Based Information System Design
by Cao Hong Thang
Supervisor: Prof Vilas Wuwongse

Teaching and Learning Structured Query Language (SQL) Programming with Learning Objects in a Web-Based Environment
by Rabin Kumar Gupta
Supervisor: Prof Dencho N Batanov

Research Study: A Comparative Study of Business Process Modeling Languages
by Nguyen Trong Thuy
Supervisor: Prof Vilas Wuwongse

Research Study: Analysis of an Information Network Model for Education Management and Development in Sri Lanka
by Hewa Marambage Piyadasa
Supervisor: Dr Vatcharapom Esichaikul

Research Study: Digital Annotation Systems for Asynchronous Collaborative Writing Activities
by Tsering Dolker
Supervisor: Dr Vatcharapom Esichaikul

Research Study: Identification of Critical Success Factors and Barriers of Global Software Outsourcing
by Guda Swama Rani Reddy
Supervisor: Dr Vatcharapom Esichaikul

Research Study: The Development of a Legal Frame for E-Commerce in Thailand
by Le Thiung Dung
Supervisor: Dr Vatcharapom Esichaikul
Chapter 4: SET - CONSTRUCTION, ENGINEERING AND INFRASTRUCTURE MANAGEMENT FIELD OF STUDY

4.1 Introduction

The Construction, Engineering and Infrastructure Management field trains professionals to play leading roles in the international construction industry and in infrastructure development and management. It offers courses in four levels - operations, project, strategic issues and corporate issues. It prepares students to become effective managers and decision-makers familiar with modern techniques of construction management, engineering management and infrastructure management.

The field’s courses are delivered based on a hierarchical knowledge scale that considers principles and fundamentals, applications (tools and techniques), and emerging issues. In offering courses spanning fundamentals to advanced, the emphasis is on shifting from classical to innovative knowledge.

4.2 Faculty and Research Staff

Full-time Faculty

STEPHEN O OGUNLANA, BSc, MSc, Univ of Ife, Nigeria; PhD, Loughborough, Univ of Tech, UK.

Professor (Construction Economics; Project Management; Productivity Improvement; Dynamic Modeling and Simulation; Human Resources Management)

CHOTCHAI CHAROENNGAM, BEng, King Mongkut’s Inst of Tech, Thonburi, Thailand; MS, Univ of Kansas; PhD, Univ of Texas, USA

Associate Professor (Project Planning, Scheduling, and Controls; Construction Productivity Improvement; Information Technology in Construction)

BONAVENTURA H W HADIKUSUMO, BEng, Univ of Diponegoro, Indonesia; MEng, AIT; PhD, Univ of Hong Kong.

Assistant Professor (Construction Information Technology; Construction Site Safety, Virtual Reality application in construction; Web-based project design and management; Design for X-ability; Construction simulation; Construction site safety; Cost control)

PANNAPA HERABAT, BS, MS, PhD, Carnegie Mellon Univ, USA.

Assistant Professor (Asset Management System; Pavement Management System; Bridge Management System (BMS); Infrastructure Economics; and Computer-Aided Engineering Management)

4.3 Completed Grant and Sponsored Research

A Markov Deterioration Model for Truck-Induced Cracking Bridge Decks

Project Description: The research develops a hybrid deck deterioration model that incorporates the quantitative analysis of crack mechanism due to truck traffic loads into the concept of Markov deterioration model for network-level management of bridges in Thailand. The computer program that can simulate the track mechanism in reinforced concrete bridge deck under truck traffic is developed. This includes finite element modeling of the reinforced concrete under cracked and uncracked states and a simulation process based on the bridge deck geometry, material properties, and track traffic characteristics in Thailand. The simulation output is analyzed to obtain transition probability matrices in accordance with the concept of Markov deterioration model.

Duration: 1 September 2004 to 31 October 2005

Investigator: Dr Pannapa Herabat
4.4 Ongoing / In Progress Grant and Sponsored Research

Consistency of Safety and Health Management System Implementation
Project Description: This study investigates the consistency of safety and health management system. The project aims to improve safety and health management practices within the construction industry. The performance of the system is benchmarked against industry standards and best practices.
Duration: May 2005 to December 2006
Investigator: Dr B H W Hadikusumo
Sponsor: Bovis Lend Lease
Total Contracted Amount: Baht 88,500.00

Construction Work Performance Under Bovis Lend Lease Safety and Health Management System
Project Description: This study investigates the performance of Bovis Lend Lease's (BLL) safety and health management system. The performance is compared with industry standards and best practices.
Duration: May 2005 to December 2006
Investigator: Dr B H W Hadikusumo
Sponsor: Bovis Lend Lease (Thailand) Ltd
Total Contracted Amount: Baht 88,500

EU-Asia Network of Competence Enhancement on Public-Private Partnerships (PPPs) in Infrastructure Development
Project Description: This project enhances the cooperation and development of PPPs in infrastructure development across Europe and Asia. It involves developing and implementing best practices and training programs.
Duration: October 2005 to March 2007
Investigator: Dr B H W Hadikusumo
Sponsor: Ministry of Foreign Affairs
Total Contracted Amount: Baht 4,978,000.00

Inspection Manuals and Procedures for Expressway Transit Authority of Thailand
Project Description: This project develops inspection manuals and procedures for the Expressway Transit Authority (ETA). The project aims to improve the maintenance and inspection process of expressways.
Duration: April 2004 to March 2007
Investigator: Dr B H W Hadikusumo
Sponsor: Ministry of Foreign Affairs
Total Contracted Amount: Euro 400,000

Seminar: CIB Symposium on Globalization and Construction 2004
Project Description: This seminar focuses on globalization and construction, with discussions on how the construction industry can adapt to global trends.
Duration: May 2004 to December 2005
Investigator: Dr B H W Hadikusumo
Sponsor: Ministry of Foreign Affairs
Total Contracted Amount: Baht 1,025,000.00

Strategic Budgeting System II
Project Description: This project focuses on developing a strategic budgeting system that can be used to coordinate and prioritize projects.
Duration: October 2004 to March 2006
Investigator: Dr B H W Hadikusumo
Sponsor: Ministry of Foreign Affairs
Total Contracted Amount: Baht 1,000,000.00

The Strategic Portfolio Program Management
Project Description: This project aims to develop a strategic portfolio program management system that can be used to coordinate and prioritize projects.
Duration: October 2005 to March 2007
Investigator: Dr B H W Hadikusumo
Sponsor: Ministry of Foreign Affairs
Total Contracted Amount: Baht 4,978,000.00
4.5 Publications

**Refereed Journals**


**Refereed Books/Chapters**


**Conference Proceedings**


**Other Publications**

Charoenngam, C and Treerat, N, Output Structure for Strategic Based Budgeting (SPBB), A Research Report for Bureau of Budget, Office of the Prime Minister, Royal Thai Government (RTG), 2005. (in Thai)
Construction, Engineering & Infrastructure Management Field of Study

Ogunlana, S O, Public Private Partnerships-
Gold Mining in partially cleared
minefields, International Symposium on
Public Private Partnerships, Hong Kong.

Shamas-ur-Rehman-Toor and Ogunlana, S O,
What is critical for success -
Investigating the critical success factors and key performance
indicators for Mega construction projects, Society for Project

4.6 Doctoral Students’ Dissertation

Improvement of the Rural Infrastructure
Development Process in Thai Sub-district
Local Government
by Narong Leungboontak
Supervisor: Dr Chotchai Charoenngam

Testing of Herzberg’s Motivation Theory in the
Construction Industry
by Rathavoot Ruthankoon
Supervisor: Prof Stephen O Ogunlana

4.7 Masters Students’ Theses
and Research Studies

A GIS-Based Decision Module for Pavement
Management in Thailand
by Ittiwat Keratiwattanakul
Supervisor: Dr Pannapa Herabat

An Application of Asset Valuation for Railroad
Tracks
by Chinnawat Yamkran
Supervisor: Dr Pannapa Herabat

An Application of Planning and Control
Techniques in Thai Construction Projects
by Kriengkai Payapwattanawong
Supervisor: Dr Chotchai Charoenngam

Assessing Safety Management Practices in
the Bhutanese Construction Industry
by Kin Dorji
Supervisor: Dr Bonaventura H W Hadikusumo

A Web-Based Application to Support Quality
Management Documentation for a
Construction Company
by Noppadol Kaewbotsut
Supervisor: Dr Bonaventura H W Hadikusumo

Building an Innovation Management System
in a Construction Multi-Business Corporation
by Nguyen Van Hoai
Supervisor: Dr Chotchai Charoenngam

Case Studies of Solid Waste Collection in
Karachi, Pakistan
by Muhammad Rizwan
Supervisor: Prof Stephen O Ogunlana

Cash Flow Planning Application for
Construction Projects
by Nakorn Nakwarin
Supervisor: Dr Bonaventura H W Hadikusumo

Construction Process Improvement for a
Mass Housing Project: A Case of Pre-cast
Housing Construction
by Patiyia Padhan
Supervisor: Prof Stephen O Ogunlana

Construction Work Performance under Bovis
Lend Lease Safety Program
by Thanapat Leingtong
Supervisor: Dr Bonaventura H W Hadikusumo

Collaborative Solving Problems between
Consultants and Contractors
by Wijittra Mahavanakom
Supervisor: Dr Chotchai Charoenngam

Culture and Workplace Behaviors: A Case
Study of Joint Venture Construction Projects
in Thailand
by Yoyu Toto Roma
Supervisor: Prof Stephen Ogunlana

Development of a Prediction Model and
Prioritization of the Expressway Maintenance
Management System
by Mohammad Shahidul Islam
Supervisor: Dr Pannapa Herabat

Knowledge Management in the Estimating
Process in a Construction Organization
by Mohammad Kamal Hossain
Supervisor: Dr Bonaventura H W Hadikusumo

Management of Mega Projects: Case Study of
the Second Bangkok International Airport
by Shamas-ur-Rehman-Toor
Supervisor: Prof Stephen O Ogunlana

Motivation of Construction Engineers in
Yunnan, China
by Dai Jiliang
Supervisor: Prof Stephen O Ogunlana
Multicriteria Decision Making for Highway Management System  
by Mohammad Mamunur Rashid  
Supervisor: Dr Pannapa Herabat

Owner's Risk Management for Civil Construction Projects in Vietnam  
by Nguyen Thanh Huy  
Supervisor: Prof Stephen O Ogunlana

Public Project Financial Planning: The Asset-Based Approach for Vietnam Transport Infrastructure  
by Nguyen Thi Cam Tu  
Supervisor: Dr Chotchai Charoenngam

Reliability-Based Optimal Inspection Interval  
by Dolyawich Nongpong  
Supervisor: Dr Pannapa Herabat

Risk Management in the Pakistan Construction Industry: A Contractors’ Perspective  
by Asif Hameed Malik  
Supervisor: Prof Stephen O Ogunlana

Rural Road Development and Poverty Alleviation in the Lao PDR  
by Emi Doyle  
Supervisors: Prof Stephen O Ogunlana  
Dr Shinya Hanaoka

Social Impact Assessment Development for Roads Projects in Thailand  
by Siriporn Sumonwattanadej  
Supervisor: Dr Pannapa Herabat

Strategic Management Process of Vietnamese Construction Organizations in Ho Chi Minh City  
by Nguyen Huu Nghia  
Supervisor: Dr Chotchai Charoenngam

The Integrated Performance Indicator for Airport Pavement Evaluation  
by Yongyot Retchaya  
Supervisor: Dr Pannapa Herabat
Chapter 5: SET - DESIGN & MANUFACTURING ENGINEERING AND INDUSTRIAL ENGINEERING & MANAGEMENT FIELDS OF STUDY

5.1 Introduction

Design and Manufacturing Engineering

Design and Manufacturing Engineering field of study prepares students to manage advanced manufacturing technologies, focusing on the selection, use, control, design and integration of computer controlled manufacturing systems. The Design and Manufacturing Engineering curriculum reflects the objective of imparting fundamental knowledge to develop the ability to address the complex interaction between manufacturing, computers and industry.

Industrial Engineering and Management

Industrial Engineering and Management field of study prepares students for manufacturing management and decision support positions in industry and public sector, by equipping them with a broad range of decision making skills for a variety of applications. The I&EM curriculum reflects the objective of imparting fundamental knowledge to develop the ability to address complex industrial issues, emphasizing on how to design, run, control, and optimize the production systems.

5.2 Research Facilities and Laboratories

IEM and DME fields share all the laboratory facilities with Mechatronics and Microelectronics fields of study. There are several well equipped laboratories with the primary function of supporting the students and faculty for teaching and research and to conduct outreach programs.

Computer Integrated Manufacturing (CIM) Laboratory

The Computer Integrated Manufacturing (CIM) Laboratory was officially inaugurated on September 23, 1991. It provides the hardware and software support for Industrial Systems Engineering. Many research activities have been undertaken in close collaboration with industry and government sectors in the area of Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Numerical Control (CNC), Rapid Prototyping (RP) and Medical Technology. The CIM Laboratory also provides specialized training and consultancy services in CAD, CAM, CNC Machining, Reverse Engineering, Rapid Prototyping, Packaging Technology, Flexible Manufacturing Systems (FMS), and Development of Postprocessor for 5-axis CNC.

The CIM Laboratory is equipped with production and training CNC machines including EMCO TURN242 industrial production CNC lathe, EMCO VMC200 CNC vertical machining center for universal production, MAHO MH600E2 5-axis universal milling and boring machine, EMCO compact 5 CNC, EMCO F1 CNC, LVD CNC press brake, LVD waterjet cutting CNC, ZOLLER tool presetting system, and Mondiale Gallic G-420 Industrial CNC lathe, EMCO CNC training system, CAD/CAM software including UNIGRAPHICS NX4, Master CAM 9.1, Mechanical Desktop 6, AutoCAD Inventor Series, SolidWorks 2005, CAM 2000, Mimics 6.3 & Magic 5.4.

Metrology Laboratory

Metrology Laboratory provides the hardware and software support for Industrial Systems Engineering. Metrology Laboratory is equipped with Measuring Instruments (Zeiss...
Design & Manufacturing Engineering and Industrial Engineering & Management Fields of Study

CMM, Mitutoyo Profile Projector, Taylor Hobson Surface Roughness Tester, Lab View Hardware & Software).

Mechatronics and Automation Laboratory

This lab is equipped with many PLC systems (S5, S7-200/300/400, INDRAMAT, BOSCH), distributed control systems (PC57), operator panels (OP5, OP17/DP, OP35), PC-based human machine interface package (WINCC), and networked fieldbuses (PROFIBUS, INTER-BUS, SERCOS). The lab has mobile robots (NOMAD, PIONEER 2), Robot arms (CRS), Industrial Robot (KUKA-KR15), a self-made Open Architecture CNC machine, CNC control systems (MTC 200, SINUMERIK 8100/8400), image processing systems (DVT, MATROX), and FPGAs (XILINX-1VIRTEX PRO, ALTERA). Software packages such as SYNOPSYS IC Design, ANSYSIM, ANSYS, ADAMS, and many types of special sensors and actuators are also available for the research use.

Many research activities have been undertaken in close collaboration with industry and government sectors in the area of industrial automation, robotics, control, system design and integration. Some examples of the research are: medical teleanalyzer, automated visual inspection systems, MEMS design, autonomous flying robot, automating centrifuge machines, autonomous under-water robot, automating crystallization process, etc.

Simulation Laboratory

This lab is equipped with networks of Pentium PC for general applications and internet access, high end CAD/CAM & Simulation software such as ARENA and AutoMOD. In addition, a high performance computer facility with parallel cluster is also available for research use.

Microelectronics Laboratory

The microelectronics facilities consist of two main laboratories:

1. IC Design Lab
2. Nanotechnology

The IC Design lab computers have standard software useful for studying and research. ANSYS, Orcad, ModelSim SE, Xilinx ISE, Synopsys Leonardo Spectrum LS, Tanner S-Edit for Schematic Capture, T-Spice and W-Edit for Simulation and L-Edit for Physical Layout) are some of the software which are available. All the computers are networked through a high end (Intel XEON) server which is secure from external attacks. The laboratory facilities are used for Analog and digital circuit design, Microchip design and fabrication, MEMS, Micro-actuators and micro-sensors design, Computational electronics, etc. The fabrication is done in cooperation with NECTEC, NSTDA, Thailand.

The Nanotechnology Laboratory consists of a chemistry lab, instrumentation room and an electronics laboratory. The chemistry laboratory is equipped with standard chemical tables and hood for carrying out wet-chemical processing. The instrumentation room consists of equipment like optical spectrophotometer, microscope etc. The electronics laboratory is equipped with digital oscilloscopes, signal generators, power supplies, standard voltage and current meters as well as stocked with discrete devices for testing and research. This laboratory is used for teaching and research especially in the processing related subjects.

5.3 Faculty and Research Staff

Full-time Faculty

MARIO T. TABUCANON, BSEE, BSME, Cebu Inst of Tech, Philippines; MEng, DEng, AIT, Thailand.

Professor (Multiple Criteria Decision Making; Operations and Production Management; Operations Research; Project Management; Systems Modeling)

ERIK L.J. BOHEZ, BEng, High Tech Inst St Antonius, Ghent; MEng, State Univ of Ghent, Belgium.

Associate Professor (Computer Aided Design; Computer Aided Manufacturing; Computer Graphics; Computer Numerical Control; Five Axis
Machining; Fractal and Holistic Manufacturing; Robust Control; Simulation of Metal Removal; Virtual Axis Machine) 
[CNC/CAD/CAM; Five Axis Machining; Holonic and Fractal Manufacturing; Mold and Die Design] 

VORATAS KACHITVICHYANUKUL, BS, Natl Taiwan Univ; MEng, AIT, Thailand; PhD, Purdue Univ, Indiana, USA 
Associate Professor (Simulation; ERP; Scheduling, Metaheuristics; Parallel Computing) 
[Planning and Scheduling Systems; Enterprise Resource Planning Systems; Supply Chain Modeling and Analysis; Discrete Event Simulation Software Development; Manufacturing System Simulation; Manufacturing Decision Support Systems; Just-in-Time Manufacturing System] 

ANULARK TECHANITISAWAD, BEng, Kasetsart Univ, Thailand; MBA, Eastern Michigan Univ; PhD, Texas A&M Univ, USA 
Associate Professor (Branch and cut for assembly system design with zonings; Integer and Combinatorial Optimization; Integrated location and vehicle routing; Mathematical Programming) 

PISUT KOOMSAP, BEng, Thammasat Univ, Thailand; MSc, Univ of Louisville; PhD, Pennsylvania State Univ, USA 
Assistant Professor (Sensing and Control for Manufacturing Processes and Systems; Laser Applications in Manufacturing; Rapid Prototyping; Condition-Based Maintenance; Continuous Improvement) 
[Rapid Prototyping; Sensing and Control for Manufacturing Processes and Systems; Laser Applications in Manufacturing; Condition-Based Maintenance; Continuous Improvement] 

HUYNH TRUNG LUONG, BEng, Ho Chi Minh City Univ of Tech, Vietnam; MEng; DEng, AIT, Thailand. 
Assistant Professor 
[Emergency inventory policies and inventory policies for perishable products; Supply chain design; Measures of bullwhip effect in supply chains; Availability-based and reliability-based maintenance; Fuzzy quality control charts; Statistical design of experiments; Network flows related problems]
5.5 Ongoing / In Progress Grant and Sponsored Research

Biodegradable Polylactide and Natural Rubber for Multicolor Articles Rapid Prototyping

Project Description: Rapid Prototyping (RP) is a method to manufacture products without mold and die. Three-dimension CAD solid models are translated into stacks of 2D cross-sections, used to generate commands to fabricate physical prototypes layer by layer. Several of RP systems are commercially available in the market today, and many techniques are in research. The trend of new RP techniques is towards low cost systems that are affordable to middle and small companies. The outcome of this research will provide a capability of producing multicolor articles from environment-friendly materials, and capable of making multicolor articles. This research proposes to develop a process to produce multicolor articles from two economically significant raw materials of Thailand: the environmental-friendly polylactide and natural rubber to strengthen the capability of Selective Vacuum Manufacturing (SVM), a new RP technique being developed at AIT. In this proposed process, four process-colored pigments are mixed with base materials according to the input color from the design, and transferred to feeder of SVM system, where the material is filled layer-by-layer to manufacture multicolor parts. The outcome of this research will provide a capability of producing multicolor articles from environment-friendly materials with inexpensive RP technique, affordable to middle and small companies.

Duration: January 2002 to November 2005
Investigator: Assoc Prof Erik L J Bohez
Sponsor: RIT
Total Contracted Amount: Baht 1,326,400

Evaluation of the Modernization of Technical Education in Production Technology

Project Description: The purpose of the project is to evaluate the results of the Project “Modernization of Technical Education in Industrial Production Technology” Phase I, implemented between 1994 and 1998 by EMCO under contract with Rajamangala Institute of Technology (RIT). The study was limited to 10 sites, which were the object of the Phase I of the Project. The result of the evaluation is that the project was highly successful. A plan for further development is provided and suggestions to link to the Thai industry are given. Investments in new site campuses and CNC Technology Center are given. Curriculum and required training for RIT faculty and staff are suggested.

Duration: July 2001 to December 2007
Investigator: Assoc Prof Erik L J Bohez
Sponsor: EMCO/RIT
Total Contracted Amount: Baht 450,000

5.6 Publications

Refereed Journals


AITE Annual Report on Research 2005


Refereed Books/Chapters


Conference Proceedings


5.7 Doctoral Students' Dissertation

Design and Manufacturing Engineering

Optimization of 5-Axis Freeform Surfaces Machining: Vector Field Clustering Approach by Chu Anh My
Supervisor: Associate Professor Erik L J Bohez

Industrial Engineering and Management

Applications of the Neural Network Energy Functions in Solving Integer Programming Models by Komgrit Leksakul
Supervisor: Dr Anulark Techanitisawad

Heuristics for Job Shop Scheduling Problems with Progressive Weighted Tardiness Penalties and Inter-machine Overlapping Sequence-dependent Setup Times by Chatpon Mongkalig
Supervisor: Prof Mario T Tabucanon

5.8 Masters Students' Theses and Research Studies

Design and Manufacturing Engineering

An Expert System for Boiler Fans Maintenance Support Using Vibration Analysis Technique by Nguyen Hong Long
Supervisor: Dr Pisut Koomsap

Application of Mini-SCADA in Hanoi Electrical Network by Phung Quang Khai
Supervisor: Associate Professor Erik L J Bohez

A Preliminary Investigation on Abrasive Water Jet Milling (AWM) Process by Amit Kumar
Supervisor: Dr Pisut Koomsap
Design & Manufacturing Engineering and Industrial Engineering & Management Fields of Study

Automatic Design of a Multi-Liquid not Mixed Cocktail Glass
by Aueychai Jitaua
Supervisor: Associate Professor Erik L J Bohez

Development and Implementation of a Braking Algorithm for a Car Crash Avoidance System
by Jakra Tandhavatana
Supervisor: Dr Pisut Koomsap

A Comparative Study of Third-Party-Logistics-Service Providers and Traditional Warehouse
by Mattaneeya Songsanit
Supervisor: Dr Voratas Kachitvichyanukul

A GA-Benders Algorithm for Lot Sizing and Scheduling in a Multistage Production System with Sequence Dependent Setup
by Tensak J Ingamakkul
Supervisor: Dr Anulark Techanitisawad

A Genetic Algorithm for Resource-Constrained Project Scheduling with Flexible Work Profiles
by Nguyen Tien Dung
Supervisor: Dr Anulark Techanitisawad

A Genetic Algorithm for Resource-Constrained Project Selection and Scheduling
by Trinh Quoc Vu
Supervisor: Dr Anulark Techanitisawad

An Ant Colony Algorithm for Solving Multi-Depot Vehicle Routing Problems with Time Windows
by Tossaporn Nakay
Supervisors: Dr Anulark Techanitisawad, Dr Voratas Kachitvichyanukul

An Enhanced Genetic Algorithm for Multi-Objective Job Shop Scheduling
by Nguyen Van Lam
Supervisor: Dr Voratas Kachitvichyanukul

An Inspection Maintenance Model for Power Transformers: A Case Study of Bangpa-In Substation, Electricity Generating Authority of Thailand
by Chanchai Singleewan
Supervisor: Dr Huynh Thong Luong

A Periodic Review Inventory Model with Joint Orders for a Retail Gas Station
by Le Nhu Hung
Supervisor: Dr Anulark Techanitisawad

A Periodic Review Inventory Model with Uncertain Demand in a Two-Echelon Distribution System
by Pham Thi Thu Hoai
Supervisor: Dr Anulark Techanitisawad

Application of Genetic Algorithm in Continuous Flow Shop Scheduling
by Buu Thanh Tung
Supervisor: Dr Huynh Thong Luong

Application of Tabu Search in a Resource-constrained Project Scheduling Problem: A Case Study in Vietnam
by Le Quy Quan
Supervisor: Dr Huynh Thong Luong

A Production Optimization Model for Oil Refinery
by Yen Quang Thao
Supervisor: Dr Voratas Kachitvichyanukul

A Simulation Model for Wire Harness Assembly of Automobiles
by Jocel R Cenabre
Supervisor: Dr Voratas Kachitvichyanukul

A Simulation Tool for Performance Evaluation of Hybrid CONWIP/KANBAN Control Policy
by Chu Thanh Chung
Supervisor: Dr Voratas Kachitvichyanukul

Continuous Flow Shop Scheduling: A Case Study of Additives and Petroleum Products Company in Hanoi, Vietnam
by Bui Huy Thanh
Supervisor: Dr Huynh Thong Luong

Decision Support System for Integrated Planning and Scheduling
by Kanokpoom Kungwalsong
Supervisor: Dr Voratas Kachitvichyanukul

Development of an Optimal Maintenance Policy for Roads: A Case Study in Vietnam
by Ta Manh Tung
Supervisor: Dr Huynh Thong Luong

Efficient Warehousing: A Case Study of a Toy Manufacturing Company
by Gajendra Dwivedi
Supervisor: Dr Huynh Thong Luong

Fuzzy Quality Control Chart
by Sukoon Runkaew
Supervisors: Dr Huynh Thong Luong, Dr Voratas Kachitvichyanukul
Job Scheduling with Sequence-Dependent Setup Time: A Case Study of Terdsak Engineering 1991 Limited Partnership
by Chatchai Chaloemphanit
Supervisor: Dr Huynh Trung Luong

Measures of Bullwhip the Effect in the Supply Chain with Autoregressive Demand Processes
by Nguyen Huu Phien
Supervisor: Dr Huynh Trung Luong

Performance Evaluation of Operation Policies with Variable Product Mix
by Nguyen Thi Xuan Hoa
Supervisor: Dr Voratas Kachitvichyanukul

Production Planning: A Case Study in Thanglong-Viglacera Ceramic Tiles Company
by Le Sy Trung
Supervisor: Dr Huynh Trung Luong

Simulation-Based Tool for Theory of Constraints (TOC) Implementation
by Chompoonoot Kasemset
Supervisor: Dr Voratas Kachitvichyanukul
Chapter 6: SET - GEOTECHNICAL AND GEOENVIRONMENTAL ENGINEERING FIELD OF STUDY

6.1 Introduction

Beside the traditional areas of foundation engineering, earth structures, underground excavations, land subsidence, and landslide mitigations, geotechnical engineers and researchers are increasingly involved in new and dynamic areas of ground improvement, geosynthetic engineering, land reclamation, lightweight materials, forensic engineering and the effective recycling of waste materials.

Furthermore, geotechnical engineers are increasingly challenged to solve environmental problems related to the reduction of construction wastes, provision of efficient waste disposal facilities, clean-up of contaminated sites as well as geological related hazards such as landslides and soil erosion. The GTE field of study also includes onshore and offshore exploration. In accommodating these requirements, the courses in the field have been enhanced to equip geotechnical engineers not only with traditional knowledge of soil mechanics and geology but also with skills in hydrogeology, geochemistry, biological processes, petroleum engineering, resource exploration, and geophysics. Students in the field are exposed to geomaterials, continuum mechanics and particulate/discontinuous media.

6.2 Research Facilities and Laboratories

The Geotechnical and Geoenvironmental Laboratory can be boasted as one of the most equipped geotechnical laboratories in the region with more than 30 years of experience in both soil and rock testing. The laboratory, which offer technical services on testing and research on the engineering behavior and properties of soil and rock; geologic mapping; environmental geophysical surveys; and testing of geosynthetic materials conducted by ACSIG, consists of five (5) sections - Soil Mechanics, Rock Mechanics, Engineering Geology, Geophysics, and Geoenvironmental Engineering.

Soil Mechanics Laboratory

The Soil Mechanics Laboratory has facilities for testing and research on the engineering behavior and fundamental properties of soil. It is equipped to test compaction, seepage, compressibility, deformation and shear strength, soil dynamics, and ground improvement. Among other equipment, it has an automatic Central Data Acquisition System (CDAS) and two temperature-controlled rooms that house triaxial and consolidation equipment. Its field operation unit has a full range of tools for sampling soils and rocks and field test equipments for vane tests, Dutch cone tests, piezocone tests, pressuremeter tests, screw plate tests, electric logging, and vibration measurements.

Rock Mechanics Laboratory

The Rock Mechanics Laboratory has facilities to determine a variety of the physical and mechanical properties of rocks and rock aggregates required for research and practice. Moreover, the laboratory is capable of determining hardness, swelling and slake durability index properties of weak rocks. The laboratory has provided testing services to a large number of infrastructure projects in the region.

Engineering Geology Laboratory

The Engineering Geology Laboratory has facilities for research on the engineering behavior and fundamental properties of rocks and minerals. It provides classification and characterization tests for rock and...
minerals including petrographic and X-ray diffraction studies. It has stereoscopes, radial line planimetric plotter, stereo-sketch and sketch masters for analysis and interpretation of airphotos as applied to mineral explorations, transportation route studies, forestry, and civil engineering.

**Geophysics Laboratory**

The Geophysics Laboratory is being developed for training and researches in Geosystem Exploration and Petroleum Geoengineering. It has a number of seismic, electric, magnetic and radiometric instruments, including some of the most advanced equipment such as DAS-1 (OYO), a multi-purpose hi-performance seismic data acquisition system, or SYSCAL R1 Plus (IRIS Instruments), an all-in-one multi-electrode resistivity and induced polarization (IP) imaging system. The Laboratory is capable of conducting and assisting in geophysical field surveys for engineering, environmental, mineral resources, oil and gas exploration as well as in performing analysis, interpretation and visualization of geophysical data acquired.

**Geoenvironmental Laboratory**

The Geoenvironmental Laboratory provides a variety of equipment for geoenvironmental engineering research. It has equipment for geotechnical and chemical analysis that supports research in fundamental processes related to soil, water and chemical interactions that are applied to site and risk assessment, waste containment systems, and remedial technology. The chemical analysis equipment, spectrophotometer, from which the ion concentration can be determined with good accuracy and precision, enables research on soil-contaminant interaction. Flexible wall permeameter, rigid wall permeameter and consolidation cell with permeameter are used to analyze water and chemical migration through waste containment systems. While the electrokinetic cell with advanced monitoring and controlled system is utilized for research in site reclamation and site remediation.

### 6.3 Faculty and Research Staff

#### Full-time Faculty

**DENNIS BERGADO, BSCE, Mindanao State Univ, Philippines; MEng, AIT, Thailand; PhD, Utah State Univ, USA**

**Professor**

(Soil/Ground Improvement Techniques, Geosynthetic Engineering, Landfill Liners, In-Situ Testing, and Geotechnical Engineering for Mitigation of Natural Hazards)

[Ground improvement techniques and geosynthetics, In-situ testing, Geotechnical disaster mitigation, and Probabilistic/numerical methods in geotechnical engineering]

**ULRICH GLAWE, Dipl-Geol, Univ of Erlangen-Nuremberg, Germany; MSc, Imperial College, UK; PhD, Univ of Erlangen-Nuremberg, Germany.**

**Associate Professor**

(Geoenvironmental Engineering; Engineering Geology)

[Geological hazards; Ground improvement using electrochemical stabilization; Contaminant transport in fine-grained soils; Landfill design for developing countries and in wet lands; Tsunami deposits]

**NOPPADOL PHIEN-WEJ, BEng, Chulalongkorn Univ, Thailand; MS, PhD, Illinois at Urbana-Champaign, USA.**

**Associate Professor**

(Tunnelling and other underground excavations in rocks and soils; Slope stability and retaining structures; Landslides; Earth structures and dams; Pile foundations; Buried pipes and culverts)

[Soft ground tunnelling; Underground excavations in rock; Deep excavations; Land subsidence from deep well pumping; Rock properties]

**KYUNG-HO PARK, BEng, MEng, Korea Univ; DEng, SUNY at Buffalo, USA.**

**Assistant Professor**

(Geotechnical Engineering; Geomechanics; Computational Mechanics; Boundary Element Methods)
6.4 Completed Grant and Sponsored Research

Asia Link
Contribution: 5.75 man-months
Contributor: Dr Ulrich Glawe
Sponsor: European Commission
Total Contracted Amount: Baht 12,277,315.00

Asia Pro Eco
Duration: March 2004 to February 2005
Investigator: Dr Ulrich Glawe
Sponsor: European Commission
Total Contracted Amount: Baht 1,297,296.00

Construction of Ground Improvement for East Runaway/Taxiways & Cargo Aprons, Suvarnabhumi Airport
Duration: 17 January 2003 to 31 July 2005
Investigator: Dr Ulrich Glawe
Sponsor: European Commission
Total Contracted Amount: Baht 3,209,759

Development of System and Software for Tunnel-induced Building Damage Risk Assessment in Bangkok
Duration: 1 May 2003 to 30 June 2005
Investigator: Dr Kyung Ho Park
Collaborator: Dr William Barry, AIT
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 575,000

Geoenvironmental Engineering Curriculum Development for South and Southeast Asian Region
Project Description: Academic knowledge and practice in the field of Geoenvironmental Engineering is well advanced in Europe, Asian academics and engineers however, still lack knowledge in this newly developing discipline, despite the great demand in the region. The project aims at setting up a curriculum development program in the South and Southeast Asia to provide adequate education to civil engineers and engineering geologists in the above-mentioned field by taking into consideration the regional socio-economic background. This aim will be achieved through faculty exchange, workshops, new courses and lectures, shared project research including students’ involvement, and by extending the project activities with short-courses, with emphasis on less developed countries such as Vietnam, Laos PDR and Cambodia. Since the 36 months program will be primarily implemented at the School of Civil Engineering, AIT, it will target students from all over Asia during and after the project. In addition, teaching and academic activities will be expanded to the less developed countries in the region during the project, and after the end of the EC sponsored program.
Duration: 24 September 2002 to 23 September 2005
Investigator: Dr Ulrich Glawe
Sponsor: European Commission
Total Contracted Amount: Baht 12,607,033

Geotechnical Advisory Services in the Construction Supervision of Kong Tha Dan Dam, Nakom Nayok, Thailand
Contribution: 0.5 man-month
Participant: Dr Noppadol Phien-wej
Sponsor: Royal Irrigation Department of Thailand
Total Contracted Amount: Baht 640,000.00

Geotechnical Supervision for Foundation Works of Tha Dan Dam, Nakom Nayok
Project Description: Tha Dan Dam is the first major reinforced cement concrete dam to be constructed in Nakom Nayok, Thailand. The project is initiated by His Majesty the King and is now under construction. AIT’s involvement will be in an advisory capacity in foundation excavation and treatment works and rock quarrying for dam material.
Duration: February 2000 to December 2005
Investigator: Dr Noppadol Phienwej
Sponsor: ASDECON Corporation, Thailand
Total Contracted Amount: Baht 610,000

Integrated Management & Safe Disposal of Municipal Solid Waste in Least Developed Asian Countries
Duration: 1 April 2004 to 30 October 2005
Investigator: Dr Ulrich Glawe
Collaborator: Prof Dennes Bengado, AIT
Prof C Visvanathan, AIT
Khulna University of Engineering & Technology, Bangladesh
Sponsor: European Commission
Total Contracted Amount: Baht 1,297,296

Klong Prapa Canal Covering Project- Part IV (Utilities, Geotechnics and Geometric Design)
Duration: 26 October 1999 to 30 June 2005
Investigator: Dr Noppadol Phienwej
Collaborator: Prof Worsak Kanok-Nukulchai, AIT
WISANUCOM Engineering Consultants Company Limited, Thailand
Sponsor: Department of Highways, Ministry of Communication, Thailand
Total Contracted Amount: Baht 2,245,200
Klong Prapa Canal Covering Project
Project Description: The 40-meter wide Klong Prapa Canal is an open channel that has been delivering raw drinking water to Bangkok over the past 100 years. In response to His Majesty the King’s concerns over the growing effects of domestic waste, pollution and road traffic on the quality of raw water, a Royal Project has been initiated to enclose the open-channel and protect it from intrusion. The by-product is an elevated Klong Prapa Corridor that will provide a multi-mode transportation system, which is environment-friendly and pollution-free. The enclosure system must meet strict requirements specified by the Metropolitan Waterworks Authority, and the project must ensure its constructability.
Duration: 26 October 1999 to 30 June 2005
Investigators: Prof Warsak Kanok-Nukulchai, Prof Tawatchai Tingsanchai, Prof Yodphol Sanaboriboon, Dr Noppadol Phienwej, Mr Anwar Naveed
Sponsor: Department of Highways, Thailand
Total Contracted Amount: Baht 11,329,367.85

Review and Investigation of Flood Drainage Project around the Suwannaphum Airport
Contribution: 1.5 man-months
Participant: Dr Noppadol Phien-wej
Sponsor: Royal Irrigation Department of Thailand
Total Contracted Amount: 3,124,625.00

The Asian Horizon 21- A Tri bilateral Collaboration between AIT-KKU and CU on Development of Geosystem Exploration Program for Thailand
Duration: 20 March 2002 to 31 March 2005
Investigator: Dr Pham Huy Giao
Collaborator: Department of Mineral Resources, Thailand
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 1,000,000

Thermal Stabilization of Soft Bangkok Clay
Duration: 1 April 2003 to 30 June 2005
Investigator: Prof Dennis Bergado
Collaborator: Dr Suttisak Soralump, Kasetsart University, Thailand
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 918,500

6.5 Ongoing / In Progress Grant and Sponsored Research

Bridge-Development of Human Resources in Development of Academic Programmes in Sustainable Geosystem Exploration and Engineering (BRIDGE)
Project Description: Considering the growing demand for an international training and education in geo-system engineering and exploration in the Mekong region countries, this 3-year project aims to help develop human resources at Vietnam National University (VNU) and National University of Laos (NUOL). Project partners are VNU, NUOL, AIT, ITC (the Netherlands) and Stockholm University (SU). Overall objective of the action is to develop human resources in the Mekong region in the integrated field of Geosystem Engineering and Exploration. The main scopes and activities include: (i) Training and upgrading of teaching staff at VNU and NUOL in Geosystem engineering and exploration; (ii) Training and upgrading of administrative and managerial staff in international graduate educational management; (iii) Exchange of new teaching materials and new teaching tools; and (iv) Provide support to development of course modules that will be integrated in the international programs in geo-system engineering and exploration, under development at NUOL and VNU.
Duration: 1 November 2005 to 30 November 2008
Investigators: Dr Pham Huy Giao, Dr Noppadol Phien-wej, Prof Tawatchai Tingsanchai
Collaborator: ITC (The Netherlands), European Commission
Sponsor: Royal Irrigation Department of Thailand
Total Contracted Amount: Baht 4,674,126.00

Characterization of Soft Soil in Mekong Delta, a Collaboration Project
Project Description: The project aims at developing the design manual for evaluating the tunneling-induced building damage risk assessment using analytical methods.
Duration: 2004 to 2006
Research Team Member: Dr Pham Huy Giao
Investigator: Geotechnical Group
Collaborator: Tokyo Institute of Technology (TI).
Sponsor: Japanese Government
Total Contracted Amount: Baht 376,972.00

Development of System for Tunneling-induced Damage Risk Assessment using Analytical Methods
Project Description: The project aims at developing the design manual for evaluating the tunneling-induced building damage risk assessment using analytical methods.
Duration: 1 September 2004 to 30 December 2006
Investigator: Dr Kyung-Ho Park
Collaborator: NOWEST Co, Ltd
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 736,972.00

Post-Tsunami Reconstruction for Sustainable Coastal Development
Project Description: The aim of this research is to study the behaviour of high strength geogrid with lightweight rubber tire chip-sand fill and compare the design procedure and criteria for MSE construction with lightweight fill and high strength geogrid reinforcements as well as cost. The design procedure and criteria obtained from this project with other design methods such as a coherent gravity and tie-
back methods. This study will be completed after one year.

Duration: January 2005 to March 2006
Investigators: Prof Dennes T Bergado
Dr Noppadol Phienwej
Sponsor: Royal Thai Government (RTG)
Total Contracted Amount: Baht 600,000.00

Thermal Stabilization of Soft Bangkok (Phase 2)

Project Description: The significant characteristics of Bangkok clay, thick deposited soft clay, are low permeability, low strength, high compressibility, and high water content. These properties create problems in foundation and infrastructure engineering such as low bearing capacity, unstable slope, large settlement by consolidation when loaded and taking a long time to achieve the primary consolidation settlement. In order to reduce the future settlement contributed by the primary consolidation of thick layers of low permeability foundation soil, improvement in the soil drainage system is deemed necessary. This research work studied the new innovation technique to hasten the consolidation rate of soft Bangkok clay by using the combination of prefabricated vertical drain (PVD) and thermal method. Both laboratory and field works have been done. The results show that raising the clay temperature up to 90°C increases its permeability about 3 to 4 times. Therefore, this technique accelerates the rate of consolidation because the permeability and the pore pressures increase with temperature. Moreover, elevated temperature tends to increase the shear strength of clays at drained condition.

Duration: January 2005 to March 2006
Investigators: Prof Dennes T Bergado
Dr Noppadol Phienwej
Sponsor: Royal Thai Government (RTG)
Total Contracted Amount: Baht 900,000

6.6 Publications

Refereed Journals


Refereed Books/Chapters


Phienwej, N, Proceedings of International Symposium on Underground Excavation and Tunnelling, ITA-Sponsored Symposium, Bangkok, p. 603, February 2006. (Editor)

Conference Proceedings


Giao, P H, Development of Multidisciplinary and Application Oriented for Graduate Education and Research in Geosystem Exploration and
Geotechnical & Geoenvironmental Engineering Field of Study


Glawe, U, Visvanathan, C, and Alamgir, M, Solid Waste Management in Least Developed Asian Countries - A Comparative Analysis, Int. Conf. on Integrated Solid Waste Management in Southeast Asian Cities, Siem Reap, Cambodia, 5-7 July.


Other Publications


**Park, K H**, Development of system for tunneling-induced building damage risk assessment using analytical methods’, final project report, NOWENG Co. Ltd.


6.7 **Doctoral Students’ Dissertation**

**Fundamentals of Cement-Admixed Clay in Deep Mixing and its Behavior as Foundation Support of Reinforced Embankment on Subsiding Soft Ground** by Glen A Lorenzo

Supervisor: Prof Dennes T Bergado

**Investigating the Efficiency of Electrokinetic Remediation and Electrokinetic Stabilization in the Soft Bangkok Clay** by Pornpong Asavadorndeja

Supervisor: Dr Ulrich Glawe
6.8 Masters Students’ Theses and Research Studies

A Geotechnical-Geophysical Study on a Dyke System in the North of Vietnam
by Pham Quy Ngoc
Supervisors: Dr Noppadol Phien-Wej
Dr Pham Huy Giao

Analysis of Time-Dependent Response of Tunnels Considering Creep Effect
by Pramod Kumar Thakur
Supervisor: Dr Noppadol Phien-Wej

Analytical Prediction of Ground Movements due to MRTA Tunneling
by Md Aftabuzzaman
Supervisor: Dr Kyung-Ho Park

Application of Artificial Neural Networks (ANN) in Prediction of Ground Movement in EPB Shield Tunneling of Bangkok MRT
by Peemruch Suwattiphan
Supervisors: Dr Noppadol Phien-Wej
Dr Suchatwee Suwansawat

A Study of Well Test Analysis for the Fractured Basement of an Oil Field
by Nguyen Hai Minh
Supervisors: Dr Noppadol Phien-Wej
Dr Pham Huy Giao

Complex Variable Solutions for Tunneling-induced Ground Movements in Clays
by Bituporn Tontavanich
Supervisor: Dr Kyung-Ho Park

Development of Software for Tunneling-induced Building Damage Risk Assessment Using Analytical and Empirical Methods
by Mg Mg Myint Soe
Supervisor: Dr Kyung-Ho Park

Electrochemical Stabilization of Soft Bangkok Clay
by Florence Melvin Tomas Mendoza
Supervisors: Dr Ulrich Glawe
Dr Kyung-Ho Park

Enhanced Oil Recovery in Basement Rock of the White Tiger Field in Offshore Southern Vietnam
by Pham Duc Thang
Supervisors: Dr Noppadol Phien-Wej
Dr Pham Huy Giao

Hanoi Land Subsidence with Reference to Development of a Proper Monitoring Network
by Duong Thi Tran
Supervisor: Dr Noppadol Phien-Wej

Heavy Metal Diffusion Through Soft Bangkok Clay
by Aneel Kumar
Supervisor: Dr Ulrich Glawe

Hydrodynamic Pressure on Concrete Dams During Earthquakes
by Amanullah Mami
Supervisors: Dr Kyung-Ho Park
Dr Ulrich Glawe

Interaction between Geogrid Reinforcement and Tire Chip-Sand Mixture
by Surlyn Prempramote
Supervisor: Prof Dennis T Bergado

Investigation on Landslide in the Portal Excavation of a Diversion Tunnel in Weathered Sedimentary Rocks in Eastern Thailand
by Swe Thet Maung
Supervisor: Dr Noppadol Phien-Wej

Landslide Hazard Zonation and Preliminary Results of Debris Flow Simulation for the Hohwaeidibach-Torrent, Fluehli, Central Switzerland
by Krishna Bahadur Chaudhary
Supervisor: Dr Ulrich Glawe

Landslide Hazard Zonation for the Spierbergmoesli Area Using GIS in Central Switzerland
by Muhammad Moeen
Supervisor: Dr Ulrich Glawe

by Hewa Wasamge Jayantha Dharmaratne
Supervisor: Dr Ulrich Glawe

Numerical Modeling of a Full Scale Reinforced Embankment on Deep Mixing Cement Piles
by Nguyen Hop Minh
Supervisor: Prof Dennis T Bergado

Thermal Conductivity of Saturated Clay by Needle Probe Method
by San San
Supervisor: Prof Dennis T Bergado

Thermal Consolidation of Soft Bangkok Clay with PVD
by Sooks Chaiaprakakirat
Supervisor: Prof Dennis T Bergado
Three Dimensional Analysis of Ground Movement in the EPB Shield in Bangkok
by Chang Pyo Hong
Supervisor: Dr Noppadol Phien-wej

Undrained Shear Strength of Soft Bangkok Clay at Elevated Temperatures
by Bee Fong Lim
Supervisor: Prof Dennes T Bergado
7.1 Introduction

**Mechatronics**

At present, most academic institutions and industries in the Asian region are only system integrators. Components are procured from more developed countries (e.g., computer numerically controlled machines, robots, and automated guided vehicles) and are integrated as a system (e.g., flexible manufacturing system). To support the growth of the region’s economy, expertise not only as system integrators but also as builders of components of advanced technologies must be developed. The growing number of electronic devices and the strong interactions between mechanical and electronic parts no longer permit separate investigations of these components. Mechatronics provides new insights through an integrated consideration of mechanics, electronics, and information technology. The curriculum is designed to provide multidisciplinary knowledge and to develop the ability to design mechatronics systems.

**Microelectronics**

The region’s growing industrial sector and the increasing demand for high technologies have brought the need for expertise in microelectronics to a critical level. The students are prepared to cope with the needs of the electronics industry in the region. The curriculum is equally balanced between the analog and digital design of circuits as well as the processing related topics including failure analysis, suitable for this electronics industrial sector in the region. The curriculum has been designed and constantly adapted in partnership with microelectronics industries and collaborating universities overseas. Miniaturization of IC and the possibilities of completely new technologies like nanotechnology have also been introduced.

7.2 Research Facilities and Laboratories

Mechatronics and Microelectronics fields of study share all the laboratory facilities with IEM and DME fields of study. There are several well-equipped laboratories with the primary function of supporting the students and faculty for teaching and research and to conduct outreach programs.

**Computer Integrated Manufacturing (CIM) Laboratory**

The Computer Integrated Manufacturing (CIM) Laboratory was officially inaugurated on September 23, 1991. It provides the hardware and software support for Industrial Systems Engineering. Many research activities have been undertaken in close collaboration with industry and government sectors in the area of Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Numerical Control (CNC), Rapid Prototyping (RP) and Medical Technology. The CIM Laboratory also provides specialized training and consultancy services in CAD, CAM, CNC Machining, Reverse Engineering, Rapid Prototyping, Packaging Technology, Flexible Manufacturing Systems (FMS), and Development of Postprocessor for 5-axis CNC.

The CIM Laboratory is equipped with production and training CNC machines including EMCO TURN242 industrial production CNC lathe, EMCO VMC200 CNC vertical machining center for universal production, MAHO MH600E2 5-axis universal milling and boring machine, EMCO compact 5 CNC, EMCO F1 CNC, LVD CNC press brake, LVD waterjet cutting CNC, ZOLLER tool presetting system, and Mondiale Gallic G-420.
Mechatronics and Microelectronics Fields of Study

Industrial CNC lathe, EMCO CNC training system, CAD/CAM software including UNIGRAPHICS NX4, Master CAM 9.1, Mechanical Desktop 6, AutoCAD Inventor Series, SolidWorks 2005, CAM 2000, Mimics 6.3 & Magic 5.4.

Metrology Laboratory

Metrology Laboratory provides the hardware and software support for Industrial Systems Engineering. Metrology Laboratory is equipped with Measuring Instruments (Zeiss CMM, Mitutoyo Profile Projector, Taylor Hobson Surface Roughness Tester, Lab View Hardware & Software).

Mechatronics and Automation Laboratory

This lab is equipped with many PLC systems (S5, S7-200/300/400, INDRAMAT, BOSCH), distributed control systems (PCS7), operator panels (OP5, OP17/DP, OP35), PC-based human machine interface package (WINCC), and networked fieldbuses (PROFIBUS, INTER-BUS, SERCOS). The lab has mobile robots (NOMAD, PIONEER 2), Robot arms (CRS), Industrial Robot (KUKA-KR15), a self-made Open Architecture CNC machine, CNC control systems (MTC 200, SINUMERIK 8100/8400), image processing systems (DVT, MATROX), and FPGAs (XILINX-1i VIRTEX PRO, ALTERA). Software packages such as SYNOPSYS IC Design, ANYSIM, ANSYS, ADAMS, and many types of special sensors and actuators are also available for the research use.

Many research activities have been undertaken in close collaboration with industry and government sectors in the area of industrial automation, robotics, control, system design and integration. Some examples of the research are: medical tele-analyzer, automated visual inspection systems, MEMS design, autonomous flying robot, automating centrifuge machines, autonomous under-water robot, automating crystallization process, etc.

Simulation Laboratory

This lab is equipped with networks of Pentium PC for general applications and internet access, high end CAD/CAM & Simulation software such as ARENA and AutoMOD. In addition, a high performance computer facility with parallel cluster is also available for research use.

Microelectronics Laboratory

The microelectronics facilities consist of two main laboratories:

1. IC Design Lab
2. Nanotechnology

The IC Design lab computers have standard software useful for studying and research. ANSYS, Orcad, ModelSim SE, Xilinx ISE, Synopsys, Leonardo Spectrum LS, Tanner S-Edit for Schematic Capture, T-Spice and W-Edit for Simulation and L-Edit for Physical Layout) are some of the software which are available. All the computers are networked through a high end (Intel XEON) server which is secure from external attacks. The laboratory facilities are used for Analog and digital circuit design, Microchip design and fabrication, MEMS, Micro-actuators and micro-sensors design, Computational electronics, etc. The fabrication is done in cooperation with NECTEC, NSTDA, Thailand.

The Nanotechnology Laboratory consists of a chemistry lab, instrumentation room and an electronics laboratory. The chemistry laboratory is equipped with standard chemical tables and hood for carrying out wet-chemical processing. The instrumentation room consists of equipments like optical spectrophotometer, microscope etc. The electronics laboratory is equipped with digital oscilloscopes, signal generators, power supplies, standard voltage and current meters as well as stocked with discrete devices for testing and research. This laboratory used for teaching and research especially in the processing related subjects.
7.3 Faculty and Research Staff

Full-time Faculty

NITIN V AFZULPURKAR, BEng, Univ of Poona, India; PhD, Univ of Canterbury, New Zealand
Associate Professor
[Computer vision (pattern recognition and image processing); MEMS design, fabrication for electronic and bio medical applications; Soft computing algorithms for robotics and automation applications; Mechatronics applications for industrial use]

JOYDEEP DUTTA, BSc (Hons), St Edmund’s College; MSc (Physics), North Eastern Hill Univ; PhD, IACS, Calcutta Univ, India.
Associate Professor
[Functional materials, nanomaterials, Nanoparticles, self-organisation, Biomimetic processes, Polyelectrolyte deposition, Gas sensors, Bio-sensors, optoelectronic devices]

MANUKID PARNICHKUN, BEng, Chulalongkorn Univ, Thailand; MEng, PhD, Univ of Tokyo, Japan
Associate Professor
[Robotics, control, and measurement (involves with design and development of hardware and software of mechatronics devices); New robot mechanism, novel control algorithm, and innovative measurement concept are investigated]

Visiting Faculty

DEBESH KUMAR DAS, BEng; MEng; PhD, Jadavpur, India.
Visiting Professor
[VLSI design and testing; Logic synthesis]

HEE-GAK LEE, BS, Korea Military Academy and Seoul Natl Univ; MS, Drexel Univ; PhD, Univ of Iowa, USA
Visiting Professor
[Structural analysis and design/optimization; design and manufacturing; concurrent engineering; automotive engineering; weapon systems; CAD/CAE].

NUKALA SURIYANARAYANA MURTHY, BE, Andhra University Waltair; MS, IIT Chennai; PhD, NIT Warangal, India
Visiting Professor
[Low Power VLSI Architectures for DSP Applications; ASIP Implementations and Device Modeling; Application of Cumulants and HOSA]

LERTSAK LEKAWAT, BE King Mongkut’s Institute of Technology Ladkrabang, Thailand
MSc George Washington University USA; PhD Carnegie Mellon University, USA
Visiting Lecturer
[Data Storage System, Analog design, digital design, mixed signal design]

7.4 Completed Grant and Sponsored Research

Development of an Automatic-Controlled-Flying Robot Project
Project Description: Control of 6-DOF fully autonomous helicopter type flying robot is very difficult. Many researchers verified their control algorithms only on simulation. There are very few success experiments on fully control of the flying robot. In order to make the robot fly autonomously, the attitude and position controls are needed. In this project, the neuro-fuzzy controllers (NFC) are developed to control the roll, pitch and yaw of the flying robot, while the hybrid adaptive neuro-fuzzy model reference control (Hybrid-ANMRC) is developed to control its position. The attitude controllers are trained offline to zero out the roll, pitch and yaw errors. The position control uses the hybrid technique called, “hybrid adaptive neuro-fuzzy model reference control”. The position control learns online to track the velocity reference model, while trying to obtain the smooth response and zero steady state error.

Duration: January 2001 to December 2005
Investigator: Dr Manukid Parnichkun
Sponsor: Thailand Research Fund
Total Contracted Amount: Baht 1,080,000

Development of an Intelligent Underwater Mobile Robot Project
Project Description: This project is to develop an intelligent underwater mobile robot, which can be remotely controlled. The development includes its intelligence, onboard control system, and wireless communication. Human operator is able to remotely control the robot.
7.5 Ongoing / In Progress Grant and Sponsored Research

A Study of Development of an Intelligent Vehicle Project

Project Description: The project is to develop an intelligent vehicle for use to improve highway safety and fuel consumption. The intelligent vehicle can also be employed by handicapped and elderly persons who are normally unable to effectively and safely travel around by themselves, which can translate into some significant savings for the nation. The project main objective is to develop an intelligent vehicle which is able to move from one place to another autonomously, without help from human. Operator only needs to provide information about his/her destination to the vehicle. The vehicle receives intelligence from various sensors installed on board. These sensors are used to determine the position of the vehicle, the directions of other vehicles in the vicinity, static and dynamic obstacles, traffic lines, symbols, signs, inter-vehicle distances, etc. It also receives intelligence from the Global Positioning Satellites (GPS) to help in navigation, control, and avoidance of accidents.

Duration: March 2005 to December 2006
Investigator: Dr Manukid Pamichkun
Sponsor: National Electronics and Computer Technology Center
Total Contracted Amount: Baht 1,000,000

Conjugated Semiconductor Nanoparticles as Fluorophores for Rapid Detection of Bacteria’s

Project Description: This project will study the assembly of fluorescent inorganic nanoparticles (nanophosphor, ZnS:Mn2+ and biomimetic polymers and its subsequent attachment to bacteria’s and will try to address the two major challenges for the rapid detection of a single bacterium are the achievement of (i) short to real-time detection and (ii) ultrasensitivity in bioanalysis. Here, we propose a bioconjugated nanophosphor (ZnS:Mn2+)-based bioassay for in situ pathogen quantification. The bioconjugated nanoparticle would provide the fluorescent signal for bioanalysis that can be easily incorporated with biorecognition molecules, such as an antibody.

Duration: December 2005 to December 2006
Investigator: Dr Joydeep Dutta
Sponsor: National Electronics and Computer Technology Center
Total Contracted Amount: Baht 1,498,992

Machine Vision Training Module

Project Description: Capacity building for the HDD Cluster for the industry personnel in “Machine Vision” techniques.

Duration: September 2005 to December 2005
Investigator: Dr Nitin Afzulpurkar
Sponsor: Consortium of Industry and NECTEC
Total Contracted Amount: Baht 252,000

ZnS Nanophosphors for Field Effect Devices and DNA Labeling Applications

Project Description: This project addresses the development of doped zinc-sulphide quantum dots to be used as phosphors for flat panel displays and for DNA labeling purposes. The bottom-up approach of synthesis is being followed in this project where the nanoscaled materials are synthesized from their atoms. ZnS:Mn particles has been built up for its emission enhancement and electroluminescent devices are being fabricated. The phosphors so developed will be attached to crosslinkers and the biomolecules of different DNA’s to use the quantum dots for DNA labeling.

Duration: 2003 to 2005
Investigator: Dr Joydeep Dutta
Sponsor: National Electronics and Computer Technology Center
Total Contracted Amount: Baht 1,800,000

International Symposium on Nanotechnology in Environmental Protection and Pollution

Project Description: The symposium addressed environmental protection and pollution issues and topics, which were frequently mentioned in conferences and workshops worldwide as topics that need to be addressed sooner than later. An open dialogue between the scientists and engineers developing these technologies and the environmental activists and public policy-makers can lead to a sense of trust and will give directions to the future needs and activities.

Duration: December 2004 to December 2005
Investigator: Dr Nitin Afzulpurkar
Sponsor: NANOTEC/MTEC, NSTDA, AORD (USA)
Total Contracted Amount: Baht 450,000 + US$ 5,000

Development of MEMS actuator (2004-2005)

Project Description: To develop an optimal design for an electrostatic comb drive for disc drive dual stage servo system and to study active control of fly height of a MEMS-based micro actuator by applying numerical simulation techniques.

Duration: July 2004 to December 2005
Investigator: Dr Nitin Afzulpurkar
Sponsor: Seagate Technology
Total Contracted Amount: Baht 142,000

Machine Vision Training Module

Project Description: Capacity building for the HDD Cluster for the industry personnel in “Machine Vision” techniques.

Duration: September 2005 to December 2005
Investigator: Dr Nitin Afzulpurkar
Sponsor: Consortium of Industry and NECTEC
Total Contracted Amount: Baht 252,000

ZnS Nanophosphors for Field Effect Devices and DNA Labeling Applications

Project Description: This project addresses the development of doped zinc-sulphide quantum dots to be used as phosphors for flat panel displays and for DNA labeling purposes. The bottom-up approach of synthesis is being followed in this project where the nanoscaled materials are synthesized from their atoms. ZnS:Mn particles has been built up for its emission enhancement and electroluminescent devices are being fabricated. The phosphors so developed will be attached to crosslinkers and the biomolecules of different DNA’s to use the quantum dots for DNA labeling.

Duration: 2003 to 2005
Investigator: Dr Joydeep Dutta
Sponsor: National Electronics and Computer Technology Center
Total Contracted Amount: Baht 1,800,000
Development of a Medical Tele-Analyzer by Force-Displacement-Hybrid Tactile Sensor and Actuator for Abdominal Mass Analysis (Phase 2) Project

Project Description: Presently, expert medical doctors in abdominal mass analysis are insufficient in Thailand. Patients staying far away from the hospitals, where the expert doctors are working, have to bear to get cured at near hospitals without any choices. Some patients might choose to move to the expert hospitals but they have to spend a lot of money and time. It is too late for many times. Furthermore, in the case of heavy infection patients, doctors cannot approach the patients directly. This problem needs urgent solution.

From the above reasons, our research group has an idea to develop a medical tele-analysis system. The developed system consists of 2 subsystems; doctor-side subsystem and patient-side subsystem. In the doctor-side subsystem, an array of displacement sensor is equipped to detect movement of doctor’s hand and fingers. The detected information is transmitted to the patient side to be used in medical disease analysis. On the other hand, the patient-side subsystem consists of an array of displacement actuators which is used to follow displacement of doctor’s hand and fingers. An array of force sensors is used to detect forces between patient and the equipment.

Since the above mentioned analysis and control need real-time operation, the desired communication channel has to be direct-line type. Telephone line, satellite, or other coming media is the choice of selection.

Automatic database system, which helps doctor to analyzer disease, will be implemented on the developed tele-analyzer. This database system collects data in the previous analysis to help the system to learn and record the data automatically. Supervised teaching by expert medical doctor in necessary to help medical students or less experience doctors in analyzing disease and also in self-learning.

Not only using in medical tele-analysis, the proposed system can also be used in any tele-force-displacement control processes.

Duration: November 2004 to December 2006
Investigator: Dr Nitin Atzulpurkar
Sponsors: Consortium of Seagate, Hitachi, Western Digital and NECTEC
Total Contracted Amount: Baht 1,500,000

Development of an Automatic Tide Sensing Unit for Tsunami Early Warning System

Project Description: The main objective of this project is to study and develop an automatic tide sensing unit for Tsunami early warning system. The sensing unit will have the capability to detect automatically tide information, including tide height, wave amplitude, wave length, and wave speed. All of the information will be transmitted to a ground station to analyze possibility of Tsunami, its magnitude and arrival time at each coastal location for proper action and warning to the concerned parties.

Duration: December 2005 to December 2006
Investigator: Dr Manukid Parnichkun
Sponsor: Royal Thai Government Joint Research Fund
Total Contracted Amount: Baht 1,000,000

Development of Generic Smart MEMS Based Control Systems

Project Description: In this research, electrostatic actuator combined with accelerometer sensor using polymers and cmos processing technology is designed and fabricated. A micropump and micro valve system are then designed and fabricated. The possible application areas are smart devices for HDD, medical and automotive applications.

Duration: February 2004 to December 2006
Investigator: Dr Nitin Afzulpurkar
Sponsor: National Science and Development Agency, Thailand
Total Contracted Amount: Baht 3,880,800

Development of a Systematic Error Compensate CNC Controller Project

Project Description: Nowadays, accuracy of products is one of the most critical considerations for manufacturers. Since many work-pieces are produced by Computer Numerical Control Machine (CNC Machine), thus, work-pieces accuracy depends directly on accuracy of the CNC Machine.

Actually, CNC machine is able to produce work-piece accurately up to the level of 1 mm. However, in reality, it is very difficult to control the machine at this level since the CNC machine always includes the following inaccuracies in the system; (1) inaccuracy in CNC machine assembly, especially with movable components, (2) thermal distortion of CNC machine and work-pieces during manufacturing, (3) inaccuracy induced by cutting forces, (4) cutting tool wear, (5) fixture errors, etc. Inaccuracies from (1), (2), and (3) are the main factors of manufacturing errors in CNC machines.

Mostly, manufacturing error is time-variant (not constant with time), it depends on many factors, including machine condition, environment temperature, work-
Mechatronics and Microelectronics Fields of Study

In this research, the researchers will develop a systematic-error-compensate CNC controller. The developed controller collects necessary information; e.g., position and displacement, temperature, forces, etc., from CNC machine and uses this information in the error compensate algorithm to compensate error in real time. Output from the error compensation is applied to correct command to the CNC machine.

Duration: 2003 to December 2007
Investigator: Dr Manukid Parnichkun
Sponsor: Mitutoyo Association for Science and Technology
Total Contracted Amount: 2,500,000 Yen

Nanocomposite Polymer-metal Plasmon Sensors

Project Description: This project aims on the development of nanotechnology activities amongst the partners making use of the cross-disciplinary competence of the principal investigators of this project. The nanoparticle synthesis will be carried out in AIT in close co-operation with the Polymers group that will advice on the functionalisation of these particles. Simultaneously the group in Uppsala will develop the polymers to be used in this project. Nanocomposites will then be fabricated for specific sensor applications.

Duration: May 2005 to April 2008
Investigator: Dr Joydeep Dutta
Sponsor: SIDA Research Grant, Sweden
Total Contracted Amount: 367,000 Swedish Kroner

Nanotechnology based Pressure Sensors for Tsunami Detection

Project Description: The main objective of this project is to study and develop a “stand alone pressure sensing device” for Tsunami early warning system. The device will be fabricated using a demonstrated multilayered thin film deposition technique that has been developed at AIT, comprising of alternate layers stacks of gold nanoparticles and doped or undoped ZnS nanoparticles by a novel layer-by-layer modified polyelectrolyte deposition process.

Duration: December 2005 to December 2006
Investigator: Dr Joydeep Dutta
Sponsor: AIT-RTG Joint Research Project
Total Contracted Amount: Baht 875,000

7.6 Publications

Refereed Journals


Minh, V, and Afzulpurkar, N, Robustness of Model Predictive Control for Ill-Conditioned Distillation Process, International Journal of Developments in Chemical Engineering and Mineral Processing, Australia special issue on Advanced Control and Real-Time


Refereed Books/Chapters


Conference Proceedings


Kiatpanichagij, K., and Afzulpurkar, N. V., Automated Visual Inspection for Contamination Detection in Electronic Industry, Proceedings of 16th International DAAAM Symposium on Intelligent Manufacturing and
Mechatronics and Microelectronics Fields of Study

Automation, 19-22 October 2005, Croatia, ISSN 1726-9679


7.7 Doctoral Students’ Dissertations

Mechatronics

Hybrid Kalman Filter/Fuzzy Logic-Based Position Control of Autonomous Mobile Robot
by Rerngwut Choomuang
Supervisor: Dr Nitin V Afzulpurkar

7.8 Masters Students’ Theses and Research Studies

Mechatronics

3D Measurement with the Catadioptric Stereoscopic Camera System for Assembly Applications
by Kadam Digvijay Manikrao
Supervisor: Dr Manukid Parnichkun

Automatic Obstacle Avoidance and Map Generation for a Mobile Robot
by Anup Arun Desai
Supervisor: Dr Manukid Parnichkun

Automatic Road Sign Recognition for Intelligent Vehicle
by Nguyen Viet Tep
Supervisor: Dr Manukid Parnichkun

Automation of a Tunnel KILN
by Pham Hong Son
Supervisor: Dr Nitin V Afzulpurkar
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by Tom Takan
Supervisor: Dr Lertsak Lekawat

Design and Fabrication of 2-Axis, High G MEMS Micro Accelerometer
by Akekachai Deesiri
Supervisor: Dr Nitin V Afzulpurkar

Design of the IEEE 802.15.4 MAC FPGA and ASIC Layout for Low-Rate Low-Power Wireless Networks
by Thanasit Praputtry
Supervisor: Dr Lertsak Lekawat

Development of Iron-based Amorphous Soft Magnetic Alloys from Commercial Cast-Iron
by Rantej Bali
Supervisors: Dr Eric Fleury
Dr Joydeep Dutta

Formation and Potential Uses of Glutamate-Stabilized Gold Nanoparticles
by Abhilash Sugunan
Supervisor: Dr Joydeep Dutta

Head Noise Characterization of GMR and TMR Sensor for Magnetic Recording
by Amit Kumar Suhane
Supervisor: Dr Lertsak Lekawat

Optimal Design and Fabrication of MEMS Microactuator for a Hard Disk Drive Dual-Stage Servo System
by Puttachat Khuntontong
Supervisor: Dr Nitin V Afzulpurkar

Study of Zinc Sulphide Quantum Dots
by Hemant C Warad
Supervisor: Dr Joydeep Dutta

Towards Luminescent Device Using ZnS Quantum Dots
by Bunyarit Hemtanon
Supervisor: Dr Joydeep Dutta
Chapter 8: SET – REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS
FIELD OF STUDY

8.1 Introduction

Geoinformatics comprising Remote Sensing (RS), Geographic Information System (GIS) and Global Positioning System (GPS) provides extremely useful tools for environmental and natural resources management. They are widely recognized as supporting tools for the planning, monitoring, and management of the appropriate utilization of resources at the country, regional and global levels.

While they represent multidisciplinary backgrounds, students in RS&GIS share a common interest, that is, to use remote sensing, GIS, GPS and other space technologies as tools in pursuing their academic work as well as in developing new technologies that are applicable to the region.

Because of the complexity of the technologies together with the heavy dependence on advanced computer skills, application specialists need to have a sound knowledge of the theoretical aspects and practical approaches to integrate many resources of information that address different applications. Furthermore, scientists, planners or engineers interested in these technologies should be familiar with past, present and future satellite systems, their appropriate usage, data acquisition and handling and integration with other data sources.

The curriculum well covers the theoretical aspects and application of space technology, especially in Remote Sensing and GIS. It provides students ample time to gain application know-how through laboratory sessions. Students are free to use satellite data received by the NOAA, AVHRR and MODIS Satellite Receiving Stations for their theses or research studies.

The demand for RS&GIS graduates is very high as there is lack of professionals in these disciplines, particularly those with a vast knowledge of the practical utilization of these technologies. Employment opportunities are available in a wide range of areas, including agriculture, forestry, coastal development and management, urban planning and development, medical technology, mapping and planning, disaster mitigation and environmental management.

Major areas covered in the coursework are fundamentals of remote sensing and GIS, earth-energy interaction, atmospheric correction, application potential in various disciplines, GIS data sources, map projection, geo-statistics, spatial modeling, automated mapping, digital terrain model, GPS data acquisition, and integration of GIS, remote sensing and GPS.

8.2 Research Facilities and Laboratories

The RS&GIS field of study provides excellent facilities for teaching, research and projects which consists of the Digital Image Processing laboratory, Institute-wide GIS laboratory, Asia e-learning project experiment room, meeting rooms, and the Geoinformatics Center laboratory. The RS&GIS field of study has a policy of maintaining the best working environment for students, staff and faculty. Apart from the Institute-provided access to the Internet and electronic mail, each student of the RS&GIS field of study is allocated computer space for individual use of about 1-2 Gb (extendible). The space for personal web pages to be hosted on RS&GIS network, can also be provided upon request. The RS&GIS LAN Network can also be monitored in real time.
Besides, it has a very good archive of over 600 scenes of satellite imagery of SPOT, Landsat-TM, NOAA, ADEOS, ERS-SAR, and JERS-SAR to serve the students in their research and thesis studies. Other data, such as topographic, landuse, soil, geology maps of Thailand and some aerial photographs, are also available.

The RS&GIS library also provides students with more specialized books, journals, and computer manuals.

Some equipment in its laboratory available for academic activities include: Trimble geoexplorer; Garmin GPS Series III and V; laptop computer; digital camera; wireless hub/switch; wireless USB; network switch; network hub; black/white and color laser printers; A4 and A0 scanners; table and personal stereoscopes; and an LCD projector.

8.3 Faculty and Research Staff

The Institute is deeply grateful that Her Royal Highness Princess Maha Chakri Sirindhorn has seen fit to share her expertise and experience with faculty, staff and students, as an Honorary Faculty Member. In this singular position, Her Royal Highness is associated with the Remote Sensing and Geographic Information Systems Field of Study.

Full-time Faculty

XIAOYONG CHEN, BS, MS, PhD, Wuhan Technical Univ of Survey and Mapping, People’s Republic of China. Associate Professor (Automated Mapping, GIS, Photogrammetry, Remote Sensing, Mathematical Morphology and Database Management System)

[Remote sensing and geographic information system; particular emphasis on GIS theory, digital image analysis and real-time mapping; key research areas on theoretic framework of geo-spatial information science, digital photogrammetry, laser range data processing, multi-dimensional / multi-scale / multi-accuracy / multi-media geo-spatial data modeling; GIS application in urban planning, intelligent transportation system, environment monitoring, disaster mitigation, archaeology and tourism]

KYOSHI HONDA, BAgri, DEng, Tokyo Univ, Japan

Associate Professor (Image Processing, Erosion control, Terrain modeling, Remote Sensing, GIS, Data Assimilation)

[Modeling and Simulation on Near Real Time Ubiquitous Geo-Informatics WebGIS, including development of remote sensing and GIS server on Web Map Service (WMS) using Open Source Software such as Minnesota Map Server; Tsunami WMS development; Real time Mapping; volcano slope development; Crop/Plant Modeling by data assimilation; Debris Flow Simulation; Parallel computing

NITIN KUMAR TRIPATHI, BTech, National Inst of Technology, India; MTech, IIT; PhD, IIT, Kanpur, India.

Associate Professor (GIS, Remote Sensing, Environment, Internet GIS)

[Application of Geoinformatics in environment, marine, health and agriculture fields; Development of wireless GIS using the concept of Internet GIS and wireless devices such as wireless LAN, personal digital assistant (PDA) with mobile phone (GPRS) used for real-time spatial data logger and air-pollution monitoring]

Visiting Faculty

MICHIRO KUSANAGI, BS, MS, Univ of Tokyo, Japan; MS, PhD, Univ of California, USA.

Visiting Professor (Aerospace System Engineering, Space System Engineering)

JUNICHI SUSAKI, BEng, MEng, DEng, Univ of Tokyo, Japan

Visiting Assistant Professor (Environmental Information Extraction and Validation, Remote Sensing and GIS development)

[Satellite data processing from data receiving to application; field
measurements of physical parameters on surface such as Bidirectional Reflectance Distribution Function (BRDF) and albedo, and used the data for model development and validation; Environmental change monitoring using on satellite and meteorological data based on data fusion techniques. One of such applications is early drought warning system targeting field measurement, model development and application.

**Research Staff**

MANZUL KUMAR HAZARIKA, PhD, University of Tokyo, Japan; MEng, Asian Institute of Technology, Bangkok, Thailand; MTech, Indian Institute of Technology, Kharagpur; BTech, J N Krish Vishwa Vidyalaya (J. N. Agriculture University), India

**Senior Research and Training Specialist**

(RS and GIS Applications to Global Environment, Terrestrial Carbon Cycle and NPP)

[Handling independent projects, conducting research and analysis, identifying issues, formulating options, and making conclusions and recommendations; Theories, concepts and applied approaches related to carbon cycle and ecosystem models, which require an integration of multiple, complementary and independent data and methods in a spatial domain for accurate estimation of carbon sequestered in forests at a reasonable cost]

SURAT LERTLUM, BS, Norwich University; MS, The George Washington University, USA; DTechSc, Computer Science, Asian Institute of Technology, Thailand

**Research Scientist**

(GIS, RS, Digital Image Processing, Surveying, Mapping)

[Low-resolution (NOAA AVHRR) forest classification, High-resolution (Landsat TM), and Multi-resolution forest classification includes thermal band; Object-Oriented data model for multi-resolution / multi-temporal remote sensing and GIS data sets; related-research with NOAA AVHRR and MODIS data; related-research on Real Time Kinematics Differential GPS and the development of mobile system utilizing open source software; related-research on the archaeological remote sensing and GIS including the remote sensing and GIS for archaeology in Southeast Asia; related-research on the archaeological Virtual Reality, including 3D modeling from digital photographs and from laser scanning]

LAL SAMARAKOON, PhD, Ehime University, Japan.

**Visiting Senior Scientist; Director, Geoinformatics Center**

[Technology transfer and knowledge sharing; Appropriate usage of remote sensing; GIS and GPS in real-world applications; landslide hazard mapping; poverty mapping; social impact and environment changes; location-allocation studies; internet GIS; Web application and Digital Asia network for regional data sharing. Provide remote sensing, GIS and GPS consulting services to help solve real-world applications, develop institutional capacities and appropriate means for technology transfer.]

MARC SOURIS, PhD, Université de La Rochelle, France

**Visiting Research Scientist**

(Remote Sensing and GIS development)

8.4 Completed Grant and Sponsored Research

**3D Digital City Modeling: Some Case Studies for Protection of World Cultural Heritages in Thailand**

Duration: April 2002 to July 2005

Investigator: RTG

Collaborator: Dr Xiaoyong Chen

Sponsor: RTG

Total Contracted Amount: Baht 1,000,000

**Application of GIS in Poverty Mapping**

Project Description: The training course provided the participants the technical know-how for preparing poverty maps applying 'small area estimation' method using census and household survey data. The training helped the participants in locating the pockets of...
Remote Sensing & Geographic Information Systems Field of Study

severe deprivation for implementing poverty reduction programs on priority basis.

Duration: February 3 to 23, 2005
Investigator: Dr Manzul Hazarika
Sponsor: Central Bureau of Statistics, Nepal
Total Contracted Amount: Baht 478,625

Basic Training in Remote Sensing and GIS
Project Description: This was a basic training in Remote Sensing and GIS and the training was organised for a group of participants from Afghanistan.
Duration: May 3-31, 2005
Investigator: Dr Manzul Hazarika
Sponsor: UNEP - RPC.AP (Training for Afghanistan)
Total Contracted Amount: Baht 195,000

Digital Asia Network (DAN)
Project Description: This project was aimed at exchanging spatial digital data distributed among various agencies through network. The contract included providing 2 training courses on open GIS during the project period.
Duration: April 2004 to July 2005
Investigator: Dr Lal Samarakoon
Sponsor: JAXA/RESTEC
Total Contracted Amount: Baht 1,874,796

E3P
Project Description: The project aims to assess the environmental impact of the intensification of pig production in the Red River delta, North Vietnam. This intensification is impossible to avoid because of the permanent increase of population. The pollution phenomena in the area will be modeled and try to simulate through a GIS the different possible scenarios, in order to help decision makers in the future master plan for the development of the regions.
Duration: March 2005 to February 2006
Investigator: Dr Frederic Borne
Sponsor: CIRAD-France
Total Contracted Amount: Baht 329,000

J AXA Mini-Project (VSSD)
Project Description: This is a capacity building project based on real-world applications of remote sensing and GIS. Six countries, namely Nepal, Bangladesh, Philippines, Vietnam, Cambodia and Laos participated in project. Capacity building was carried out based on areas identified by each participating countries. Some of the topics were flood mapping, paddy cultivated area estimation, coastal zone monitoring and management, and urban area expansion. Trainees were invited to Geomatics Center 2 times, spending 4 weeks in each occasion. Joint field visits were conducted to collect relevant information in their home countries. J AXA appreciated the project outcomes and agreed to increase the number of projects.
Duration: April 2004 to July 2005

Investigator: Dr Lal Samarakoon
Co-Investigator: Dr Manzul Hazarika
Sponsor: Japan Aerospace Exploration Agency, Project FY 2004-2005
Total Contracted Amount: Baht 8143,200

Near Real Time Agricultural Activity Monitoring Using Multi-Temporal MODIS Earth Observation Satellite Data
Duration: 1 May 2003 to 30 June 2005
Investigator: Dr Kyoshi Honda
Collaborator: Kasetsart University, Thailand
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 950,000

Real Time Spatial Logging Device for Open GIS
Duration: 1 May 2003 to 30 June 2005
Investigator: Dr Nitin Kumar Tripathi
Collaborator: Dr Phisan Santitammont, Chulalongkorn University, Thailand
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 937,000

Regional Space Activity Promotion Study
Duration: 22 June 1999 to 31 March 2005
Investigator: Dr Michiro Kusanagi
Sponsor: National Space Development Agency of Japan
Total Contracted Amount: Baht 2,967,329

Space Application Study
Duration: 1 April 1999 to 31 March 2005
Investigator: Dr Michiro Kusanagi
Sponsor: Japan Science and Technology Corporation
Total Contracted Amount: Baht 1,233,796

Sustainable Peri Urban Agriculture
Duration: 1 July 2003 to 31 December 2005
Investigator: Dr Frederic Borne
Collaborator: Dr Nitin Tripathi
Sponsor: Centre de Cooperation Internationale en Recherche Agronomique pour le Development, France
Total Contracted Amount: Baht 369,000

Training on applications of GIS for Biodiversity Mapping
Project Description: Fundamental concepts of Remote Sensing and GIS were presented in the first week of the training and a case study for biodiversity was given in the second week.
Duration: June 20 to July 1, 2005
Investigator: Dr Manzul Hazarika
Sponsor: BISEP-ST, Nepal
Total Contracted Amount: Baht 429,000

Training on Open-source Map Server
Project Description: Training was aimed at providing the fundamental structure as well as implementation an opensource mapserver
8.5 Ongoing / In Progress Grant and Sponsored Research

**Applying Parallel Computing on Cluster and Grid systems for Agricultural Monitoring Based on Crop Model and Remote Sensing (RTG-C-CLUSTER)**

*Project Description:* To implement SWAO-GA on cluster and grid computing system to make it possible to perform agriculture monitoring which is based on data assimilation on crop model and remote sensing.

*Duration:* October 2004 to June 2006

*Investigator:* Dr. Honda Kiyoshi

*Sponsor:* RTG-Budget Joint Research Project FY 2004

*Total Contracted Amount:* Baht 975,000

**Asia e-learning Project Experiment by Multi-point Distant Learning Network System**

*Project Description:* AIT have been conducting distant education pilot experiment via Superbird C since 2003 with Tsukuba University and Multimedia University. AIT’s part is to provide RS & GIS contents as well as supporting fundamental experiment as Thai side counterpart. This will continue on as one of the WINDS (Giga-bit rate satellite) utilization program.

This project is to try to investigate about the status of health condition of school children utilizing GIS technology for their distributions since 2003.

*Duration:* Since 2003

*Investigator:* Prof. Michiro Kusunagi

*Sponsor:* Japanese Space Exploration Agency (JAXA)

**Asian Highway**

*Technical Abstract:* To design and develop an information system for the Asian Highway based on GIS utilizing remote sensing images. Master database which will provide public through Web Map Service will be developed. Also a stand alone system to provide good human interface without internet connection will be developed. The data includes Asian Highway data such as route, spec of road, socio-economic data and remote sensing images and elevation data.

*Duration:* August 2003 to April 2006

*Investigator:* Dr. Honda Kiyoshi

*Sponsor:* UN-ESCAP

*Total Contracted Amount:* Baht 652,500

**Development of marine and coastal resources database of Thailand**

*Project Description:* To develop the fundamental GIS database for key components of marine and coastal resources in Thailand, namely coral reefs, mangrove forests, seagrass beds, animals for conservation (e.g. turtles, dugong) and threats e.g. coastal erosion. The database will be stored on the server computer for National Coastal and Marine Information Centre under DMCR to be shared by many potential users such as governmental, non-government and researchers to help in the conservation and coastal zone management.

*Duration:* One Year

*Investigator:* Dr. Honda Kiyoshi

*Co-Investigator:* Dr. Nitin Kumar Tripathi

*Sponsor:* UNEP

*Total Contracted Amount:* Baht 2,460,000

**Digital Asia**

*Project Description:* Keio University has established Digital Asia Research Center (DARC) and looking forward to establish a network in the region to collaborate with Node Agencies for data sharing. This network attempts to link all participating agencies and provide a place where they can obtain useful information for developing their own applications. During the five-year project period, attempt will be made to establish 30 Nodes in the region with high-end computer hardware and software necessary for data/information sharing over the Internet. Geoinformatics Center participates as a collaborator for developing browser software, promoting data sharing, teach/train Node Agencies and supporting the system.

*Duration:* April 2005 to March 2010

*Investigator:* Dr. Lal Samarakoon

*Sponsor:* Keio University, Project FY 2005-2009

*Total Contracted Amount:* Baht 700,000 (Annually)

**Flood Water Retention for Dry Season**

*Project Description:* Northeast Thailand has always been subjected to floods and droughts problems and the problems are getting more severe with increasing water demands, land use change, deforestation, etc. The Chi river basin is one main river basin of this region that suffers flood during rainy season and drought during dry season. This research proposal aims to develop a methodology to alleviate the floods and droughts problems of the Chi river basin. A water budget model for the basin will be developed to find the water availability and demand. The scarcity of the water during the drought is the main issue that will be addressed by finding the locations for the rainwater harvesting structures using the digital terrain model and the remote sensing data. Planning the water retention structures will be modeled by integrating hydrologic model, hydraulic model, remote sensing and GIS and hierarchy optimization techniques.

*Duration:* October 2005 to October 2006

*Investigator:* Dr. Nitin Kumar Tripathi

*Sponsor:* RTG-Budget Joint Research Project FY 2005

*Total Contracted Amount:* Baht 970,000
Geographic Information System and Nutritional Status of Lamponn Province

People Thailand

Project Description: To set up a GIS database to analyze nutritional status of Thai people: 1) to investigate the distribution and frequency of protein energy malnutrition (PEM) of preschool and school children using GIS technology, 2) to study the associations between nutritional environmental determinants and PEM in preschool and school children.

Duration: September 2004 to February 2006
Investigator: Prof Michiho Kusanagi
Co-Investigator: Dr Srisaang Kaojarern
Sponsor: RTG-Budget Joint Research Project FY2004
Total Contracted Amount: Baht 600,000.00

GIM

Project Description: To develop algorithms for delineating actual irrigated and non-irrigated area using multi-temporal low-resolution RS data and limited number of high resolution RS data at global scale.

Duration: December 2002 to December 2005
Investigator: Dr Honda Kiyoshi
Sponsor: International Water Management Institute
Total Contracted Amount: Baht 1,200,000

Human Network Project

Project Description: Geoinformatics Center has trained more than 1000 personnel, most of them belonged to various agencies of the Asian region since its inception in 1995. It was found that many of the trainees have moved from their original agencies to other agencies, while some of them have excelled to become leaders or experts. This project is aimed at re-establishing the link with the past trainees in order to promote JAXA and AIT activities in applications of space technologies in the region through them. Further, it is expected that it will help JAXA and AIT in finding new areas for applications and opportunities. During this project, 6 countries will be visited for holding 1-day seminar inviting past trainees. Their information will be compiled and posted in a website.

Duration: January 2005 to June 2006
Investigator: Dr Lal Samarakoon
Sponsor: JAXA - Bangkok, Project FY 2005-2006
Total Contracted Amount: Baht 774,810

Image Processing, Data Analysis, and Preparation of a GIS Data Base of Remote Sensing Images From Around The Mesopotamia Marsh (Mesopotamia)

Project Description: To carry out image processing, data analysis and preparation of a GIS database of remote sensing image around the Mesopotamia marsh.

Duration: January 2004 to April 2006
Investigator: Dr Honda Kiyoshi
Sponsor: Digital Service International Co., Ltd (DSI)
Total Contracted Amount: Baht 700,000

JAXA Mini Project (WSSD-2)

Project Description: This project was awarded as a part of JAXA's contribution to the Asia-Pacific region for capacity building. This project comprise of three parts; Caravan Training Programs, Mini-Projects, and Workshops. Caravan Programs are being conducted since 1997 with the help of JAXA sponsorship. Each year two countries are being selected. In 2005-06, trainings were conducted in Lao PDR and Sri Lanka and 9 Mini-Projects were supported in 6 countries. Two workshops were conducted in 2005-06 for information sharing, one as a parallel session during the Asian Conference of Remote Sensing (ACRS) and the other one at ASEAN Subcommittee on Space Technology and Applications (SCOSA), both were held in Hanoi.

Duration: April 2005 to March 2006
Investigator: Dr Lal Samarakoon
Co-Investigator: Dr Manuel Nazarka
Total Contracted Amount: Baht 14,730,000

JST Project

Project Description: This research grant was provided by the Japan Science and Technology Agency (JST). The Yasuoka Laboratory, Institute of Industrial Sciences, University of Tokyo facilitated the project for satellite data receiving and archiving. Geoinformatics Center was requested to receive, archive and distribute NOAA and MODIS data among the research centers in Japan and collect field data for validations. This research project is expected to continue for few more years.

Duration: January 2005 to March 2006
Investigator: Dr Lal Samarakoon
Co-Investigator: Dr Junichi Susaki
Sponsor: Japan Science Technology, Project FY 2005-2006
Total Contracted Amount: Baht 1,478,000

KDML 105-GIS

Project Description: To investigate the effect of environment and management factors which could contribute to the grain quality of Khao Hom Mali and identification of environmental and management factors which could contribute to the grain quality of Khao Hom Mali and identification of potential growing areas.

Duration: November 2005 to October 2006
Investigator: Dr Xiaoyong Chen
Co-Investigator: Dr Srisaang Kaojarern
Sponsor: RTG-Budget Joint Research Project FY 2005
Total Contracted Amount: Baht 1,000,000

Road Management

Project Description: To develop a methodology on the use of remote sensing data and digital elevation model (DEM) for evaluating risk of mass movement such as collapse, landslides, debris flow for the purpose of road management in especially planning and detail designing phase. The study area is selected in Catanduanes island in the Philippines.

Duration: February 2002 to February 2006
Remote Sensing & Geographic Information Systems Field of Study

Investigator: Dr Honda Kiyoshi
Sponsor: Japan Bank of International Cooperation
Total Contracted Amount: Baht 1,111,968

Spatial Analysis of Malaria Risk to the Determination of Epidemiological Surveillance in an Endemic Region of Thailand and the effectiveness of a New Control strategy (RTG-MALARIA)

Project Description: To carry out geo-spatial risk assessment on malaria to come up with better control strategies by combining expertise of Mahidol University (Malaria disease) and AIT (geo-informatics)

Duration: October 2004 to June 2006
Investigator: Dr Honda Kiyoshi
Sponsor: RTG -Budget-Joint Research Project FY 2004
Total Contracted Amount: Baht 1,000,000

The GIS Component in Tsunami Early Warning System of AIT (RTG-TSUNAMI-GIS)

Project Description: To implement GIS components to Tsunami Early Warning System of AIT: 1) to develop a real time GIS for Tsunami Information Management using FOSS, 2) to collect Real Time Tsunami Sensor Data and update GIS database, 3) to collect earthquake on line from Web and E-mail and update GIS database, 4) to publish Tsunami Sensor Information and Earthquake Information to concerted people over the Internet, 5) to carryout 3D Tsunami Simulation.

Duration: December 2005 to December 2006
Investigator: Dr Honda Kiyoshi
Sponsor: RTG-Budget-Joint Research Project FY 2005
Total Contracted Amount: Baht 875,000

8.6 Publications

Referred Journals


Tripathi, N K and Vasan, C. Open GIS based wireless data logger for flood mitigation, Role of water sciences in trans-boundary river basin management, Ed. By Dr S Herath, Dr Dusmantha Dutta, Dr A Dasgupta. Published by: United Nations University, Asian Institute of Technology, 75-80, 2005.

Conference Proceedings


Deng, M, Chen, X, Niu, S, and Zhang, L. Approach for Uncertainty of Topological Relations between Spatial Regions in Vector-based GIS, the International Symposium on Spatial-temporal Modeling, Spatial Reasoning, Analysis, Data Mining and Data Fusion (SIM'05), Beijing, August 2005.


Honda, K. Crop Growth Modeling using Remote Sensing, Executive Authority Confederacy Forum on Hydroinformatics Harmonious Solidarity,


Kusanagi, M., Real Time Distance Education Experiment for Geo-informatics Field, UN/IAF, 2005.


Kusanagi, M., Thapa, R.B., and Kitazumi, A. Potential future transportation infrastructure in South East Asia


Kusanagi, M. and Thapa, R.B. Real Time Distance Education: Experiment of Geo-informatics Course over Asia, Map Asia Conference, Jakarta, 22-25 August 2005.


8.7 Doctoral Students’ Dissertations

Analysis of SPOT Vegetation NDVI for Mapping Irrigated and Non-Irrigated Rice Cultivation by Daroonwan Kamthonkiat
Supervisor: Dr Kiyoshi Honda

A Semantic Zoom Approach in GIS to Rule-Based Landscape Visualization by Chamnan Kumsap
Supervisor: Dr Frederic Borne

8.8 Masters Students’ Theses and Research Studies

A Mobile GIS Based Shopping Assistant System by Kapil Katiyar
Supervisor: Dr Nitin Kumar Tripathi

A Mobile GIS Based Tourist Information System by Mandar Narayan Sarlashkar
Supervisor: Dr Nitin Kumar Tripathi

A Real Time Disaster Mapping Camera by Ravi Chauhan
Supervisor: Dr Kiyoshi Honda

Automatic Detection of Traffic Flow Parameters for ITS by Ruifeng Ye
Supervisor: Dr Xiaoyong Chen
Cloud Motion Vector (CMV) and Change Determination in the Foothills of Bhutan from Remotely Sensed Images
by Ugyen Penjor
Supervisor: Prof Michiro Kusanagi

Data Assimilation in SWAP Model Based on a NDVI-LAI Relationship
by Panithan Srinuandee
Supervisor: Dr Kiyoshi Honda

Distribution Testing of Positional Error of Geospatial Data
by Sirikul Hutasave
Supervisor: Dr Xiaoyong Chen

Error Distribution Simulation for Handling Positional Uncertainties in Geographic Information Systems
by Zhang Lei
Supervisor: Dr Xiaoyong Chen

Extraction of River Network from ASTER Data and SRTM DEM
by Aleinmar Htwe
Supervisor: Dr Kiyoshi Honda

Fusion of Stereo-Optical and Interferometric SAR DEMs
by Manoj Karkee
Supervisor: Prof Michiro Kusanagi

GIS Based Model/Algorithm Development to Identify Core Rural Road Network for Development and Maintenance Planning
by Md Shahidul Islam
Supervisor: Dr Kiyoshi Honda

GIS Based Poverty Analysis and Mapping for Rural Development Planning in Nepal: A Case Study of Kaski District
by Man Bahadur Kshetri
Supervisor: Prof Michiro Kusanagi

Integration of Remote Sensing Data with Forest Growth Model to Estimate the Growth Productivity
by Juthasinee Thanyapaneedkul
Supervisors: Dr Nilin Kumar Tripathi
                      Dr Frederic Borne

Monitoring Agricultural Drought Using MODIS Temperature Vegetation Dryness Index in Mae Nam Chi Basin, Thailand
by Kaesom Jumpa
Supervisor: Dr Nilin Kumar Tripathi

Monitoring Shoreline Dynamics in Pak Phanang, Thailand Using Remote Sensing and Geographic Information Systems
by Sayedur Rahman Chowdhury
Supervisor: Dr Nilin K Tripathi

Tsunami Disaster Preparedness Model for Sustainable Planning and Development of Krabi, Thailand
by Abdul-Salam Soomro
Supervisor: Dr Nilin Kumar Tripathi
Chapter 9: SET - STRUCTURAL ENGINEERING
FIELD OF STUDY

9.1 Introduction

Structural engineering has always been seen as one of the few fields of study where one can combine real technical skills with artistic flair. Structural engineers are known to be people who enjoy innovation, opportunities, responsibility and excitement, whilst working within a creative profession. Structural engineers plan and design various structures such as buildings, bridges, sport stadiums, towers, and underground structures.

The built environment which is designed and constructed by structural engineers has an enormous impact on our everyday lives. In order to design and construct safe and economic structures, they need to keep abreast with the latest methods of structural analysis, modeling concepts for computation, advanced design, material technology, and improved knowledge in structural loadings.

The field educates professionals who will be at the forefront of advanced research in Structural Engineering. They are trained to respond creatively to the industrial requirements of infrastructure development.

9.2 Faculty and Research Staff

Full-time Faculty

WORSAK KANOK-NUKULCHAI, BEng (Hon), Chulalongkorn Univ, Thailand; MEng, AIT, Thailand; PhD, Univ of California (Berkeley), USA. Professor (Computational Mechanics, Finite Element Methods, Tall Building Static and Seismic Analysis, Bridge Engineering, Microcomputer Software for Structural Engineering, Genetic Algorithms, Nonlinear Analysis of Structures and Continua, Plate/Shell Structures, Engineering Education, Nanomechanics)

KIM KIDU, BEng, Hanyang Univ, Korea; MEng, AIT, Thailand; PhD, Imperial College of Science, Tech and Medicine, London. Associate Professor

PICHAI NIMITYONGSKUL, BEng, Chulalongkom Univ, Thailand; MEng, DEng, AIT, Thailand. Associate Professor

PENNUNG WARNITCHAI, BEng, Chulalongkom Univ, Thailand; MEng, PhD, Tokyo Univ, Japan. Associate Professor

WILLIAM BARRY, BS, PhD, Carnegie Mellon Univ; MS, Stanford Univ, USA. Assistant Professor

Visiting Faculty

YOSHITAKA KATO, Visiting Assistant Professor

[finite element methodologies and numerical methods; finite element modeling of large deformation plates and shells; time integration methods; contact and impact problems; nonlinear solution techniques as well as the numerical aspects of dynamic problems; finite element software development especially under personal computer environment; meshfree methods based on Kriging Interpolation; structural health monitoring]

KIM KIDU, BEng, Hanyang Univ, Korea; MEng, AIT, Thailand; PhD, Imperial College of Science, Tech and Medicine, London. Associate Professor

PICHAI NIMITYONGSKUL, BEng, Chulalongkom Univ, Thailand; MEng, DEng, AIT, Thailand. Associate Professor

PENNUNG WARNITCHAI, BEng, Chulalongkom Univ, Thailand; MEng, PhD, Tokyo Univ, Japan. Associate Professor

WILLIAM BARRY, BS, PhD, Carnegie Mellon Univ; MS, Stanford Univ, USA. Assistant Professor

YOSHITAKA KATO, Visiting Assistant Professor
Structural Engineering Field of Study

Concrete structures based on risk evaluation, evaluating environmental impacts on concrete structures, estimating concrete quality of existing structure using multiple NDT (Non-Destructive Test) and modeling of diffusion of substances in concrete.

Research Staff

NAVEED ANWAR, Associate Director, Asian Center for Engineering Computations and Software

BERNARD LEFEBVRE, Senior Research Assistant and Director, Habitech Center

9.3 Completed Grant and Sponsored Research

EASEC-10 Conference Preparation Phase
Project Description: The East Asia-Pacific Conference on Structural Engineering and Construction (EASEC) was founded by Professor Fumio Nishino, then the Vice President for Academic Affairs of the Bangkok-based Asian Institute of Technology, to provide a forum for professional structural and construction engineers and researchers working in Asia and the Pacific region to present recent progress in research and development, and to discuss the implementation of new tools and technology in professional applications. In particular, the conference intends to promote mutual understanding and share common ideas. EASEC has been held biennially since 1986. EASEC-10 will be organized in Bangkok during August 3-5, 2006.

Duration: 1 July 2005 to 31 December 2005
Investigator: Prof Worsak Kanok-Nukulchai
Sponsor: EASEC Secretariat
Total Contracted Amount: Baht 400,000

Independent Inspecting and Testing Agency in Manufacturing of Concrete Sleepers for SRT (ITD Sleeper – 2005)
Project Description: Italian Thai Development Public Company Limited was contract from the State of Railways of Thailand (SRT) for manufacturing and supplying of concrete sleepers for SRT Track Rehabilitation Project. Based on the specifications SRT, an independent testing agency is required. At the request of Italian Thai Development Public Company Limited, the structural engineering laboratory of the then School of Civil Engineering, Asian Institute of Technology is engaged to conduct the inspecting and testing for the structural performance of sleepers precast concrete.

Duration: 1 January 2005 to 31 December 2005
Investigator: Dr Pichai Nimityongsuk
Sponsor: Italian-Thai Development Public Co Ltd, Thailand
Total Contracted Amount: Baht 800,000

Investigation of Structural Integrity of Din Daeng Housing
Duration: 1 December 2002 to 31 December 2005
Investigator: Dr Pichai Nimityongsuk
Sponsor: National Housing Authority, Thailand
Total Contracted Amount: Baht 5,303,315

Klong Prapa Canal Covering Project
Duration: 26 October 1999 to 30 June 2005
Investigator: Prof Worsak Kanok-Nukulchai
Collaborator: Case Company Limited, Thailand
Sponsor: Department of Highways, Ministry of Communication, Thailand
Total Contracted Amount: Baht 6,341,440

Klong Prapa Canal Covering Project - Part II (Water & Architect)
Duration: 26 October 1999 to 30 June 2005
Investigator: Prof Tawatchai Tingsanchali
Collaborators: Prof Worsak Kanok-Nukulchai, AIT
Prof Ajit Annachhatre, AIT
YP Consultants Company Limited, Thailand
Dr Apichart Wongkaew
Dr Yingplew Suphakitwong
Sponsor: Department of Highways, Ministry of Communication, Thailand
Total Contracted Amount: Baht 1,228,748

Klong Prapa Canal Covering Project - Part III (Traffic Study)
Duration: 26 October 1999 to 30 June 2005
Investigator: Prof Yordphol Tanaboriboon
Collaborators: Prof Worsak Kanok-Nukulchai, AIT
Mr Krisda Tangkawachiranon
Sponsor: Department of Highways, Ministry of Communication, Thailand
Total Contracted Amount: Baht 1,513,000

Klong Prapa Canal Covering Project - Part IV (Utilities, Geotechnics and Geometric Design)
Duration: 26 October 1999 to 30 June 2005
Investigator: Dr Noppadol Phienwej
Collaborators: Prof Worsak Kanok-Nukulchai, AIT
WISANUCOM Engineering Consultants Company Limited, Thailand
Sponsor: Department of Highways, Ministry of Communication, Thailand
Total Contracted Amount: Baht 2,245,200

Natural Rubber Composites for Railway Sleepers: A Feasibility Study
Duration: 16 May 2003 to 30 June 2005
Investigator: Prof Worsak Kanok-Nukulchai
Collaborator: Thammasat University, Thailand
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 996,000
Risk Analysis due to Catastrophic Urban Floods in Bangkok using GIS, Remote Sensing and Surface-River Model

Duration: 1 September 2004 to 30 November 2005
Investigator: Dr Yoshitaka Kato
Collaborator: Dr Dushmanta Dutta, AIT
Sponsor: United Nations University, Japan
Total Contracted Amount: Baht 360,000

9.4 Ongoing / In Progress Grant and Sponsored Research

Adjustment to the Building Energy Code
Project Description: Department of Energy Development and Promotion (DEDP) is implementing a project entitled “Adjustments of the Building Energy Code” with assistance from the Danish Cooperation for Environment and Development (DANCED). The main purpose of the project is to update the Building Codes related to energy. The existing codes and standards relating to energy will be adjusted or updated according to the latest available knowledge. Comprehensive and valuable knowledge on energy issues related to buildings already exists in Thailand. To emphasise the sustainability of the project it is obvious to utilize this national resource.

Duration: 1 June 2002 to 30 June 2006
Investigator: Prof Worsak Kanok-Nukulchai
Sponsor: Danish Energi Management A/S
Total Contracted Amount: Baht 14,040,000

Chemical Modification of Natural Rubber Composites for Structural Application
Project Description: Natural rubber (NR) is naturally soft and highly deformable at room temperature. After crosslinking (or vulcanization), rubber becomes more elastic but still possesses low compressive modulus. From our previous investigation, mechanical properties of NR were significantly enhanced by increasing crosslinking density of NR vulcanizates, and by adjusting types and amounts of reinforcing fillers. It was found that by increasing crosslinking density of NR vulcanizates, the rubber product becomes very stiff and inelastic, whereas, by adjusting the type and amount of reinforcing fillers at low to moderate crosslinking density, the stiffness of the rubber is still low. Crosslinking density demands expensive chemicals and a large amount of reinforcing fillers to achieve desirable properties.

Duration: 30 September 2004 to December 2006
Investigator: Prof Worsak Kanok-Nukulchai
Sponsor: Royal Thai Government (RTG) Joint Research Fund
Total Contracted Amount: Baht 996,000

EASEC Secretariat (EASECS)
Project Description: To run the secretariat for EASEC Series of Conferences organized biennially in Asia. The Conferences serve to provide a forum for professional structural and construction engineers and researchers working in Asia and the Pacific region to present recent progress in research and development, and to discuss the implementation of new tools and technology in professional applications. In particular, the conference intends to promote mutual understanding and share common ideas. EASEC has been held biennially since 1986.

Duration: 25 June 2005 to 31 December 2006
Investigator: Prof Worsak Kanok-Nukulchai
Sponsor: Participants/ Donor/ Subsidy
Total Contracted Amount: Baht 8,800,000

Evaluation of Seismic Capacity of Gravity-Load-Designed, Prestressed Concrete Slab-Column Frame Buildings in Bangkok
Duration: October 2005 to March 2006
Investigator: Dr Penninga Warmitcharo
Sponsor: Thailand Research Fund
Total Contracted Amount: Baht 350,000

Finite Element Modeling of Tsunami Propagation on the Coast of Thailand
Project Description: On December 26, 2004, coastal regions of the Indian Ocean were devastated by large tsunami initiated by a large earthquake in the ocean near Indonesia’s province of Aceh. Much of tragic loss of lives and injuries could have been prevented if there were early warning systems in those countries surrounding the Indian Ocean, including Thailand. In order to set up a reliable warning system in Thailand, it is necessary to have good wave sensors in the ocean to detect potential tsunami as well as good mathematical and numerical tools to predict behavior of tsunami. This study aims to establish a finite element model for simulating tsunami propagation on the coast of Thailand. The obtained model can be used in conjunction with wave sensors to form a tsunami warning system. The obtained software application will encourage Thailand to rely on its own strength in tsunami disaster prevention and mitigation.

Duration: 1 November 2005 to 31 October 2006
Investigator: Prof Worsak Kanok-Nukulchai
Sponsor: Royal Thai Government (RTG) Joint Research Fund
Total Contracted Amount: Baht 875,000

International Ferrocement Information Center
2005 (IFC 2005)

Duration: 1 February 2005 to 31 December 2006
Total Contracted Amount: Baht 300,000
Investigation of Structural Integrity of Eua
Arthorn Housing
Project Description: AIT conduct an inspection to investigate the structural integrity of Eua Arthorn Housing Authority.
Duration: 10 May 2004 to 31 December 2007
Investigator: Dr. Penung Warnitchai
Sponsor: National Housing Authority
Total Contracted Project: Baht 3,750,000

Mitigation of Seismic Risk in Thailand
Duration: Since August 2002
Investigator: Dr. Penung Warnitchai
Sponsor: National Housing Authority
Total Contracted Amount: Baht 3,154,000

Natural Rubber Composites for Railway Sleepers: A Feasibility Study
Project Description: In this proposal, different natural rubber composites will be studied with the aim to be utilized as railway sleepers. Natural rubber is proposed as the primary raw material because Thailand is currently the largest producer of rubber in the world. If the project finds a successful composite of natural rubber that fits for railway sleepers, the country will benefit from being able to exploit the large stock of natural rubber the over-produces every year. This in turn will stabilize the market price of natural rubber. Prototypes of railway sleepers will be made from different composites of natural rubber, and will be tested based on the functional requirements of railway sleepers in cooperation with the State Railway of Thailand. As railway tracks can be installed by regular spikes as in the case of wooden sleepers, Thailand will not need to import special fasteners. In addition, once the technology is well proven, Thailand can export this technology overseas.
Duration: 16 May 2003 to December 2006
Investigator: Prof. Worsak Kanok-Nukulchai, Dr. Noppadol Phien-wej
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 996,000

Seismic Behavior of Steel Beam-Column Connection with Knee Brace (Knee Braced Frame)
Project Description: The research proposed herein will involve an experimental study of a new structural system to resist seismic forces called moment frames with knee brace. The research work involves a quasi-static testing and numerical simulations of the frame assembles.
Duration: November 2005 to November 2006
Investigator: Dr. Penung Warnitchai
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 996,000

Seismic Hazard Assessment and Mitigation of Seismic Risk in Thailand (Phase 1): Sub-Project 3 and 4
Project Description: In this project, the dynamic properties of about forty (40) tall reinforced concrete buildings in Bangkok will be identified by an ambient vibration method. Based on the results obtained, an appropriate empirical formula for estimating building fundamental periods will be derived, and a method to construct accurate building dynamic models will be developed. The seismic performance of six representative buildings will be extensively evaluated by nonlinear pushover analysis, and economic and effective corrections of retrofit schemes to improve the seismic performance will be identified. Based on these results, practical seismic design guidelines will be made.
Duration: 1 September 2002 to 31 December 2006
Investigator: Dr. Penung Warnitchai
Collaborator: Dr. Noppadol Phienwej, AIT
Sponsor: Thailand Research Fund
Total Contracted Amount: Baht 3,154,000

Testing of Structural Integrity of Concrete Structure for Hopewell Column (Hopewell 2005)
Project Description: To study the structural integrity of Hopewell's column and to observe and identify the extent of deterioration or damage of concrete structure and to determine the strength of concrete by using either non-destructive tests for North Bound Train System in a Bangkok (Bang Sue-Rangsit) and Bang Sue Train Station.
Duration: August 2005 to March 2007
Investigator: Dr. Pichai Nimityongskul
Sponsor: NTR
Total Contracted Amount: Baht 3,000,000

9.5 Publications

Refereed Journals


Refereed Books/Chapters


Conference Proceedings


Structural Engineering Field of Study


Kato, Y and Takeshita, N, Simulation Study on Relation Between Local Rainfall Conditions and Amount of Moisture Supplied to Concrete, Proceedings of the 4th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia, pp.79-88, 2005


Other Publications


Nimityongskul, P, AIT adopted vetiver grass to make respiration grain storage silo, Published on page 7, The National Newspaper, Monday, August 15, 2005 (in Thai).


Nimityongskul, P, 2 Patents pending for invention at the department of intellectual property, Ministry of Commerce on vetiver grass development technology - Simple press equipment - Vetiver Grass-Clay Block Pattern and Usage


9.6 Doctoral Students' Dissertation

Structural Identification: Prestressed Concrete Girder Bridge for Strength Evaluation
by Anun Patjawit
Supervisor: Prof Worsak Kanok-Nukulchai

9.7 Masters Students' Theses and Research Studies

Adaptive Force-Based Pushover Analysis of Reinforced Concrete Frames Using a Fiber Section Model
by Benny Suryanto
Supervisors: Dr Kim Kidu
Dr Pennung Warnitchai

A Mechanistic Approach for Modeling Deterioration of Flexible Pavement
by Javed Qureshi
Supervisor: Dr William Barry

An Assumed Strain 4-Node Reinforced Concrete Shell Element Considering Geometric and Material Nonlinearity
by Songsak Suthasupradit
Supervisor: Dr Kim Kidu

An Improved Local Kriging Method in 2D Elastostatics
by Thaung Htut Aung
Supervisor: Dr William Barry

Application of Moving Kriging Shape Functions on Plate Problems
by Shazim Ali Memon
Supervisor: Prof Worsak Kanok-Nukulchai

Design Improvement of R/C Interior Beam-Column Joints in Low to Moderate Seismic Risk Regions
by Pramin Nonchan
Supervisor: Dr Pennung Warnitchai

Development of Ferrocement Armored Panels
by Panuwat Joyklad
Supervisor: Dr Pichai Nimityongskul

Development of High-Strength and Durable Concrete Mix Proportions by Using Replacement of Fly Ash and Silica Fume
by Phyu Phyu Myint
Supervisor: Dr Pichai Nimityongskul

Effects of Foundation Flexibility on Elastic and Inelastic Seismic Responses of Multi-Story Buildings
by Jose Leo C Mission
Supervisor: Dr Pennung Warnitchai

Enhancing Fresh Tremie Concrete Properties for Bored/Deep Pile Applications
by Muhammad Talha Junaid
Supervisor: Dr Pichai Nimityongskul

Experimental Investigation on Fresh Concrete Properties of High Strength and Durable Concrete with Prediction Models Using Artificial Neural Networks
by Bishnu Prasad Subedi
Supervisor: Dr Pichai Nimityongskul

Feasibility Study on Structural Health Monitoring of Multi-Span Prestressed Concrete Bridges by Using Thermal-Induced Responses
by Kiangkrai Teewattanakul
Supervisor: Dr Pennung Warnitchai

Finite Element Analysis of the Response of Steel Frame Structures Subjected to High Temperature
by Thein Nu
Supervisor: Dr William Barry

Interference Effects from Adjacent Structures on Wind-Induced Forces in Large Billboards
by Kobchai Poemsanittham
Supervisor: Dr Pennung Warnitchai

Nonlinear Finite Element Analysis of Reinforced Concrete Deep Beams
by Sara Gladini Khazraghy
Supervisor: Dr William Barry
Structural Engineering Field of Study

Production of Aerated and Autoclaved Lightweight Mortar Containing Pulverized Fly Ash and Bottom Ash
by Thanmaporn Ungsongkhun
Supervisor: Dr Pichai Nimityongskul

Production of Low Cost Self-Compacting Concrete Using Fly Ash and Dolomite Powder
by Salim Ahmed Barbhuiya
Supervisor: Dr Pichai Nimityongskul

Relevance of Beam-Column Joint Damage on Seismic Performance of RC Framed Buildings
by Aloke Rajbhandary
Supervisor: Dr Pennung Warnitchai

Repair of Reinforced Concrete Slabs Using Modified Ferrocement Laminate
by Montree Boonyapongphun
Supervisor: Dr Pichai Nimityongskul

Response Analysis of a Cable Stayed Bridge Under Wind Loading
by Bhargab Mohan Das
Supervisor: Dr Pennung Warnitchai

Seismic Performance Evaluation of Bangkok Mass Rapid Transit Authority Subway
by S Selva Prakash
Supervisor: Dr William Barry

Three Dimensional Analysis of Concrete Structures with Continuum Damage Model
by Panot Chobsilprakob
Supervisor: Dr Kim Kidu

Three Dimensional Elasto-Plastic Constitutive Relation for an 8-Node EAS (Enhanced Assumed Strain) Solid Element
by Sacharuck Pornpeerakeat
Supervisor: Dr Kim Kidu

Two Dimensional Model Development for Numerical Simulation of Tsunami Propagation Using the Semi Implicit Characteristic-Based Split Method
by Gunawan Budi Wijaya
Supervisor: Prof Worsak Kanok-Nukulchai

Use of Natural Beach Sand and Powdered Stone in Making High Strength Concrete
by Alvin Proboyo
Supervisor: Dr Pichai Nimityongskul
Chapter 10: SET - TELECOMMUNICATIONS
FIELD OF STUDY

10.1 Introduction

The Telecommunications program offers areas of specialization in transmission systems; switching systems; telematics; network planning, and in collaboration with the School of Management, telecommunications management.

The courses offered emphasize modern telecommunications skills in systems planning and engineering, telecommunications software development, and administrative and financial aspects of telecommunications management.

Graduates from the master's program form the nucleus for effective high-level technical planning and management operations at their employer organizations. Some of the graduates are engaged in planning, development, and service activities leading to the installation, commissioning, management, design etc. of value-added systems. Given the important role of our graduates in the development of the telecommunications sector, the learning is of significant benefit to the users of telecommunications services within the region.

Graduates of the doctoral program play key roles in enhancing the level of education and research in the national universities of the region, and promote and strengthen the R&D potential of emerging regional manufacturing industries.

Research covers a wide variety of topics at the cutting edge of research and development. Specific issues addressed in the broad fields of transmission and switching systems are, for example, coherent optical communications, multiple-access strategies for cellular-mobile and cabled networks, as well as questions of congestion control and new services in ISDN and future B-ISDN networks.

10.2 Research Facilities and Laboratories

Today's fast-booming world of Telecommunications and Computer networking plays a significant leadership role. To support this achievement the Telecommunications field of study puts the effort to continue the development of Telecommunications technologies and systems. It covers a wide variety of research in telecommunications ranging from modeling, analysis wire line and wireless systems to application and protocol development.

Its research subjects are in coherent optical communications; congestion control, ATM, and B-ISDN networks; error correction and detection methods; mobile and Internet traffic studies; multiple-access strategies for cellular-mobile, satellite systems, and cabled networks; network performance analysis, planning and design; and speech processing. Its research specialisations are in broadband networks; network planning; switching systems; telecommunications management in collaboration with the School of Management; telematics; and transmission systems.

Transmission and Switching Lab (TSL)

The Transmission and Switching lab is equipped with Nokia Digital Switching Exchange DX200 (DX220, DX210) that supports PSTN and ISDN. There are also several telephone switches, traffic simulators, protocol analyzer, PDH/SDH (STM1 & STM4) transmission systems, fiber optic line equipment, transmission line analyzer, error rate meter which are available for experiment in switching, transmission and internetworking. The switching and transmission systems are integrated as real telecommunications network. Among the applications whose study has been made possible by these systems are Operation and Maintenance, performance measurements.
of real narrowband and broadband telecommunication networks, as well as new services.

**Network Planning Lab (NPL)**

High performance computer aided network planning tools are supported by several workstations at the Network Planning lab. This lab provides hands-on experience design and optimization in radio network, fixed network and fiber optical network.

**Wireless Lab (WL)**

The main purpose of the Wireless laboratory is for measurement and performance analysis. It is equipped with Modulation and Error rate measurement meters, Simulation software like SATSIM, which was developed by the students, is a simulation package to calculate the subsatellite points of a LEO/MEO/GEO and its orbital parameters. It also displays graphically on a two-dimensional earth map the instantaneous position and path traced by the satellite (Multi orbit and Multi satellite). Another is NMS/X, a measurement system for GSM, DCS and NMT networks tracing, capable of measuring up to four networks simultaneously. The results are used for benchmarking service quality of operational cellular networks. These results can be analyzed and can be used for tuning the network parameters in NPS/X.

**Communications Labs (CL)**

The Communications lab is used to perform experiments courses under Signal and Systems, Communications Electronic, Digital Transmission Technology and Digital Signal Processing. Test bench equipment includes analog and digital oscilloscopes, function generators, analog and digital Spectrum analyzers, Digital sampling oscilloscopes and DSP cards and workstations which have simulation applications like MATLAB.

**Computer Laboratory (PCL)**

There are two Computer Laboratories in Telecommunications Program. One is for Senior students and one is for Junior Students. All computers are latest powerful computers.

**TC Library**

In Telecommunications Program, there is a small library, from where students can borrow telecommunication related journals, manuals and reference books.

### 10.3 Faculty and Research Staff

**Full-time Faculty**

**KAZI MOHIUDDIN AHMED**, MSc, Inst of Communications, Leningrad, USSR; PhD, Univ of Newcastle, Australia. 
Professor (Telecommunication Networks; Digital Modulation Techniques; Satellite Communications; Cellular Mobile Communications; Digital Transmission and Communications) [Wireless Systems and Networks; Disaster Warning and Post-disaster Communications; Applications of ICT in Sustainable Development; Propagation and Channel Modeling in Mobile Communications; Multiple Access Techniques & Protocols; Satellite Communications; Antenna Array Processing; Signal Processing]

**R M A P RAJATHEVA**, BSc, Moratuwa Univ, Sri Lanka; MSc, PhD, Univ of Manitoba, Canada. 
Associate Professor (Equalization Algorithms for Frequency Selective Channels) [Digital and Mobile Communications, Space Time Processing- MIMO Performance analysis; OFDM and Multicarrier Techniques, Multiuser Detection, Application of Channel Coding for Distributed Source/Video Coding, Architectures for Emergency Communication Systems, Security Issues]

**TEERAPAT SANG UANKOT**, BEng, Chulalongkom Univ, Thailand; MEng, DEng, Tokyo Institute of Technology, Japan. 
Associate Professor (Data Communications; Broadband Integrated Services Digital Networks; AI... Annual Report on Research 2005

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Multimedia Communications and Systems; Network Quality of Service
[Digital Signal Processing, especially Image Compression for Moving and Still Image, the routing algorithm in the network such as IP and MPLS network, High Speed Network, IP-based multimedia applications; QoS provisioning in Networks]

POOMPATSAENGUDOMLERT, BSE, Princeton Univ; MS, PhD, Massachusetts Inst of Tech, USA
Assistant Professor
[Communication theory, optical networks, resource allocation problems, and array processing; Recent research activities have focused on optical network designs based on existing infrastructure networks and communications for disaster management]

Visiting Faculty

A B SHARMA, BSc, Univ of Newcastle-upon Tyne, UK; LicTech, DTech, Helsinki Univ of Tech, Finland
Visiting Professor (Fiber-Optic Systems; Digital Transmission Technologies; Signals and Systems; Modulation Techniques; Coding Theory)
[High-speed all-optical networks (WDM, TDMA, CDMA); Optical WDM local access using spectrally sliced ASE; Radio-over-fiber for future broadband cellular systems]

TAPIO J ERKE, MSc, Helsinki Univ of Tech, Finland
Visiting Associate Professor
[Traffic measurements, modeling, and performance in various telecommunication networks, PSTN, Cellular, Internet, ATM, and optical networks; Resource allocation for different services, network dimensioning and optimization, and switching structures]

Research Staff

MIKKO KOVALAINEN, PhD
Visiting Senior Researcher
[Knowledge management, Project management, HighTech management, Software business, Technology strategies]

10.4 Ongoing / In Progress Grant and Sponsored Research

Algorithm and System Design of Signal Processing on Quantum Cryptography System: Simulations
Project Description: Experimental results and implementation of quantum key distribution (QKD) system which employs four polarization states encoding key bits in two non-orthogonal bases were reported. The transmitter uses four diode lasers with emission wavelength of 830 nm at 1 MHz repetition rate as weak coherent sources and passive optical components to assign individual photon polarization. The receiver comprises similarly passive optical components to analyze the polarization of arriving photons, and four silicon avalanche photodiodes operated in Geiger mode to detect single photons, and to optically synchronize the system. In a demonstration experiment the QKD system enabled to generate shifted-key about 5,000 bits/s, at an average of about 0.06 photons per pulse at clock rates of 1 MHz. An average quantum bit error rate (QBER) was about 6.5% for a 6.5 m free space transmission test range.

Duration: 15 September 2004 to 31 March 2006
Investigator: Dr Teerapat Sanguankotchakorn
Sponsor: Royal Thai Government (RTG) Joint Research Fund
Total Contracted Amount: Baht 810,000.00

10.5 Publications

Refereed Journals


Conference Proceedings


Saengudomlert, P and Chan, V W S, Hybrid optical and electronic signal processing for ultra-wideband RF antenna arrays, Proceedings of IEEE


10.6 Masters Students' Theses and Research Studies

Advanced Duplicate Address Detection (DAD) and Buffering-Based Provision of Seamless Handover in Mobile IPv6
by Shobhan Adhikari
Supervisor: Dr Teerapat Sanguankotchakorn

An Adaptive Multi-Threshold Bandwidth Reservation for Multi-Services in a Cellular System
by Jairak Tanpaiboonkul
Supervisor: Associate Professor Tapio J Eke

Blind Channel Estimation in MIMO for MC-CDMA
by Abdur Rahim
Supervisor: Prof Kazi Mohiuddin Ahmed

Cyclic-Based Maximum Likelihood Detection for Unknown Channel and Interferences: Differential Unitary Space Time Codes
by Kyaw Moe Aung
Supervisor: Prof Kazi Mohiuddin Ahmed
Optimization of the Core-Router Fiber-Delay-Line Buffer Dimensions for Horizon-Based Optical-Burst Switching in WDM Networks
by Nguyen Buong Giang
Supervisor: Prof A B Sharma

Performance Analysis of Enhanced IEEE 802.11 and Adaptive 802.11E Wireless Lans
by Orawan Tipmongkolipsk
Supervisor: Associate Professor Tapio J Erke

Performance Evaluation of an Indoor Ultra Wideband Channel for Different Pulse Shape Derivatives, Path Loss and Modulation Schemes
by Mohammad Upal Mahfuz
Supervisor: Prof Kaz Moliuddin Ahmed

Performance Evaluation of Group Forming Service in Push to Talk Over Cellular for GSM/GPRS Network
by Tran Thanh Anh
Supervisor: Associate Professor Tapio J Erke

Performance of MIMO MC-CDMA Uplink System with V-BLAST and Multiuser Detection in Frequency Selective Rayleigh Fading Channel
by Chuwalee Neemanatana
Supervisor: Prof Kaz Moliuddin Ahmed

Measurement-Based Study of IP Access in a Fixed Network
by Arunpong Ytleak
Supervisor: Associate Professor Tapio J Erke

Space Time Code for Multi Band OFDM on IEEE Ultra Wideband Channels
by Le Thanh Quyen
Supervisor: Prof Kaz Moliuddin Ahmed

Wavelength Assignment with Destination and Intermediate Node Initiated Reservation for Optical Networks with Sparse Wavelength Conversion
by Nguyen Huynh Minh Tam
Supervisor: Prof A B Sharma

Research Study: Broadband Wireless Data Transmission Through LMDs: A Case Study of Ho Chi Minh City
by Hoang Nam Thang
Supervisor: Prof Kaz Moliuddin Ahmed

by Nguyen Khanh Tung
Supervisor: Prof Kaz Moliuddin Ahmed

Research Study: Frequency Planning and Management Issues in 3G and Beyond in Mobile Communication: A Case Study of Pakistan
by Abdul Qayoom Memon
Supervisor: Prof Kaz Moliuddin Ahmed

by Sudpakdee Arun
Supervisor: Dr Teerapat Sanguankotchakom

Research Study: Management of Telecommunications after a Natural Disaster: The Effect of Tsunami in Aceh, Indonesia
by Jerome Albou
Supervisors: Associate Professor Tapio J Erke

Research Study: Measurement and Analysis of Internet Traffic in the ADSL Network of HCM P & T
by Pham Dang Cuong
Supervisor: Associate Professor Tapio J Erke

Research Study: Multirate Congestion Control for Multicast Environment
by Thuya Lawin
Supervisor: Associate Professor Tapio J Erke

Research Study: Performance Analysis of Multidimensional Traffic in a Cellular Network
by Thi Han Tun
Supervisor: Associate Professor Tapio J Erke

Research Study: Performance Evaluation of IPv6/IPv4 Deployment Over Dedicated Data Links
by Mongkol Somrobru
Supervisor: Dr Teerapat Sanguankotchakom

Research Study: Performance Study of Concatenated Reed-Solomon and Convolutional Code on IEEE 802.11A WLAN
by Cung Tat Minh Tam
Supervisor: Prof Kaz Moliuddin Ahmed
Research Study: Planning Internet Access for a Personal Phonehandy System: A Case Study of HCM City, Vietnam
by Nguyen Thanh Tam
Supervisor: Prof Kazi Mohiuddin Ahmed

Research Study: Planning of Satellite Communications for Rural and Remote Areas of Vietnam
by Dao Phuoc Linh
Supervisor: Prof Kazi Mohiuddin Ahmed

Research Study: Power Line Communications: A Case Study of a Rural Area of Vietnam
by Nguyen Le Phuong Hien
Supervisor: Prof Kazi Mohiuddin Ahmed

Research Study: Quality of Service in CDMA Networks and Application to the CDMA2000-1X Network of VP Telecom
by Truong Do Lan
Supervisor: Dr Teerapat Sanguankotchakorn

Research Study: Tariff Structure for Mobile Communications Services: Case Study in Vietnam
by Nguyen Thanh Nghi
Supervisor: Prof Kazi M Ahmed

Research Study: The Mobility Effect on Hybrid the Hybrid Routing Protocol for Ad Hoc Wireless Networks
by Kitt Buphavesa
Supervisor: Dr Teerapat Sanguankotchakorn

Research Study: Traffic Engineering and QoS Improvements Based on MPLS
by Tran Xuan Duc
Supervisor: Dr Teerapat Sanguankotchakorn

Research Study: Traffic Measurement in a Broadband Remote Access Server in Ho Chi Minh City, Vietnam
by Le Thanh Tung
Supervisor: Associate Professor Tapio J Erke

Research Study: Traffic Measurement in an International Network, A Case Study of Ho Chi Minh City Gateway, Vietnam
by Mai Ly Tuan Anh
Supervisor: Associate Professor Tapio J Erke

by Vo Minh Chuong
Supervisor: Associate Professor Tapio J Erke
Chapter 11: SET - TRANSPORTATION ENGINEERING FIELD OF STUDY

11.1 Introduction

Industrialization and population growth have tremendous impacts in the movement of people and goods. Everyday, movement is hampered by congestion, insufficiency of public transport facilities, traffic accidents, and other conditions. Moreover, as manufacturing expands globally, businesses want to reduce transportation costs by limiting the number of distribution nodes. Concerns over congestion on highways, increasing pollution and hazardous materials all emphasize the need to effectively maximize transportation systems. Thus, the issue of transportation is obviously crucial, not only now but in the future.

The Transportation Engineering field exposes students to the process of alleviating transportation problems. The coursework and research in the area provide advanced knowledge in transportation planning and economics, traffic engineering and safety, and the design of highways/pavements and other transportation facilities. Transportation Engineering students acquire advanced skills concerning the planning, design, operations, maintenance, rehabilitation, performance, and evaluation of transportation systems, including their economic and public policy aspects.

The field imbibes in each student the development of analytic, problem-solving, design, and management skills suitable for public and private sector professional work.

11.2 Faculty and Research Staff

Full-time Faculty

YORDPHOL TANABORIBOON, BS, MS, Oklahoma State Univ; PhD, Virginia Polytechnic Univ, USA.
Professor (Transportation Planning, Traffic Engineering, Public Transportation Systems)
[Road safety audit, accident investigation and reconstruction, application of data mining in road safety, road user behaviors, database development, disaster management, and sustainable development]

SHINYA HANAOKA, BEng, M Info Sc, D Info Sc, Tohoku Univ, Japan.
Assistant Professor
[Transport planning and logistics; air transport, which includes evaluation of the air traffic distribution policies in multiple-airport region and the activity of low-cost carriers in Asia; transport logistics, which includes city logistics, intermodal logistics, maritime transport, air cargo and so on; Public transport market and the environmental impact of transport, such as air pollution and noise]

KUNNAWEE KANITPONG, PhD, University of Wisconsin-Madison; MS, University of Maryland at College Park, USA; BS, Chulalongkorn University, Thailand.
Assistant Professor
[Highway pavements with emphasis on several major aspects including: highway materials and construction, pavement design and analysis, pavement management system, asphalt rheology, and asphalt concrete mixture design]
11.3 Completed Grant and Sponsored Research

Klong Prapa Canal Covering Project– Part III
(Traffic Study)

Duration: 26 October 1999 to 30 June 2005
Investigator: Prof Yordphol Tanaboriboon
Collaborators: Prof Worsak Kanok-Nukulchai, AIT
Mr Krisda Tangkawachiranon
Sponsor: Department of Highways, Ministry of Communication, Thailand
Total Contracted Amount: Baht 1,513,000

11.4 Ongoing / In Progress Grant and Sponsored Research

Logistics Management at the Intermodal Terminals

Project Description: This project aims to find and determine the requirements for logistics management and to verify an optimum solution of performance at the intermodal freight terminal. It also intends to develop a framework for evaluating the logistics performance of mode choice. The research proposes fuzziness measurements which address the real situation of human judgment with mathematical formulation. Fuzzy set theory is applied to develop a set of performance as basic indicators. Once the patterns of freight mode choice are determined, optimization model can find the optimal solution to maximize the performance indicator. Sensitivity analysis shows the changes which can influence the shift of mode choice. The results give insight in the relation with constraints of various parameters.

Duration: 1 November 2005 to 31 October 2006
Investigator: Dr Shinya Hanaoka
Sponsor: Royal Thai Government (RTG)
Total Contracted Amount: Baht 876,000

Road Safety Audit Along the Chalong Rat and Burapha Withi Expressways

Project Description: This project, financed by the Expressway and Rapid Transit Authority of Thailand (ERTA), is aimed to prevent the occurrences of accidents or reduce the severity of accidents taking place along the Chalong Rat and Burapha Withi Expressways by applying the concept of road safety audit which is a proactive tool for solving road accident problems.

Duration: 22 August 2005 to 21 April 2006
Investigator: Prof Yordphol Tanaboriboon
Sponsor: The Expressway and Rapid Transit Authority of Thailand (ERTA)
Total Contracted Amount: Baht 1,000,000.00

Thailand Accident Research Center

Project Description: The establishment of TARC is to conduct in-depth study in road safety. The task involves the at-scene investigation of the traffic accidents and database development for statistical analysis. Moreover, it focuses on the accident reconstruction to describe the events in sequences and the factors involved in these events. It aims to address road safety issues to promote the awareness of safety in the societies.

Duration: 1 July 2005 to 30 June 2007
Investigator: Prof Yordphol Tanaboriboon
Sponsor: Department of Highways
Total Contracted Amount: Baht 14,000,000.00

11.5 Publications

Refereed Journals


Luathep, P and Tanaboriboon, Y

Paisalwattana, S and Tanaboriboon, Y

Paisalwattana, S and Tanaboriboon, Y

Ponboon, S and Tanaboriboon, Y

Tanaboriboon, Y and Satienam, T

Tanadtang, P, Park, D, and Hanaoka, S

Taneerananon, P, Chanwannakul, T, Saunpaga, V, Khompraty, T, Kronprasert, N, and Tanaboriboon, Y

Conference Proceedings

Anh, TT, Tanaboriboon, Y, and Hung, BQ


Islam, M B and Tanaboriboon, Y, Crash Investigation and Reconstruction. The New Experience in Developing Countries: Thailand Case Study, Proceedings of the 13th International Conference Road Safety on Four Continents (in CD-ROM), Warsaw, Poland, pp. 874-884, October 2005.

Kanitpong, K and Bahia, HU, Measuring Properties of Asphalts That Are Critical for Moisture Damage of Asphalt Paving Mixtures, Accepted for presentation and publication in the 15th International Road Federation World Meeting 2005, International Road Federation, Bangkok, Thailand, June 2005. (in CD-Rom)
Kanitpong, K and Bahia, H U, Predicting Field Permeability of Hot Mix Asphalt Mixtures from Laboratory Measurements. The 15th International Road Federation World Meeting 2005, International Road Federation, Bangkok, Thailand, June 2005. (in CD-Rom)


11.6 Doctoral Students' Dissertation

Development of the Computerized Bangkok Bus Transit Management System by Narongsak Botromvongpiu. Supervisor: Prof Yordphol Tanaboriboon

Development of Transportation Model for a Regional City with GIS Integration by Kittida Tangkavachiranon. Supervisor: Prof Yordphol Tanaboriboon

11.7 Masters Students' Theses and Research Studies

An Alternative Planning Approach to Alleviate Traffic Congestion Problems Through Public Participation in Dhaka, Bangladesh by Jobaida Naher. Supervisor: Prof Yordphol Tanaboriboon

Analysis of the Effects of a Cooperative Delivery System in Bangkok by Ali Gul Qureshi. Supervisor: Dr Shinya Hanaoka

An Evaluation of the Accessibility of the New Rail Transit System in Bangkok by Monakot Thongsongkiet. Supervisor: Prof Yordphol Tanaboriboon

A Study of Seat Belt Usage and Its Impact in Thailand by Nuttapong Boonthob. Supervisor: Prof Yordphol Tanaboriboon

A Travel Behaviour Analysis for Delhi: A Case Study of the Metro by Chhavi Dhingra. Supervisor: Dr Shinya Hanaoka


Development of Interface for Motorcycle Routing Problems: A Case Study in Bangkok by Charles Ruenpanich. Supervisor: Dr Shinya Hanaoka

Estimate the Value of Time of Container Cargo on Thailand by Aunchalee Thongsongkiet. Supervisor: Dr Shinya Hanaoka

Identification of Factors in Road Crashes Through Accident Investigation and Reconstruction in Thailand by Mouyid Bin Islam. Supervisor: Prof Yordphol Tanaboriboon

Impact on Thai Air Market by Occuring of Low-Cost Carriers by Thyne Lilavivat. Supervisor: Dr Shinya Hanaoka

Modeling the Occurrence of the Short-Shipped in Air Cargo by Bachai Phoosanabhongs. Supervisor: Dr Shinya Hanaoka
Motorcycle Accident Analysis in Hanoi
by Nguyen Thi Thanh Hoa
Supervisor: Prof Yordphol Tanaboriboon

Study of Travel Factors Through Structural Equation Modeling and Market Segmentation Approach in Bangkok
by Pradeep Kumar Shrestha
Supervisor: Prof Yordphol Tanaboriboon

Traveler Response Towards Advanced Traveler Information Systems (ATIS) in Bangkok
by Agha Faisal Habib Pathan
Supervisor: Prof Yordphol Tanaboriboon
Chapter 12: SET - WATER ENGINEERING AND MANAGEMENT FIELD OF STUDY

12.1 Introduction

Today’s major challenges for water engineers and managers include securing water for people and for food production; protecting vital ecosystems; and dealing with variability and uncertainty of water in space and time.

The Water Engineering and Management (WEM) field imparts education and training toward an understanding of the complexity of water use and water resources management problems. It offers a balanced curriculum, which covers both the engineering and management aspects of water resources development. Students are trained to acquire knowledge and hands-on practice in tools and techniques to come up with viable and sustainable solutions within the framework of the integrated water resources management at the river basin scale.

Water Engineering and Management covers five major areas - Agricultural Water, Coastal Water, Urban Water, Water Resources, and Extreme Events and Risk Management. The courses are designed in such a way that students can specialize according to their interests. Courses on watershed hydrology, hydrodynamics, water resources systems, and concepts in water modeling provide the solid foundation to the advanced courses. The field emphasizes on tools and techniques in resource planning and management in addition to laboratory and field practices.

Agricultural Water courses impart knowledge and skills necessary for the development and management of water resources for agriculture. They address various multi-disciplinary issues in the planning, design, implementation, operation and maintenance of irrigation and drainage projects and land and water conservation programs. Current researches in the area include irrigation and drainage system management, cropping systems, erosion and water quality problems, soil conservation and land-use, and watershed management.

The management and design of sound engineering works for the control and effective use of coastal zones require in-depth knowledge of hydrodynamics and the understanding of coastal zone phenomena. Coursework and research in Coastal Water cover studies of wave characteristics and their action on beaches, coastal sedimentation, estuarine hydraulics and the applied aspects of coastal zone engineering and management.

Urban Water courses relate to water supply and sanitation, storm water, and domestic wastewater and urban drainage for sustainable management of urban areas. The research in relation to urban water focuses on application of state-of-the-art theory in water demand forecasting and management, design and management of water distribution systems in urban and rural areas, real-time hydrological information systems for urban flooding and drainage.

Given the ever-growing importance of water quality, an integrated water quantity-quality approach is essential. Courses in Water Resources focus on techniques to assess the occurrence and availability of surface and groundwater. Students acquire a sound understanding of basic principles in river engineering and modeling, water resources planning, conjunctive use of surface and groundwater; integrated water resources management and social and environmental impact assessment of water resources projects. In-depth knowledge and hands-on practice on mathematical modeling of water resources systems is provided.

Flooding is a natural phenomenon and various human activities as well as climatic changes have aggravated the problem causing economic losses. Students are exposed to an understanding of the behavior of rivers, and to design appropriate structural and non-structural alternatives for
the effective management of rivers and waterways. Research in the area of **Extreme Events and Risk Management** includes river flow analysis, and flood control and mitigation, flood modeling and forecasting, flood plain development and management.

### 12.2 Faculty and Research Staff

#### Full-time Faculty

**ASHIM DAS GUPTA, BEng, Gauhati Univ, India**; MEng, DEng, AIT, Thailand.

*Professor*

**TAWATCHAI TINGSANCHALI, BEng, Chulalongkorn Univ, Thailand**; MEng, DEng, AIT, Thailand.

*Professor*

[Flood Control Engineering and Management; Flood Forecasting, Warning and Flood Disaster Management; River Engineering and Hydropower; Water Resources Project System Optimization]

**MUKAND S BABEL, BEng, Rajasthan Agr Univ, India**; MEng, DEng, AIT.

*Associate Professor*

[From hydrologic and water resources modeling to integrated water resources management; particularly in watershed modeling and management; drought analysis, forecasting and management; water resources allocation and management at river basin level; and water resources and socio-economic development; Research related to groundwater resources management and water supply system and management]

**ROBERTO CLEMENTE, BSAE, Univ of the Philippines at Los Baños, MS, AIT, Thailand**; PhD, McGill Univ, Canada.

*Associate Professor*

[Focal areas related to irrigation/drainage, and land and water resource assessment and management; Studies on the impacts of fertigation on water quality, modeling surface/subsurface transport of water and solutes, performance evaluation of irrigation and drainage systems, and assessment of soil erosion hazard and soil quality dynamics in agricultural watersheds; Joint research on water harvesting and management and soil hydraulic characterization in sloping agricultural lands; Future research on evaluation and optimization of soil, water, chemical and crop management schemes to enhance agricultural productivity without jeopardizing environmental quality]

**DUSHMANTA DUTTA, BEng, Dibrugarh Univ, India**; MEng, AIT, Thailand; PhD, Univ of Tokyo, Japan.

*Visiting Associate Professor*

#### Visiting Faculty

**SUTAT WEESAKUL, DEng, MEng, Asian Institute of Technology**; BEng, Chulalongkorn University, Thailand

*Senior Research Engineer*

[NUMERICAL COMputation in sea and coastal area including flood propagation using developed computer programs; Application in solving urban drainage problem using both engineering and management approaches; By collaboration with Dr. Ole Mark from DHI, the on-line urban flood warning system at Sukumvit, Bangkok, Thailand providing useful information in daily life during rainy season are disseminated in http://www.wap.ait.ac.th; Improvement of hydraulic design using physical hydraulic model test in hydropower; development projects in Lao and Myanmar and improvement in design of intake, diversion tunnel, riparian outlet, energy dissipater, spillway and head pond]
12.3 Completed Grant and Sponsored Research

An assessment of socio-economic impacts of floods under climate change conditions in large coastal cities in South and Southeast Asia

Project Description: The project aims at assessing, through distributed flood risk modeling, the socio-economic impacts of flooding under climate change conditions in six large coastal cities in South and Southeast Asia. A comprehensive database of datasets of hydrologic characteristics, urban development, and socio-economic situations from participating countries, comprising Bangladesh, India, Pakistan, Sri Lanka, Thailand, and Vietnam, is developed. Flooding simulations are carried out for present climatic conditions and climate change scenarios in 2025, 2050, 2075, and 2100. The project provided opportunities to partner institutions for application of flood simulation and risk analysis tools and methodologies to assess the regional impacts of climatic changes facilitating policy development for urban flood risk management in coastal cities in South and Southeast Asia.

Investigators: Prof Ashim Das Gupta, Dr Sutat Weesakul
Duration: 1 January 2004 to 31 October 2005
Total Contracted Amount: Baht 2,046,356

Flood Forecasting for Lower Chao Phraya River Basin

Project Description: This project focuses on developing flood forecasting models for the Lower Chao Phraya River Basin, to calibrate models using flood data in 1995, 1996, and 2002. To study scenarios for flood management using model. To prepare reports for flood forecast model. To deliver models prepared under this agreement to the client.

Duration: 1 January 2004 to 31 October 2005
Investigator: Dr Sutat Weesakul
Sponsor: Panya Consultants Co. Ltd., Thailand
Total Contracted Amount: Baht 2,046,356

Hydro-political Vulnerability and Resilience in South and Southeast Asia

Project Description: The objective of the project is to carry out a regional study on hydro-political vulnerability of river basins. The study, carried out in collaboration with Oregon State University (OSU), focuses on basins at risk as well as highlight regional successes. Issues relating to surface and groundwater quality and quantity are addressed together with the issues of scale, conflict and cooperation. Representative case studies, highlighting both tension and cooperation, are also conducted.

Appropriate maps are generated highlighting hydro-political vulnerability of river basins.

Investigators: Prof Ashim Das Gupta, Dr Mukand Singh Babel
Duration: 1 February 2005 to 31 December 2005
Total Contracted Amount: Baht 200,000

Joint Research Project on Land Use and Soil Quality Dynamics in Wellimada Watershed, Sri Lanka

Project Description: A research project funded by Danida which focused on “Land use dependent soil quality dynamics” was undertaken in Wellimada watershed, Sri Lanka in August 2005, where 2 faculty from ASE and 2 faculty from WEM pooled its research allocation of $4,100 each to generate a total budget of $16,400 or 636,320 bahts for the joint research. From this budget, each faculty was allocated $1,500 to participate in International Conference and the rest of the budget was allocated for research expenses, travel, equipment, office supplies and personnel expenses. Dr. Clemente made use of the Conference budget when he presented a paper at the FRONTIERS International Conference on Unsaturated Zone Modeling at Wageningen the Netherlands in Oct. 2004. Part of the budget was also used to finance Dr. Clemente’s masteral student’s thesis research in the watershed in Sri Lanka. A paper authored by the student (Mr. Rivas) and co-authored by the 4 faculty (i.e. Dr. Clemente, Dr. Ranamukhaarachchi, Prof. DasGupta and Dr. Zeebisch) was prepared and presented at the MTERM International Conference held at AIT on June 8-10 2005.

Investigators: Prof Tawatchai Tingsanchali, Dr Roberto Clemente, Dr S Ranamukhaarachchi
Duration: 15 June 2004 to 15 April 2005
Sponsor: Danida (WEM)
Total Contracted Amount: Baht 160,000

Klong Prapa Corridor Project, A Bridge Over Raw Drinking Water (sub-project on Water and Architect)

Project Description: The research project involves multi-disciplinary engineering aspects in structural, geotechnical, transportation, hydraulic engineering and environmental engineering. As one of the principal investigators on hydraulic and environmental engineering, the effect of structures or roads designed to cover the Klong Prapa canal of the Metropolitan Waterworks Authority to prevent the effect of air pollution due to traffic and intrusion of domestic sewage water on the hydraulics of flow and raw water quality of raw water are investigated and recommendations are given on design improvement of the covering structures to maintain water quantity and quality within the acceptable standard of MWA.

Duration: 15 October 1999 to 30 June 2005
Investigator: Prof Tawatchai Tingsanchali
Measurement of Water Quality in the Mun River Basin

**Project Description:** The proposed work comprises collection and analyses of water samples from selected monitoring locations along the Mun River in the Northeast of Thailand at a weekly interval during the rainy season of 2004. The laboratory analyses of the water samples are carried out at the WEM laboratories to determine concentrations of SS, TP, FAI, NH4-N, NO3-N, NO2-N, and PO4-P. The output from the project is used for the calibration of nutrient transport models. In addition, research results are also useful as teaching material and as data for research by master/doctoral students in WEM.

**Duration:**
- 1 March 2004 to 28 February 2005

**Investigator:**
Dr Mukand Singh Babel
Prof Ashim Das Gupta

**Sponsor:**
Department of Civil Engineering, Tokohu University, Japan

**Total Contracted Amount:** Baht 500,000

Rainfall forecast for Eastern Bangkok

**Project Description:** This project focus on development a rainfall forecast model which can forecast hourly rainfall starting from hour no. 1 to hour no. 6 after raining at the 33 rain gauge station of DDS, BMA in the Eastern Bangkok area and numerical model will be applied in the present study. Methodology will be artificial Neural Network (ANN) or equivalent. To carry out mathematical model testing and training using historical hourly rainfall records from stations of Department of Drainage and Sewerage (DDS), Bangkok Metropolitan Administration (BMA).

**Duration:**
- 1 January 2004 to 31 October 2005

**Investigator:**
Dr Dushmanta Dutta
Dr Roberto Clemente

**Sponsor:**
Thammasat University, Thailand

**Total Contracted Amount:** Baht 1,200,005

Real Time Hydrological Information for the People of Thailand

**Project Description:** To compute and forecast flood level in Sukumvit urban area using a mathematical model, MOUSE and disseminate real time information flood and rainfall data through web page and mobile phone to people of Thailand.

**Duration:**
- 1 April 2003 to 30 June 2005

**Investigator:**
Dr Sutat Weesakul
Dr Chavalit Chaleeratrakul, Thammasat University, Thailand

**Sponsor:**
United Nations University, Japan

**Total Contracted Amount:** Baht 223,968.16

Risk Analysis due to Catastrophic Urban Floods in Bangkok using GIS, Remote Sensing and Surface-River Model

**Project Description:** A Training course on Urban Drainage and Irrigation/Drainage Engineering was prepared and implemented by Dr. Sutat and Dr. Clemente for the University of San Carlos (USC) Cebu, Philippines in July 2004. The training program consisted of teaching each of the 2 courses for 45 hours in 9 working days which was equivalent to the regular credit hours for one course at AIT. The 10 students from USC who participated in the course consisted of 2 faculty and 8 masteral students in the Dept. of Civil Engg., USC. The total budget allocated for the 2 courses amounted to 343,480 bahts which covered travel, food and lodging and faculty time of Dr. Sutat and Dr. Clemente. Part of this project fund was used by Dr. Clemente to support a masteral student at WEM (Mr. Tamrakar) for 12 months from Sept. 2004 to August 2005.

**Duration:**
- 1 September 2004 to 30 November 2005

**Investigator:**
Dr Dushmanta Dutta
Dr Roberto Clemente

**Sponsor:**
University of San Carlos, Cebu, Philippines

**Total Contracted Amount:** Baht 343,480.00

Urban Flood Inundation Modeling in Mekong River Basin Using a Physically based Surface-River Model

**Project Description:** A Workshop on Governance on Transboundary Water

**Duration:**
- 1 November 2003 to 30 September 2005

**Investigator:**
Dr Dushmanta Dutta

**Sponsor:**
Engineering Consultants NEWJEC Inc.

**Total Contracted Amount:** Baht 720,000

Workshop on Governance on Transboundary Water

**Duration:**
- 6 June 2005 to 10 October 2005

**Investigators:**
Dr Dusamit Babel
Prof Ashim Das Gupta

**Sponsor:**
United Nation University

**Total Contracted Amount:** Baht 223,968.16
12.4 Ongoing / In Progress Grant and Sponsored Research

12th Congress of the Asia and Pacific Division of IAHR
Project Description: The Water Engineering and Management (WEM) Field of Study of the School of Engineering and Technology (SET) serve as the secretariat of the APD-IAHR and from time to time organize congresses and conferences for the Asia and Pacific Region.
Duration: 13 November 2000 to 30 June 2006
Investigator: Prof Ashim Das Gupta
Sponsor: IAHR
Total Contracted Amount: Baht 2,579,383

An Assessment of Groundwater Vulnerability to Contamination and Estimation of Potential Areas Contributing Risk and Hazard to Groundwater in Chao Phraya River Basin by Numerical Modeling
Project Description: The scientific purposes of the project are to identify areas vulnerable to groundwater contamination, estimation of areas contributing risk and hazard to identified vulnerable areas. Pilot study is carried out for land and groundwater planning and management using integrated numerical modeling, characterization of the Chao Phraya Basin geological system and its effects on contamination transport.
Duration: 1 October 2004 to 31 March 2006
Investigator: Prof Ashim Das Gupta
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 999,000

Assessment of Water Vulnerability in South and Southeast Asia
Project Description: The project involves the assessment of vulnerability of water resources to environmental change in key water basins in Asia covering issues of water stress, water scarcity, water budget, and climate variability and climate change. Through the study, scientifically credible information is generated, which will be used to support sound decision and policy making at local and national levels for the achievement of relevant Millennium Development Goals and to ensure environmental sustainability. In addition, the project also aims to identify options for the promotion of environmental cooperation at sub-regional levels.
Duration: 1 January 2006 to 31 December 2006
Investigator: Prof Ashim Das Gupta
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 3,600,000

Collaborative Research in Water Resources and Environment Modeling
Project Description: The project involves the conduct of research activities in the area of water resources and environmental modeling by AIT in collaboration with UNU. The results of the research are disseminated through seminars and workshops. The specific areas for research involve: the development of methodologies and tools for water allocation in transboundary river basin; analyses of links between water resources management and socio-economic changes; development of appropriate methodologies for socio-economic vulnerability assessment for urban flood disaster risk management; and study of soil erosion and sediment transport in a large river basin. Under the project, UNU, through grants, supports a number of selected graduate students’ research in above areas.
Duration: 1 September 2004 to 31 August 2006
Investigator: Prof Ashim Das Gupta
Sponsor: United Nations University, Tokyo, Japan
Total Contracted Amount: Baht 500,000

Development of Operation Flood Forecasting System Case Study: Chao Phraya River Basin
Project Description: The objective of the project is to develop a mathematical model for flood forecasting including rainfall forecasting and decision support system. The study area is Chao Phraya River Basin. On line data communication system will be installed at 3 locations along the river and linked with server at AIT.
Duration: 1 June 2004 to 30 June 2006
Investigator: Dr Sutat Weesakul
Sponsor: National Electronic and Computer Technology Center (NECTEC)
Total Contracted Amount: Baht 5,027,400

Experimental Investigation of Hyper-Concentrated Tsunami Run-up
Project Description: The project will involve an experiment of a new study of hyper-concentrated tsunami run-up. The result of experiment at Khao Luk, Phang-ga will be used to investigate how Tsunami have impacted to infrastructure on land and determine the preliminary measure to alleviate its impact.
Duration: 1 November 2005 to 31 October 2006
Investigator: Dr Sutat Weesakul
Sponsor: Royal Thai Government
Total Contracted Amount: Baht 875,000

Hydraulic and Leakage Investigations in Pipe Networks for Water Supply Distribution in Bangkok
Project Description: The research project involves the investigation of leakage of waterflow in pipes and the ways to reduce the amount of leakage in the water supply distribution network of Metropolitan Waterworks Authority of Bangkok and its suburban areas. The study involves the determination of flow and pressure distribution in the pipe...
Hydraulic Model Study of Diversion Tunnel Nam Ngum 2 Hydroelectric

Project Description: The scope of the services consists of furnishing labor, equipment and materials as well as technical expertise for the physical model construction and hydraulic model tests of the diversion tunnels. The Hydraulic Model Tests will focus on study of the hydraulic conditions in the tunnel for the sub-critical and supercritical flow alternatives, study of overall diversion operation with emphasis in investigating the occurrence of waves at the surface, occlusion of air pockets and the critical transient state between both operation modes, study of tunnel inlet for free surface flow and pressure flow modes including the introduction of sill at the inlet and study of tunnel outlet under submerged operation due to backwater of Nam Ngum 1 and the variation of discharges to cover the non-submergence case.

Duration: 1 September 2005 to 31 May 2006
Investigator: Dr Sutat Weesakul
Sponsor: Team Engineering Consulting and Management Co., Ltd.
Total Contracted Amount: 2,990,650.00

Hydraulic Model Study on overflow Spillway for Nam Ngum 2 Hydroelectric: Spillway

Project Description: The scope of the services consists of furnishing labor, equipment and materials as well as technical expertise for the physical model construction and hydraulic model tests of the overflow spillway. The Hydraulic Model Tests will focus on studying the hydraulic condition of the ogee crest, chute, flow over flip bucket and capacity of weir (uncontrolled and controlled with the radial gates), suitable operation of both aerators and study downstream erosion in order to optimize the splitter design.

Duration: February 2006 to August 2006
Investigator: Dr Sutat Weesakul
Sponsor: Team Engineering Consulting and Management Co., Ltd.
Total Contracted Amount: Baht 6,300,000

MTERM Conference

Duration: 1 January 2005 to December 2006
Investigators: Dr Mukand Singh Babel
Prof Ashim Das Gupta
Sponsor: MTERM Conference Participants
Total Contracted Amount: Baht 654,255

Regional Network for Center of Excellence for Integrated River Basin Management in Asian Monsoon Region

Project Description: The regional network office is established in June 2005 at WEM in accordance with MOU between AIT and the University of Yamanashi (UY), Japan. The purpose of the center regional office is to coordinate and facilitate project collaboration between UY, AIT and other local partners such as the Thai Government agencies. The center will focus its collaboration on integrated river basin management in the Asian Monsoon Region. Other activities of the center include exchange of faculty, staff and students. The center also provides scholarships for higher studies for doctoral programs at University of Yamanashi. The regional network office starts in June 2005 for an initial period of 1 year and will be extended on annual basis for a period of 3 years.

Duration: 15 June 2005 - 14 June 006
Investigator: Prof Tawatchai Tingsanchali
Sponsor: Yamanashi University
Total Contracted Amount: Baht 347,500

Review and Investigation in Flood Drainage around Suwanna Bhumi Airport

Project Description: The research project involves the study on project feasibility study, design and implementation of the Suwanna Bhumi International Airport (Second Bangkok International Airport) on flood drainage in the surrounding area of the new airport. The study also takes into account aspects on socio-economic impact assessment of the project and mitigation measures to the affected people and communities. Started since 2004, the project is required to continue its responsibility for the detail design and any further design modification as needed during the project construction until it is complete. The study is jointly carried out by three institutions namely AIT, Kasetsart University and Thammasat University in which AIT serves as the project team leader.

Duration: 1 September 2003 to 30 September 2006
Investigator: Dr Noppadol Phien-wej
Sponsor: Royal Irrigation Department, Thailand
Total Contracted Amount: Baht 2,730,000
Sustainable Water Management Policy under the Freshwater Resources Management

**Project Description:** The objective of the project is to propose integrated policy designs for sustainable water resources management with emphasis on groundwater resources in Bangkok and its vicinity. Groundwater use trends are analyzed and policies/measures for the sustainable management of groundwater resources in the study area are developed based on analysis of relevant secondary data on groundwater availability and use, piezometric levels, and land subsidence, which are obtained from concerned government agencies and various past studies/project reports. The input from groundwater users and managers, especially with respect to the recommendations for suitable policies and measures for improved groundwater management is obtained through the meetings with the stakeholders.

**Duration:** 1 September 2004 to 30 September 2007
**Investigator:** Dr. Mukand Singh Babel
**Sponsor:** Institute for Global Environmental Strategies, Japan
**Total Contracted Amount:** Baht 1,700,000

The Study of Water Resources Management Review

**Project Description:** To review the present management of three river basins and to propose a new management tool using mathematical model and investigate the index for WRE.

**Duration:** January 2006 to April 2006
**Investigator:** Dr. Sutat Weesakul
**Sponsor:** Hydro and Agro Informatics Institute
**Total Contracted Amount:** Baht 1,120,000

Water Quality Modeling in Tachin River

**Project Description:** The object of the project is to carry out real time water quality modeling of Tachin River and to have preliminary study of modeling of non-point source pollutant.

**Duration:** 1 June 2005 to May 2006
**Investigator:** Dr. Sutat Weesakul
**Sponsor:** Hydro and Agro Informatics Institute
**Total Contracted Amount:** Baht 1,140,000

Water SPS, WRU/Vietnam Consultant for Course curriculum development on Irrigation Management at the Bachelors and Masteral Degrees levels

**Contribution:** 1 man month
**Sponsor:** Water Resource University (WRU), Vietnam

**TVLC e-Learning Program on IWRM**

**Duration:** January 2006 to December 2006
**Investigator:** Dr. Mukand Singh Babel
**Prof Ashim Das Gupta**
**Short-term Consultant:** Dr. Roberto Clemente
**Sponsor:** UNU-INMEM, Canada
**Total Contracted Amount:** US$ 68,900

### 12.5 Publications

#### Refereed Journals

**Babel, M S, Das Gupta, A, and Nayak, D K**  

**Chonwattana S, Weesakul, S, and Vongvisessomjai, S**  

**Clemente, R S, Asadi, M, and Dixit, P**  

**Das Gupta, A (2005)**  

**Das Gupta, A and Babel, M S**  

**Das Gupta, A and Babel, M S**  

**Das Gupta, A, Babel, M S, Xavier, A, and Mark, O**  


Wandee, P., Schultz, B., and Tingsanchali, T.

Refereed Books/Chapters


Conference Proceedings


Other Publications


Clemente, Roberto S. Project Report on Course Curriculum Development at Master's level for WRU/Vietnam on Advanced Management of Irrigation and Drainage Systems July 2005


Das Gupta, A (2005), Flood Disaster Management Harmonizing with Socio-Cultural Environment, Keynote Address, Special Session on Flood Disaster Management (HS06), 2nd Asia Oceania Geosciences Society (AOGS) Meeting, Singapore, June 20-24.


Das Gupta, A and Babel, M S (2005). Hydro-political Vulnerability and Resilience in South and Southeast Asia, Project Report, Submitted to Oregon State University, USA.

Dutta, D, Babel, M S and Das Gupta, A (2005), An Assessment of the Socio-economic Impacts of Floods under Climate Change Conditions in Large Coastal Cities in South and Southeast Asia, Project Report, Submitted to APN Secretariat.


Weesakul, Sutat, Final Report “Real Time Hydrological Information for the People of Thailand”, Royal Thai Government

12.6 Doctoral Students’ Dissertation

Drought Analysis and Forecasting for Agricultural Water Management in Awash River Basin, Ethiopia
by Desalegn Chemeda Edossa
Supervisors: Dr Mukand S Babel
Prof Ashim Das Gupta

Evaluation of Alternative Irrigation Management Models in Vietnam
by Tran Chi Trung
Supervisors: Prof Ashim Das Gupta
Dr Roberto S Clemente

Weesakul, Sutat Final Report “Rainfall Forecasting for Eastern Bangkok”, for the TEAM Engineering Consulting and Management Co., Ltd.

12.7 Masters Students’ Theses and Research Studies

A Model for Water Allocation in the Lower Mekong River Basin
by Nguyen Hoai Thanh
Supervisors: Prof Ashim Das Gupta
Dr Mukand Singh Babel

Analysis of Soil Erosion and Sediment Transport Using Empirical Models and a Process-Based Distributed Model
by Rabin Bhattarai
Supervisor: Dr Dushmanta Dutta

An Assessment of Environmental Flow Requirements for the Thachin River, Thailand
by Md Shofiful Islam
Supervisors: Prof Ashim Das Gupta
Dr Mukand Singh Babel

Application of Benchmarking in Selected Irrigation Projects in Malaysia and Thailand
by Ambili G K
Supervisors: Dr Mukand Singh Babel
Prof Ashim Das Gupta
Application of Drastic Methodology for Vulnerability Assessment of Chiang Mai - Lamphun Basin, Thailand
by Arasananth Mariappan
Supervisors: Prof. Ashim Das Gupta
Dr. Mukand Singh Babel

Application of a Genetic Algorithm for Water Allocation in Song Chu Irrigation System, Vietnam
by Nguyen Thi Van
Supervisor: Prof. Tawatchai Tingsanchali

Application of Genetic Algorithm for Analysis of Pasak Jolasid Reservoir Operation, Thailand
by Chawakom Rewtragulpaibul
Supervisor: Prof. Tawatchai Tingsanchali

Application of GIS for Assessment of Water Resources in Irawaddy River Basin, Myanmar
by Myint Aye
Supervisor: Dr. Roberto S. Clemente

Application of Soil and Water Analysis Tool (SWAT) for Water Quality in Upper Cong Watershed, Vietnam
by Le Bao Thung
Supervisors: Prof. Mukand Singh Babel
Prof. Ashim Das Gupta

Assessment of Salinity Intrusion in the Red River Delta, Vietnam
by Le Thi Thu Hien
Supervisors: Dr. Roberto Clemente
Dr. Sutat Weesakul

Assessment of the Economic Impacts of Floods Under Climate Change Conditions in a Coastal City in Bangladesh
by Md. Jabeed Abdul Naser Bhuyan
Supervisor: Dr. Dushmanta Dutta

Assessment of Urban Water Quality in Nhieu Loc - Thi Nghe Basin, Vietnam
by Ngo Thi Thanh Nhan
Supervisors: Dr. Roberto Clemente
Dr. Sutat Weesakul

Evaluation of Rural Water Supply Management Models in Tien Giang Province of Vietnam
by Giang Thi Thu Thao
Supervisors: Prof. Ashim Das Gupta
Dr. Mukand Singh Babel

Evaluation of the Bulk Water Allocation Concept in the Mahaweli System H, Sri Lanka
by LV P Nilanthi Jayawardena
Supervisor: Prof. Tawatchai Tingsanchali

Experimental Study on Development of Dynamic Bay Shape
by Chatchai Pedugsom
Supervisors: Dr. Mukand S. Babel
Dr. Sutat Weesakul

Experimental Verification of GSTARS 3 for Bed Scour and Deposition in an Open Channel
by Muhammad Ubair
Supervisor: Prof. Tawatchai Tingsanchali

Flood Control Analysis in the Yom River Basin, Thailand
by Vu Minh Thien
Supervisors: Dr. Dushmanta Dutta
Dr. Sutat Weesakul

Flood Risk Analysis in Bangkok Using GIS, Remote Sensing and a Distributed Flood Model
by Sin Wongwilwat
Supervisor: Dr. Dushmanta Dutta

Impact of Water Policy on Socio-Economic Development in Pakistan
by Rashida Mahjed
Supervisors: Dr. Mukand Singh Babel
Prof. Ashim Das Gupta

Leakage Analysis and Management in the Water Distribution Network in a Selected Area of Bangkok
by Mohammad Shariful Islam
Supervisors: Dr. Dushmanta Dutta
Dr. Sutat Weesakul

Methodology for Socio-Economic Vulnerability Assessment for Urban Flood Disaster Risk Management in Bangkok and Hanoi
by Mit Fahmida Khatun
Supervisors: Dr. Dushmanta Dutta
Dr. Sutat Weesakul

Modeling of Contaminant Transport in Subsurface Environment in the Vicinity of the Landfill Site in Ayutthaya, Thailand
by Smita Joshi
Supervisors: Prof. Ashim Das Gupta
Dr. Mukand Singh Babel

Modeling of Non-Point Source Pollution in the Mun River Basin, Thailand
by Aysha Alder
Supervisors: Dr. Mukand Singh Babel
Prof. Ashim Das Gupta

Public Health Impact of Urban Flooding: A Case Study of Jakarta, Indonesia
by Anastasia Yunioka
Supervisors: Dr. Mukand Singh Babel
Prof. Ashim Das Gupta
Water Engineering & Management Field of Study

Soil Hydraulic Characterization and Hydrologic Modeling of Sloping Agricultural Lands in Uma Oya Watershed, Sri Lanka
by Aldrin Alameda Rivas
Supervisor: Dr Roberto Clemente

Sustainable Groundwater Resources Management for the Bangkok Aquifer System
by Mana Kitirat
Supervisors: Prof Ashim Das Gupta
Dr Mukand Singh Babel

Water Resources Analysis Under Projected Climate Conditions in the Mahanadi River Basin, India
by Shilpa M Asokan
Supervisor: Dr Dushmanta Dutta
Chapter 13: SET - INFORMATION AND COMMUNICATIONS TECHNOLOGIES AREA OF STUDY

13.1 Introduction

Information and Communications Technologies field is a newly established area of study in response to the needs for the offering of a curriculum selectively drawn from the curricula of Telecommunications (TC), Computer Science, and Information Management (CSIM). With strong emphasis on communications aspects - rather than on the aggregation of hardware, software, networks, equipment and related industries - ICT recognizes the important role of information services and applications in the creation of a complete ICT infrastructure.

13.2 Research Facilities and Laboratories

There is a rapidly growing and constantly evolving interest in ICT throughout the academia and society. To support this, the evolution and the benefits of ICT in our lives, the ICT field of study at AIT continues to research and develop of ICT. The field of study covers a wide variety of research supported by the body of faculty consisting of a multi-professional team of international experts in telecommunication, computer science, educational technology and related fields.

The faculty has a strong academic background ranging from wireless and optical networks, through hardware and software, to web education and other e-services. Research subjects include those on ICT applications (e-services such as e-learning, e-health, e-governance, rural development, knowledge creation and knowledge dissemination); on the information technologies (e.g. operating systems, programming languages, information storage and retrieval); on the communication infrastructure (e.g. networks, transmission technologies, switching and routing). Research specializations are in adaptive technologies; computer-supported collaboration; Home networking; ICT security; Online communities; and voice over IP.

The ICT area of study shares the research facilities and laboratories of the Telecommunications field of study.

13.3 Faculty and Research Staff

The ICT Field of Study draws from the faculty and research staff of the Computer Science, Information Management, Remote Sensing & Geographic Information Systems, and Telecommunications Fields of Study.

Full-time Faculty

Kazi Mohiuddin Ahmed, Professor
Dencho N Batanov, Professor
Phan Minh Dung, Professor
Peter Haddawy, Professor
Kanchana Kanchanasut, Professor
Vilas Wuwongse, Professor
Xiaoyong Chen, Associate Professor
Vatcharapom Esichaikul, Associate Professor
Sumanta Guha, Associate Professor
Kiyoshi Honda, Associate Professor
R M A P Rajatheva, Associate Professor
Teerapat Sangunkotchakom, Associate Professor
Nitin Kumar Tilpathi, Associate Professor
Poompat Saengudomlert, Assistant Professor
Information and Communications Technologies Area of Study

Visiting Faculty

Michiro Kusanagi, Visiting Professor
A B Sharma, Visiting Professor
Tapio J Erke, Visiting Associate Professor
Junichi Susaki, Visiting Assistant Professor
Paul Janecek, Visiting Lecturer

Research Staff

Manzul Kumar Hazarika, Senior Research and Training Specialist
Mikko Kovalainen, Visiting Senior Researcher
Surat Lertlum, Research Scientist
Lal Samarakoon, Visiting Senior Scientist
Marc Souris, Visiting Research Scientist

13.4 Masters Students' Theses and Research Studies

Research Study: Analysis of the Role of Universities for Telecenter Development
by Than Byin Soe
Supervisor: Dr Mikko Kovalainen

Research Study: A Prototype Internet Voting System for Election in a Small Community
by Kowit Kowito
Supervisor: Dr R M A P Rajatheva

Research Study: Designing of E-Commerce Website: A Case Study of Usability in Two Websites
by Tanachon Srisaidee
Supervisor: Dr Mikko Kovalainen

Research Study: Supporting Communications, Coordination and Information Sharing in ICT Projects: A Case Study of ICT Project Design
by Thet Oo Maung
Supervisor: Dr Mikko Kovalainen