

International Student Recruitment



Department of Logistics Information Technology



Fall Semester 2009

The Department of Logistics Information Technology is the graduate school program established in Pusan National University, aiming at nurturing global and talented experts to lead the next generation's logistics technologies. We cordially invite students from all over the world who wish to unfold their dreams and hopes in the area of IT-based logistics.

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1. Introduction of Busan



Busan, a bustling city of approximately 3.7 million residents, is located on the southeastern tip of the Korean Peninsula. The size of Busan is 763.3 km², which is 0.8% of the entire land of the Korean Peninsula. The natural environment of Busan is a perfect example of harmony among moun-



tains, rivers and sea. Its geography includes a coastline with superb beaches and scenic cliffs, mountains which provide excellent resort and extraordinary scenic views, and hot springs scattered throughout the city. Busan enjoys four distinct seasons and a temperate climate that never gets too hot or too cold.



Busan is the second-largest city in Korea. Its deep harbor and gentle tides have allowed it to grow into the largest container-handling port in the country and the fifth-largest in the world, with potential for even more growth. Its natural endowments and rich history have resulted in Busan's increasing reputation as a world-class city of tourism and culture. Busan is taking its place as a city of culture and festivity through cultural activities, such as the Busan International Film Festival and the Busan Biennale. Busan is also growing into a world-class city with successful hosting of the 2002 FIFA World Cup, the 2002 Busan Asian Games, and APEC 2005 Korea.

The city has grown as a logistics hub city in Northeast Asia through the consolidation of its economic stronghold function and the harbor logistics industry, based on globalization and digitalization to cope with internal and external environmental changes. Busan is also laying the foundation as a city of international trade, finance, information, and tourism via ten major strategic industries. The city was selected as one of the top ten business-oriented cities in the Asia-Pacific region by the economics magazine, *Fortune*, and as the best place to live in Asia by the *Asia Week*.

For more information, visit our city website <http://www.busan.go.kr>

2. Introduction of Pusan National University



Pusan National University (PNU) is one of the most prestigious universities in Korea. Founded in May 1946, it is the second-largest national universities in Korea, with over 23,000 students (17,000 undergraduate students plus 6,000 graduate students) and ranks as one of the top ten universities in the country. Since 1949, the University has been situated in the north end of the city. The university is now comprised of twelve colleges, two schools, one general graduate school, one professional graduate school and five special graduate schools, contributing to the development of the nation by producing prominent experts and talented leaders.

The university is aiming to be one of the key universities in Northeast Asia as an institution fostering global and talented leaders who will lead a knowledge-based society. With its steppingstone of sixty years of history and tradition, the university has stringently progressed toward becoming a prestigious school in the world by expanding its educational and research infrastructure, and by innovating relevant software. PNU has strengthened education and learning capabilities for students by opening a Teaching and Learning Supporting Center, and has reformed its science technologies by developing programs through a Science Technology Center.

PNU graduates have advanced into promising firms at home and abroad through the establishment of a system of close industry-academia cooperation. In this manner, the PNU has opened a new age of industry-academia cooperation. The university has established a specialized campus belt connecting Busan, Yangsan, and Milyang, as well as an International Interchange Education Center, and is solidly promoting a Global PNU project. PNU is also contributing to the development of communities through the creation of a huge synergy effect.

To enhance the position of PNU as a prestigious university representing Korea in the world, PNU aims at teaching and researching in-depth theories and application methods in the spirit of truth, freedom, and service, based on the fundamental ideals of Korean education. In addition, PNU nurtures the talents of students who can make contributions to the development of a national and global society.



3. Department of Logistics Information Technology



1) Objectives

- Nurturing highly qualified and specialized graduate education in the area of logistics information technologies that can lead to a logistics revolution in the Internet of things.
- Fostering international logistics experts who will contribute themselves to the international cooperation and collaboration work with foreign partners.
- Carrying out research project works for getting a practical experience of developing logistics-related hardware and software

2) Courses

Basic Curriculum RFID Technologies, Logistics IT, Databases, Software Engineering, Artificial Intelligence, Computer Networks, Analysis & Design of Information Systems, Global Supply Chain Management, Mathematical Programming, Logistics Information system, Logistics Network Design, principles of Logistics Systems, Port Logistics System, Logistics System Simulation, Ubiquitous Computing for Logistics

Optional Courses Supply Chain Management, Freight Transportation, Adaptive Control, Applications in Artificial Intelligence, Business Process Management, Data Mining, Design of Integrated Information System Architecture, e-Business System Applications, Inventory Theory, Mobile Internet, Logistics Network Analysis, Logistics Information system security, Object-Oriented Software Development Methodology, Operations Scheduling, Port Logistics Data Network, Software Reuse Methodology, Stochastic Processes and Queuing Theory, Sensor Network, RFID Middleware, Information Technology for Logistics, Cold Chain Management, Ubiquitous Port Logistics

3) Topics and Faculty Members

RFID/Real Time Locating System/Sensor-Tag Middleware Prof. Bonghee Hong, Prof. Keunhyuk Yeom, and Prof. Hyerim Bae

RTLS/Active Tag/Mesh-Networking Prof. Sang-hwa Chung, Prof. Yunju Baek, Prof. Hwon Kim, and Prof. Han-You Jeong

Ports and Logistics Prof. Kap-hwan Kim, Prof. Kwang-ryel Ryu, Prof. Won-young Yun, Prof. Il-kyeong Moon, and Prof. Byung-Hyun Ha

Unmanned and Autonomous Controls for Ports & Logistics Prof. Keum-shik Hong and Prof. Sungshin Kim

4) Degrees

- Master of Engineering/Doctor of Engineering

5) Organizer

- Institute of Logistics Information Technology (<http://www.rclit.com>)

For more information visit our department website <http://www.rclit.com/dlit/eng>

4. Financial Supports and Experiences



1) Scholarship

- Supporting all tuition fee for full-time students (entrance fee exclusive)

2) Research Participation

- Participation in the research projects in the student's own interested field by registering as a researcher of the *Institute of Logistics Information Technology* and undertaking research (full-time students only)
- Grant of the additional allowance up to USD 10,000 (master's candidates) or USD 15,000 (doctoral candidates) per year in accordance with the contribution to research project (decided by the project's leader)

3) Globalization Program

- Short-term international training once a year (full-time students only)
- Participation in the international student exchange program (full-time students only)
- Supporting the participation in the international conference for presenting research results (full-time students only)

4) Experiences

- Participation in seminars and workshop hosted by the *Institute of Logistics Information Technology*
- Participation in academic forums
- Language courses for improving English skill for major subjects
- Programs for technology training
- Industry internship program under industry-academia cooperation

- ※ **Important Notice** Besides the formal application process below, the candidates are highly recommended to contact the planned academic advisory professor in advance and to be confirmed in the study with the adviser.

1) Application Schedule

- **Application period: April 13 (Mon) 9 am ~ April 24 (Fri) 6 pm, 2009**
 - ✓ All applicants should apply via the Internet (<http://go.pusan.ac.kr>).
- **Document submission**
 - ✓ **By mail: April 13 (Mon) ~ April 30 (Thu) 6 pm, 2008**
 - ✓ **By personal submission: April 28 (Tue) 9 am ~ 30 (Thu) 6 pm, 2009**
 - ※ Please note that the applicants whose required documents fail to arrive by the deadline can be treated as unsuccessful candidates without further notices
 - ※ **Document screening only (no individual interviews or tests):** Admission will be determined by comprehensively reviewing the sub-course grades, scholastic abilities, financial capabilities, etc
- **Announcement of admitted applicants and print-out of the certificate**
 - ✓ **June 2 (Tue) 4 pm, 2009 (expected)**
 - ※ The certificate of admission should be printed and kept because it is necessarily required for registration of foreigners
- **Forwarding of Certificate of Admission: June 4 (Thu), 2009**
 - ※ As The Certificate of Admission will be mailed to the address that is written in an application, please exactly write down your residence address including zip code (If you are in china, the mail address should be written in Chinese)
- **Print-out of cash registration fee bill: July 1 (Wed) 10 pm, 2009**
- **Cash registration**
 - ✓ Direct payment in Korea: **July 7 (Tue) ~ July 9 (Thu), 2009**
 - ✓ Remittance from abroad: **July 7 (Tue) ~ July 16 (Thu), 2009**
 - ✓ Admission will be cancelled when an applicant fails to pay registration fees in the bank within the registration period
- **Submission of degree certificate (original copy): September 7 (Mon), 2009**
 - ※ An applicant who has been admitted by our school but has not yet received a degree from his or her foreign college should obtain and submit a certificate of degree by the deadline without fail. Such an applicant must note that when he or she fails to do so for no particular reason, his or her admission can be cancelled

2) Eligibility for Application (Master's Course/Doctorial Course)

- Those who have got (or are to get) a bachelor's degree/a master's degree (But those who are to acquire degrees will be confined to those who will earn degrees by August 2009)
- Those whose education is authorized to be corresponding to the preceding eligibility in accordance with the ordinance

3) Application Inquiry

- First, visit the application website: <http://go.pusan.ac.kr>
- Admission inquiry
 - ✓ Pusan National University Admission Office
 - ✓ Tel. +82-51-510-1202~4, Fax. +82-51-510-1236
- Department-related inquiry
 - ✓ *Institute of Logistics Information Technology* (person in charge: Miseon Kim)
 - ✓ Tel: +82-51-510-3761, 3762 Fax: +82-51-581-2811 E-Mail: mskim@pusan.ac.kr

4) How to make an internet application

- Log on to <http://go.pusan.ac.kr> or <http://www.applybank.com> → User log in (enroll as a member if you are not a member) → Fill in the form → Check the application form → Pay application fee → Checking of application acceptance → Submit the required documents
- Acceptance of applications shall be acknowledged only when application fees are paid by 6 pm of the deadline
- For further information about internet application: Tel. +82-2-1544~7715, Fax. +82-2-722-5453, help@applybank.com
- The application number should be jotted down as it will be needed for the inquiry about admitted applicants and other purposes

5) A certificate to grant scholarship

- Those who want to get a certificate to grant scholarship by *Institute of Logistics Information Technology* should contact their planned advisory professor of our faculty in advance, and ask the professor for issuing the certificate

A. Faculty and Research Area



1) RFID/Real Time Locating System/Sensor-Tag Middleware

Prof. Bonghee Hong Ubiquitous Computing Database Lab. (<http://dblab.pusan.ac.kr>)

Database laboratory has produced more than 60 excellent Ph.D. and M.S. graduates since 1990. Our laboratory has been advancing to high-quality research outcomes through the open and crea-

tive thinking. Our laboratory has shown the highest level technologies of RFID middleware, RTLS middleware, and sensor tag middleware. The objective of UCDB Lab is to develop original technologies concerned about middleware for RFID, RTLS, and sensor tag.

We have highly interests in developing ubiquitous computing technologies for logistics and security. For RFID middleware, we are developing open database technologies for supporting information sharing and exchanges across enterprises. We are making effort to create ideas through field-based testing and practice. The major research activities of Database Lab. include:

- *Development of RFID middleware S/W for logistics:* i) RTLS (Real Time Locating System) – tracking location of each item or person at real time, ii) ALE (Application Level Event) – filtering and collection framework for tagging objects, iii) EPCIS (EPC Information Service) – tracking and tracing of tagged objects for logistics, iv) ALE 1.1 for writing, and v) scalable and reliable RFID middleware architecture
- *Research of continuous query processing for real-time streaming data:* RFID data stream, RTLS data stream, sensor data stream
- *Research of multi-dimensional indexing scheme for streaming data:* indexing on tag ID, time, location, and sensing values by using R, R*, R+, 3DR, TPIR-Tree
- *Development of field-based applications for cold chain management and secure container transportation management.*

Prof. Keunhyuk Yeom Software Engineering Lab. (<http://se.ce.pusan.ac.kr>)

- *Developing a Situation Aware Middleware for Business Services:* The main issue of this topic is to develop a situation aware middleware to support business services intelligently and adaptively. We focus on developing six basic technologies such as i) a technology for aggregating situation information generated from RFID, sensors, RTLS etc., ii) a technology for representing situation based on semantic, iii) a technology for context reasoning, iv) ontology repository technologies, v) a technology for monitoring situation resources, and vi) a technology for invoking business process dynamically. The results of this research are as follows: i) Situation-Aware Middleware based on RFID and ii) RFID Capturing Application.

Prof. Hyerim Bae Business & Service Computing Lab. (<http://e-biz.re.pusan.ac.kr>)

- *Logistics Business Process Management based on RFID Middleware:* Automatic identification and data collection technologies have greatly increased the ability of companies to quickly and accurately gather critical business data in the logistics system. With the introduction of automatic identification system such as Radio Frequency Identification (RFID) to a logistics unit, the workflow models for use of technology have to steadily advance or cope up. Business Process Management System (BPMS) in particular (Radio Frequency – Process Management System) RF-PMS that we have developed is a framework for achieving new levels of efficiency, velocity, visibility and accuracy in Supply Chain Execution. The RF-PM System is designed to plug in with next generation software applications and new business processes to work together in harmony, with resources in the execution of supply chain transactions. RF-PMS technolo-

gy is flexible by nature, enabling long time productivity gains by adjusting to process, system or resource interfaces. RF-PMS in the logistics network is designed to automatically recognize processes and process changes. BPMS integrated RFID provides to display a whole new type of useful information flow utilizing the monitoring function. Furthermore, to optimize and review current business processes, analysis functionality leverage their true potential.

2) RTLS/Active Tag/Mesh-Networking

Prof. Sang-hwa Chung Wireless Mesh Networking and Computer Systems Lab. (<http://pnucas.org>)

- *Development of WLAN Mesh Routers for Logistics System:* The goal of this research is to develop a mesh router for constructing the network infrastructure on harbor area using mesh network technology. We develop the mesh engine which is operated on the mesh router and includes neighbor discovery, topology forming, and channel assignment algorithms. The mesh router will be developed to provide the high network reliability based on dual radio inter-faces. The mesh router will be operated using battery because it is hard to provide the router with the power line in harbor area. A low power consumption technology will be developed to enhance the efficiency of the battery-equipped router.

Prof. Yunju Baek Embedded Systems Lab. (<http://embed.re.kr>)

- *Research on the RTLS System for Logistics Environments:* The main goal of this project is to develop 2.4GHz RTLS system for logistics environments which is a unified platform of RTLS tags, RTLS readers, and a locating engine. To achieve this, we focus our research and development efforts on the following topics: i) development of low power and low power and low cost RTLS tag Platform, ii) development of RTLS reader platform with a time synchronization module, iii) development of a novel tag location estimation engine for port logistics environment, and iv) development of a time synchronization module for time-stamping in hardware level.

Prof. Howon Kim Information Security Lab. (<http://infosec1.pusan.ac.kr>)

The Information Security Laboratory is pursuing the realization of secure and trustable information technology application environments. To achieve such a highly demanding goal, we do research on the area of security and cryptography for the target of wireless mesh network, RFID, sensor network, and Internet environment. Among these topics, we will focus on the issues on the wireless mesh network in this year.

- *Security Technology for Wireless Mesh Networks:* The goal of this research is to develop the security and privacy enhancing technology for wireless mesh network environments. In wireless network environments, the security issue has been regarded as one of the most important factor in practical applications. Moreover, in wireless mesh network, the security is more important factor than conventional wireless network environment due to its inherent high vulnerability. To achieve secure and trustable wireless mesh network, we are developing the security

technology for wireless mesh network from the viewpoints of algorithmic level, chip level, hardware level, protocol software level and architectural level.

Prof. Han-You Jeong Communications and Networking Research Lab. (<http://home.pusan.ac.kr/~hyjeong>)

The primary goal of the Communications and Networking Research laboratory is to design network architectures that are cost effective, scalable, and meet emerging needs for high data-rate and pervasive communications. This laboratory is studying on a wide range of research topics in the area of communication networks with application to wireless and optical networks. To develop architectures and algorithms that are optimized across multiple layers of the protocol stack, this laboratory's research crosses disciplinary boundaries by combining techniques from network optimization, queueing theory, graph theory, information theory, network protocols and algorithms, and physical-layer communications.

- *A Distributed Scheduling Algorithm for Wireless Mesh Networks*: The goal of this research is to develop a distributed scheduling algorithm that achieves a high throughput in wireless mesh networks. Contrary to the conventional random scheduling algorithms that do not guarantee any performance bound, this research focuses on a distributed scheduling algorithm that efficiently utilizes the capacity region of wireless mesh networks. In addition, this research addresses some implementation issues of wireless mesh networks, e.g. synchronization, framing-size trade-offs, and so on.

3) Ports and Logistics

Prof. Kap-hwan Kim Logistic Systems Lab. (<http://logistics.ie.pusan.ac.kr>)

- *Logistic Systems*: The whole system from supply to distribution of products is the range of the research. It includes various aspects of logistic system such as raw material supplying, production planning, scheduling, inventory control, delivery, and distribution. Current research efforts are focused on the development of material requirement planning systems, production scheduling systems, and delivery scheduling system.
- *Automated Material Handling Systems*: The design and the operation problems of automated material handling systems are dealt with. Automated Guided Vehicle Systems and Automated Storage and Retrieval Systems are typical equipment included in the research area. Resource allocation problem in automated, distributed, autonomous, and intelligent control architecture is another active research area.
- *Container Transportation Systems*: Development for various decision-making models and solution methodologies related to the operation and the design of container transportation system. Until recently, many researches are carried out concerning the design and the operation of port container terminals.
- *Neo-logistic System Utilizing Advanced Information Technologies*: Includes conceptual design of new logistic and transportation systems utilizing advanced information technologies.

Current emphasis is placed on applying GIS and Internet technology to logistic and transportation system. Integration of information technologies and OR techniques is being pursued.

Prof. Kwang-ryel Ryu Intelligent Systems Lab. (<http://ai.ce.pusan.ac.kr>)

- *Distributed and Adaptive Operation Control System for the Next-generation Container Terminals*: The terminal operating systems used in most conventional container terminals are usually highly customized to their specific environment and thus demands considerable cost to make necessary modifications to adapt to changing environment. Moreover, their centralized operation control scheme, due to its computational bottleneck, makes it difficult to scale-up to serve super-sized container vessels or to control in real time a large number of concurrent operations in terminals employing various un-manned automated equipments. This research aims at developing a distributed and agent-based terminal operating system. We divide the problem of terminal operation control into small sub-problems each of which could be the operation control of individual equipment. Each sub-problem is concurrently solved by an independent and autonomous agent and the agents communicate with each other for cooperation to derive a better integrated solution. The resulting system will be highly modular, flexible, and easy to scale-up. When a new type of equipment is introduced, for example, the system can be easily adapted by replacing a few relevant agent-based modules. In an environment demanding high computational power, our system can naturally be implemented on a parallel or distributed hardware.

Prof. Won-young Yun Quality System Analysis Lab. (<http://qsa.ie.pusan.ac.kr>)

Our research fields include probabilistic theory, statistics, reliability engineering, life data analysis, and quality management.

- *Development of a System Managing Physical Distribution Resource within a Hub Area*: Generally, there are two steps of framework (between hubs of network and within hubs of network) and it is a collaboration subject which is related to physical distribution within hubs, the goal of which is development of the right methodology and management system for managing physical distribution optimally. Hence, solving overemphasized phenomenon in terms of supply and demand imbalance using minimum cost within hub area, it is able to be achieved to minimize the physical distribution cost.

Prof. Il-kyeong Moon Production System Analysis (PSA) Lab. (<http://psa.ie.pusan.ac.kr>)

Pusan National University's Production System Analysis (PSA) Lab. applies principles of engineering to identify, analyze and solve planning and management problems which occur in real-world systems. The areas of main applications include production, warehouse, inventory, transportation and logistics systems. We carry out researches on modeling and implementation of production, inventory and logistics systems to support effective decisions for the competitive edge in an enterprise. The overall goal of our research is to establish an engineering base for optimization of design and operation problems. We are also interested in the simulation using ARENA. In addition, we

are active in research on Meta-heuristic algorithm, where we could develop an efficient search method that optimizes combinatorial and complex problems in practice.

- *Development of Inter-hub Empty Container Optimization Technology:* Our main objective is to develop an inter-hub empty container optimization technology. This research focuses on developing decision support systems for an empty container management which can be useful for merchant service companies. We use an integrated approach that considers both the optimization modules such as mathematical algorithm and meta-heuristic algorithm, and decision support modules such as economic analysis and alternative simulation technology. Especially, we are developing an empty container optimization system based on inventory, purchasing & leasing, and positioning decisions on empty container management.

Prof. Byung-Hyun Ha Information & Knowledge Engineering Lab. (<http://ike.ie.pusan.ac.kr>)

In Information & Knowledge Engineering (IKE) Lab., we research and develop methodologies and applications of processing information and knowledge in order to analyze a variety of systems of industrial engineering and to plan out operational schemes for them in effective ways.

- *Development of a TOS-interoperable Simulator for Container Terminal Operation:* In this research, we develop a simulator, STOM (Simulator for Terminal Operation Management), of estimating operational efficiency for existing container terminals. As a main module of STOM, we build a designer, which can model layouts and processes of the real container terminals. We also research a simulation framework interoperable with TOSs (Terminal Operation Systems) as well as various external software modules for planning schemes and control logics of container terminals.

4) Unmanned and Autonomous Controls for Ports & Logistics

Prof. Keum-shik Hong Integrated Dynamics and Control Engineering Lab. (<http://icel.me.pusan.ac.kr>)

Prof. Hong's lab, Integrated Dynamics and Control Lab, has been designated as a National Research Laboratory in 2003 by the Ministry of Science and Technology, Korea, in recognition of his research activities. Research areas include intelligent vehicles, robotics, and port automation. Prof. Hong served as an Associate Editor for *Automatica* (2000-2006) and as an Editor for the *International Journal of Control, Automation, and Systems* (2003-2005). He also serves as an Associate Editor in various IEEE and IFAC conferences editorial boards. Dr. Hong received Fumio Harashima Mechatronics Award in 2003 and a certificate of commendation at the 40th Science Day from the President Noh, Korea, in 2007. He also serves as General Secretary of the Asian Control Association.

- *Control System Design of an Unmanned Autonomous Forklift:* As a university-industry collaboration project, an unmanned autonomous forklift is developed together with CLARK, a forklift company. Control architecture using several sensors including laser scanner, vision cameras, ultrasonic sensors, etc is investigated. A feedback controller that forces the unmanned forklift to follow a given reference path is designed. This path-following control algorithm is

derived based on the representation of the forklift's kinematics in form of the reference path variable model. Obstacle avoidance algorithm using laser scanners is also discussed. The effectiveness of the proposed controller was examined through experiments.

Prof. Sungshin Kim Knowledge & Information Control Lab. (<http://icsl.ee.pusan.ac.kr>)

KINCO is conducting research work in the areas of fuzzy logic control, fault-tolerant control, neural networks, neuro-fuzzy systems, diagnostics, sensor fusion techniques, wavelets analysis, signal analysis and manufacturing systems. The underlying philosophy of the research activities carried out in the Laboratory is the effective integration of analytical and intelligent tools towards the development of new and innovative identification/control strategies for complex dynamical systems.

- *Development of Multi Path-Planning and Localization Techniques:* Estimating vehicle (unmanned fork-lift truck) position and path-planning multiple vehicles are key prerequisites for precision driving or working. Inaccurate pose estimation can cause the vehicle to drive in/outside the corridor, or build maps that do not reflect the state of the vehicle's environment, leading to poor driving or working decisions. For efficient real-time autonomous navigation, we research efficient localization and dynamic path planning techniques for multiple vehicles.