

Course of ICT Department of Integrated Safe Ocean Smart Cities Engineering

Category	Course	Main contents
Collaborative course	Smart disaster response technology	<ul style="list-style-type: none"> - Smart disaster response technologies for infrastructures - Prevention and response technologies for collapse of facilities and foundation - Development of response technologies: disaster response transmission/reception system, landslide vulnerability analysis, river hydraulic analysis, water resource and technology evaluation, etc.
	AI-based disaster detection system	<ul style="list-style-type: none"> - Development of drones for disaster detection - Development of deep-learning system for disaster quantification index - Extension of disaster detection system to disaster prevention system
	Data acquisition and analysis for monitoring natural hazard	<ul style="list-style-type: none"> - Improvement of data collection method for the evaluation of ground and structural stability - Fundamentals of ground monitoring and data processing for experimental applications
Multi-disciplinary course	Multi-disciplinary research seminar	<ul style="list-style-type: none"> - Presentation and discussion of students' research topics, research methods and problem-solving methods - Utilize the ability of convergent thinking from multidisciplinary fields to motivate independent learning
Multi-Physics Monitoring courses for disaster risk reduction	City and Sensors	<ul style="list-style-type: none"> - Learn concept and fundamentals of imaging sensor to design photography equipments - Cultivate required skills for camera system development using imaging sensor - Fundamentals and design of camera sensor for disaster prevention system
	Smart construction materials	<ul style="list-style-type: none"> - Engineering factors of construction materials for infrastructures - Learning of basic principles and types of smart construction materials - Acquisition of material properties data, and principles of data transmission
	Nondestructive evaluation in Building and Infrastructure systems	<ul style="list-style-type: none"> - Theory of multi-physics nondestructive evaluation and health monitoring for infrastructures - Analytical methods of Multi-physics data and signal processing - Optimal design of nondestructive evaluation against complex ocean degradation
	Soil dynamics using multi-sensing	<ul style="list-style-type: none"> - Development of evaluation methods for soil dynamics in smart cities - Conduct experiments to understand soil behavior and integrate with state-of-the-art technologies - Study of AI for long-term data collection
	Experimental methods in geotechnical engineering using smart sensing technique	<ul style="list-style-type: none"> - Evaluation of structure-ground interaction against dynamic loads, and stability test using seismic wave - Understanding the fundamentals of dynamic analysis and monitoring methods through experiments based on nondestructive evaluation
	IoT and Sensor	<ul style="list-style-type: none"> - Beginners course for IoT and sensor - Fundamentals of IoT including service technologies and sensing device configuration - Learning the application of IoT in disaster prevention system
	Design of Wireless Integrated Circuit	<ul style="list-style-type: none"> - Design of wireless communication system for complex disaster prevention - Design and manufacture of wireless communication circuits - HFSS software training for high frequency EM analysis
Multi-scale digital twin courses for disaster response preparation	Introduction to digital twin	<ul style="list-style-type: none"> - Introduction to digital twin in smart cities - Overview of finite element updating techniques for digital twin through real-time sensing data and structural model information - Roadmap of digital twin to ICT integrated smart cities
	Structural design of special structures in ocean city	<ul style="list-style-type: none"> - Classification of structural systems and fundamentals of vertical and horizontal resistance structural systems in ocean cities - Analysis of structural resistance systems against horizontal loads, e.g. winds and seismic load
	Smart seismic control system	<ul style="list-style-type: none"> - Seismic energy balance theory, design of vibration control devices, understand of hysteretic structural behavior, design of dampers - Construction of ocean structures using seismic control and isolation techniques - Classification of vibration control and isolation devices and nonlinear structural analysis design
	Introduction to finite element analysis	<ul style="list-style-type: none"> - Learn cyber-physical system using finite element analysis - Understand finite element model updating methods for digital twin
	Smart structural health monitoring	<ul style="list-style-type: none"> - Basics of structural health monitoring system - Introduction to structural health monitoring using static/dynamic sensing data in the field of civil, architectural, mechanical, aerodynamics and electrical-electronics engineering - Future of structural health monitoring in ICT integrated smart cities

Course of ICT Department of Integrated Safe Ocean Smart Cities Engineering (cont.)

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	Construction IoT	<ul style="list-style-type: none"> - Discussion on limitations and improvements of IoT application to construction industries, sinkhole detection and fine dust detection - Learn the configuration, implementation and application of IoT system
	Fundamentals of IoT system	<ul style="list-style-type: none"> - Learn the fundamentals of IoT components (sensors, embedded systems and networking techniques) and IoT system design through optimal placement of each components - Learn the operating principles of main sensors, data synthesis and network system
Multi-disaster response courses	Introduction to Smart City	<ul style="list-style-type: none"> - Learn the definition, features, development and enhancement of smart cities - Learn the theory and background of U-city, Eco-city, Smart Grid, EMS and CES - Learn the smart city disaster prevention plan through a case study
	Urban Micrometeorology	<ul style="list-style-type: none"> - Learn the concept, theory and analytical method for the prediction and evaluation of building wind - Background and theory of microclimate prediction method - Practical application of CFD analysis tools including STREAM
	Earthquake Engineering and seismic design method	<ul style="list-style-type: none"> - Understand earthquakes and seismic design, learn the domestic and international seismic design standards, and case studies on domestic and international earthquakes - Construction of seismic resistant ocean structures using seismic analysis, design and engineering theories - Practical applications of earthquake engineering theories
	Data analysis and environmental statistics	<ul style="list-style-type: none"> - Characteristics of environmental data and data analysis software for environmental statistics - Validation of hypothesis, ANOVA, time series regression analysis and spatiotemporal analysis - Monte-Carlo simulation, sensitivity analysis, uncertainty analysis and ANN
	Stability analysis of soft ground	<ul style="list-style-type: none"> - Important parameters for smart city construction using ground analysis to obtain soil properties - Learn various geotechnical engineering analyses and their future improvement
	Understanding of wireless communication system	<ul style="list-style-type: none"> - Comparison and evaluation of different sensing network systems using the fundamentals and characteristics wireless communication systems - Optimization of wireless communication systems for WPAN and 5G applications through modulation/demodulation methods
	Wireless System Design	<ul style="list-style-type: none"> - Understand design factors of RF transceiver - Understand characteristics and performance indicator of RF transceiver configuration module - Advantages/disadvantages of wireless communication technologies
Multi-level disaster management courses for recovery/restoration	Ocean Disaster Prevention Engineering	<ul style="list-style-type: none"> - Theoretical and practical backgrounds of complex ocean disaster prevention system - Case study on causes and prevention response of ocean disasters. e.g. typhoon, tsunami, earthquake, etc.
	Smart building system for multi-disaster prevention	<ul style="list-style-type: none"> - Understand design method of smart buildings for ocean disaster response - Architectural disaster prevention plan, design and operation using ICT - Practical application of ICT technologies for disaster prevention design and operation
	Environmental Engineering Process by water chemistry	<ul style="list-style-type: none"> - Understand chemical process that determines fate of material under natural and engineering conditions and application to practical environmental issues - Application of chemical management to environmental issues
	Environmental Engineering Process by physical process	<ul style="list-style-type: none"> - Analytical methods for use, characterization and quality management of water resources - Understand physical process that determines fate of material under natural and engineering conditions and application to practical environmental issues
	Disaster image processing based on machine learning	<ul style="list-style-type: none"> - Machine learning-based image processing for disaster prevention systems - Establish machine learning environment using programming languages and learn the fundamentals of machine learning and its application to image processing
	Complex IoT system in wide area	<ul style="list-style-type: none"> - Case study on massive IoT systems for collecting sensing data in smart cities - Requirements, limitations, background and comparison of IoT systems for smart cities