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Master of Artificial Intelligence

This multidisciplinary program establishes the theoretical and practical foundations necessary to be at the forefront of progress in the next technological revolution. Advancements made in artificial intelligence and related disciplines will soon touch every piece of technology and aspect of life, making an advanced degree in this field an essential asset for a successful career in a wide range of business and industrial sectors.

In this program, students are exposed to topics such as machine learning, deep learning, computer vision, and natural language processing. Furthermore, it also covers classification, regression, clustering, dimensionality reduction, perception, motion and manipulation, reinforcement learning, and various types of neural networks. It promotes interdisciplinary education where computer science intersects with mathematics and engineering. The applications of this program are wide-ranging and include automatic image and video processing, healthcare, financial data and trading, speech recognition, facial identification, and seismic survey processing.

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Master of Bioengineering

This program prepares students to become experts in the rapidly growing field of bioengineering, which focuses on the application of engineering tools to the principles of biology in order to create usable, robust products. Such professionals are highly demanded in numerous sectors such as reaction plants, environmental processes, and medical therapeutic medication industry.

This program focuses on cell and molecular biology, animal developmental biology (including discussion on homeostasis, organs regulations, body systems and their functions, biomaterial science (in support of medical applications), biotechnology techniques and how they are applied to solve environmental problems, and bioreaction rates (including bioreactor design, immobilization and immobilized bioreactors, fermentation, etc.). The program also provides knowledge in mathematical and engineering modelling tools describing biological systems behaviors. The applications of this program includes vary widely from genetics and molecular biology to the developments of biotechnological products in medicine, environment, agriculture, and industrial manufacturing.

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Master of Business Analytics

This program is designed to offer highly-demanded advanced skills in data analytics that can be immediately deployed by a wide range of professionals and leaders to progress in their careers in managerial, business, and technical roles. It is applicable to many sectors, including industry, banking, telecom, healthcare, etc. It is also particularly applicable, IT professionals at various levels, who are in big demand due to rapid market growth, who can especially benefit from this program to support both established and emerging applications in e-government and e-business.

This program provides a solid foundation in the field of data analytics that integrates knowledge and skills from both technical and business perspectives. Topics covered include descriptive and inferential statistics with emphasis on applications in business (distributions, estimation theory, hypothesis testing, multiple regression, nonparametric modeling, etc.), advanced business analytics (market basket analysis, data visualization, decision trees, logistic regression, supervised learning, vector machines, nearest neighbors, neural networks, text mining, etc.), data management, programming essentials of R and Python, management science (e.g. linear programming, duality and sensitivity, transportation and assignment models, goal programming, network optimization), advanced applied regression (multiple regression, residual analysis. polynomial models, etc.) and big data analytics (smart clouds, machine learning and visualization of big data, privacy, etc.).

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Master of Computational Analytics

This is an interdisciplinary program designed to provide knowledge and essential skills to solving real-world problems using computational tools, including modeling systems and phenomena and simulating them in order to fully optimize them. Graduates of this discipline are highly demanded in both business and industry, as these sectors seek to become more effective and successful in their operations.

This program focuses on developing models to understand the inherent structure of the data. Topics include probability theory, inference, least-square estimation, interpolations, adaptive approximations, numerical differentiation and integration, quadrature, multistep methods, finite difference, and applications to steady-state and time-dependent problems involving initial-value and boundary-value problems. The program also covers simulation, in terms of queuing systems, stochastic processes, random number generation, numerical methods, and software techniques for building simulators. The inverse problem is also covered, whose methods describe identifying the parameters and structures of models that give rise to the recorded observation, an essential tool to understanding physical phenomena.

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Master of Computational Material and Modeling

This multidisciplinary program focuses on a field that is rapidly evolving and strongly demanded, since understanding the properties of materials is key for manufacturing useable, robust, and economically viable products. Students are educated to be able to model, simulate, and design materials of desirable properties.

The program studies the interrelation between the structure and properties of materials, which is at the heart of understanding material behavior at a range of different length and time scales. Topics include Monte Carlo simulation, Markov chains, random walks, stochastic systems (e.g. Brownian dynamics), and continuous phase transitions in lattices. The program also covers atomistic simulations, including molecular dynamics simulations and density functional theory, as well as applications in catalysis, nanomaterials, alloy design, corrosion inhibitors, and 3D printing. Other topics include material informatics, e.g. machine learning (regression, classification, unsupervised learning, etc.) and its application in materials selection for engineering design and multi-scale modeling.

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Master of Computer Networks

Computer networks represent a field upon which the entire world economy is based. This multidisciplinary program is designed to equip students with advanced and working knowledge to succeed in the field of computer networks by acquiring valuable tools and skills in designing, managing, and securing computer networks. As the world is becoming digital, this discipline is skyrocketing in terms of demand in the job market, for both large and small business enterprises.

This program covers subjects related to wired and wireless networks, including network design and management, network security, internet of things, client server programming, and emerging technologies. A rich collection of specific topics is covered, including the fundamentals of networks (physical and data layers, switching, routing, transport, etc.), mobile computing and wireless networks (e.g. configurations, interference mitigation, wireless network architecture, multi-gigabit networks such as 5G/6G), network design (e.g. LANs, VLANs, InterVLAN routing, multicast listener discovery), and network programming. The programs also covers network management and security (cryptography, segmentation zones, secure protocols, firewall protocols, authentication and authorization, network management standards and applications, etc.), and wireless applications of internet of things (access technologies such as LoRaWAN, publish/subscribe messaging protocols such as MQTT and COAP, industrial access control for wireless sensors, etc.). A suite of emerging technologies in computer networks will also be covered.

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Master of Cybersecurity and Blockchains

This multidisciplinary program is designed to prepare students to enter the field of cybersecurity and blockchains. Both fields share a common foundation and are interlinked, and both are substantially demanded by the job market, especially given the rapid increase in computerization, virtual communication, online transactions, and money transfers.

This program covers topics in secure and trusted computing, including data and information assurance, identification of cyber assets and related security risks and threats, measurement of system resilience against cyber-attacks, and security policy compliance and governance. Students learn the pillars of computer security and data privacy and how they affect complex systems (e.g. manufacturing plants). Topics include cryptology, access control models, intrusion detection systems, and integrity verification mechanisms. Students also learn the fundamentals of Blockchain technology, including record and hash replication, and types of blockchains (public, private, and hybrid), as well the applications in cryptocurrency and various other scientific, engineering, and business cases.

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Master of Data Science

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This multidisciplinary program prepares professionals for a career in turning data into useful information, a discipline substantially demanded in the job market, as data is generated by the quintillion of bytes every day and is becoming a precious resource for nations' advancement.

Organizations increasingly heavily depend on sophisticated analytical tools to draw meaningful insights from data in order for their businesses to thrive.

This program focuses on the analysis and handling of data from multiple sources and for various applications in order to draw inferences from it. Topics include probability theory, inference, least-square and maximum likelihood estimation, forecasting, finding local and global optimal solutions (gradient descent, genetic algorithms, etc.), and generalized additive models. It also covers machine deep learning topics such as classification, conditional probability estimation, clustering, dimensionality reduction, and decision support systems. The program also covers big data analysis, including big data collection, preparation, preprocessing, warehousing, interactive visualization, analysis, scrubbing, mining, management, modeling, and tools such as Hadoop, Map-Reduce, Apache Spark, etc.

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Master of Design & Technology Entrepreneurship

This interdisciplinary program functions as a highly interactive start-up incubator, bringing together students from a variety of disciplines to complement each other in teams, focusing on three main areas: creative design thinking, disruptive digital technologies, and entrepreneurial skills. Students will gain valuable skills that would either help them advance their professional careers across a wide range of fields, or launch innovative ventures in design and technology to become leading entrepreneurs.

The program applies the knowledge and practice of design thinking and methods to identify innovative applications of digital technologies and pursue them through entrepreneurial strategies. It uses the current transition from physical to digital space as a framework to innovate new types of environments, products, services, activities, and experiences that generate high economic and social value. Topics include design thinking, communication, and leadership; innovative applications of digital technologies; interaction and service design; user experience and interface design; venture opportunity recognition; business design models; marketing strategies; design and technology management; and sustainable technology entrepreneurship. The program ends with a venture design studio for launching an innovative business.

One-Year Master's Degree consists of Two Semesters + Summer

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Master of Flow Assurance

Flow of oil, gas, chemicals, and water, whether separately or multiphase, and whether downhole or on the surface, is a critical process in the oil and gas industry, and therefore flow assurance is a top priority. Challenges in flow assurance have significant impact on the cost, reliability, and safety of oil and gas operations, and have financial implications estimated at billions of dollars annually. This interdisciplinary program provides students with the advanced knowledge and essential skills in flow assurance that are highly sought after in the job market for career growth and professional impact.

This program provides students with the knowledge needed to understand and model the multiphase transport of fluids. It covers oilfield chemistry, multiphase flow (flow regime maps, concentration distributions, multiphase pipe systems design, etc.), natural gas hydrates (structure, stability, kinetic theories for hydrate nucleation, formation risk, prevention, etc.), surface production facilities (oil/water/gas facility design, production systems, computer simulation, etc.), and corrosion science and engineering (e.g. electrochemical thermodynamics and kinetics, inhibition, passivity, protection, pitting). The program also covers essential tools such as computational fluid dynamics (discretization, numerical approximations, finite difference, finite volume, etc.), modeling of petroleum and petrochemical fluids (characterization, phase behavior, retrograde condensation, solubility in polymers, etc.), and advanced engineering economics (e.g. inflation, depreciation, taxes, cost estimation, sensitivity analysis, risk and uncertainty, capital budgeting, multi-attribute decision making, advanced asset replacement analysis).

One-Year Master's Degree consists of Two Semesters + Summer

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Master of High Performance and Cloud Computing

Cloud and high performance computing is one of the fastest growing computing areas, whose job market is growing rapidly across the globe. This interdisciplinary program is designed to equip students with the needed knowledge to design, build, operate, use, and maintain large systems designed for hosting cloud applications or running compute-intensive tasks for simulation and other purposes, as well as small computing modules designed to operate the edge of the network. This skill is highly demanded in numerous sectors: energy, healthcare, telecommunications, big data, e-commerce, defense, etc.

One-Year Master's Degree consists of Two Semesters + Summer

This program provides in-depth coverage of modern computing architectures and programming paradigms. Topics include parallel process architectures (parallel and pipelined dataflow, vectorization methods, interconnection, etc.), GPU architecture (functional units, CUDA, memory access coalescing, shared memory usage, etc.), distributed computing (threads, and abstraction, mutual exclusion, condition variables, atomic instructions, etc.), and quantum computing (qubits, entanglement, quantum protocols, quantum machine learning, etc.). The program also covers cloud and edge computing (cloud services, RESTful APIs, XaaS pyramid, serverless computing, cloud big data processing, etc.), parallel algorithms (divide-and-conquer, parallel prefix, pointer jumping, list ranking, Euler's path, ear decomposition, parallel complexity etc.), and big data analytics (smart clouds, machine learning and visualization of big data, privacy, etc.). Essential knowledge of linear algebra is also included (e.g. direct methods for large sparse linear systems, LU factorizations, regularization of ill-conditioned least squares problems).

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Master of Human Resource Management

This interdisciplinary program is designed to develop in-depth knowledge and advanced skills necessary to create the human resources leaders and specialists of the future – a highly sought after profession in the job market. It seeks to develop the student's knowledge in foundational human resource theories and frameworks and enhance their ability to evaluate relevant problems, develop creative strategies and solutions, and ultimately drive the success of their organization through unlocking the full potential of its human talent.

This program covers all significant topics relevant to the management of human resources in organizations, including the four critical skills related to HR management in any organization: 1) HR planning (strategies, resource planning, alignment with corporate goals, etc.), 2) selection and recruitment (job design, recruitment strategies, employment assessment, deployment, etc.), 3) performance and compensation (performance metrics, appraisal, feedback, pay scales, incentive plans, etc.), and 4) HR development (identifying needs, delivering training, coaching and mentoring, learner engagement, etc.). The program also covers other aspects of HR management, including leadership and organizational behavior (motivation, conflict resolution, team dynamics, emotional intelligence, etc.), communication and negotiation (interpersonal communication, conducting interviews, two-party and team negotiations, etc.), and HR analytics (research design, quantitative and qualitative analyses, basics of artificial intelligence, etc.). The program also studies the Saudi labor laws, including contracts, allowances, dispute resolution, etc.

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Master of Industrial Catalysis

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This multidisciplinary program is at the heart of the petrochemical industry and advanced manufacturing. Understanding this topic is key to becoming a successful professional who understands how to effectively develop the right tools to maximize value in petrochemical, manufacturing, or synthesis plants and satisfy the current and future needs of the industry's processes.

The program covers catalysis and its application in petrochemical industry. It provides the students with the knowledge to identify and apply various catalysts in the petrochemical industry. Topics include chemical kinetics and reaction mechanisms including methodology of mechanistic organic/inorganic chemistry, reactive intermediates, kinetics of homogeneous and heterogeneous catalysis. Furthermore, it also covers industrial catalysis with focus on the role of transition metals in catalytic processes, embracing the fundamentals of heterogeneous catalysis, including catalyst production and applications, shape selective catalysts, and the role of environmental catalysis in green chemistry. The program promotes interdisciplinary education where chemistry intersects with chemical engineering.

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Master of Intelligent Hydrocarbon Fields

The continued digitalization of the hydrocarbon industry requires engineers to integrate new technologies and emerging tools from various disciplines and applications. This program aims at addressing this need by equipping field and reservoir engineers with the necessary knowledge to adopt and use such advanced technologies and solutions for improved hydrocarbon monitoring, management, and production. In addition, many of skills acquired in this program are highly versatile and can be easily transferable to other industry applications such as advanced process control.

One-Year Master's Degree consists of Two Semesters + Summer

The program combines a carefully selected set of skills from different disciplines to equip the student with a solid foundation in Industry 4.0 topics and their applications in intelligent oil and gas field (i-field) management. Topics include the application of artificial intelligence for petroleum engineers and scientists (neural networks, fuzzy logic, clustering, etc.), digital communication (signal detection and enhancement, modulation, etc.), data science (handling, visualization, sampling, modeling, etc.), Cybersecurity of industrial control systems, advanced reservoir management (e.g. production optimization, project economics, from primary depletion to abandonment), smart well completion, and integrated downhole/surface reservoir monitoring and control (with computational reservoir models for optimized production control systems). The program also covers instrumentation and control network (e.g. SCADA, cluster tree and mesh networks, communication protocols, etc.), and big data analytics (smart clouds, machine learning and visualization of big data, privacy, etc.).

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Master of Intelligent Process Control

Process control is the backbone of all industrial systems, from small plants to mega factories. Effectively controlling these processes is key for the success, reliability, and profitability of these industrial systems – a rapidly growing discipline that is highly sought in our expanding industrial infrastructure. This interdisciplinary program enables professionals from several engineering backgrounds to gain advanced knowledge and skills in process data collection and manipulation to extract intelligent information necessary for optimal decision making, including the use of digital twins in enhancing operation and control.

The program provides students with in-depth theoretical and practical knowledge in the development of intelligent process control – an interdisciplinary field that involves numerical disciplines in engineering, computing, and mathematics. The program covers intelligent process control fundamentals (network architecture, smart sensors, control structures, control loops, etc.), simulation of chemical processes (chemical plant modeling, sparse matrices, tearing, simulator construction, etc.), instrumentation and control networks (hierarchy, SCADA, DCS, industrial interfaces, communication protocol, CAN bus, ZigBee networks, etc.), intelligent decision support systems (decision theory, modeling, case-based reasoning, decision trees, knowledge representation, etc.), and optimal process control design (e.g. dynamic programming, reachability, trajectory optimization). The program also covers soft computing for identification (parametric, non-parametric, neural networks, fuzzy-neural models, etc.), cybersecurity of industrial control systems, and applied artificial intelligence in process control (e.g. fuzzy expert systems and hybrid intelligent controllers).

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Master of Intelligent Transportation

Traffic and operation and safety represent the lifeblood of any logistical system. By 2030, the Kingdom targets to reduce road accident fatalities, improve urban mobility, and reduce congestion. This interdisciplinary program provides students with the required knowledge and advanced skills to model, analyze, and design effective, technology-based solutions that would improve traffic safety, mobility systems, and transportation efficiency – thus launching their careers in this critically important discipline.

One-Year Master's Degree consists of Two Semesters + Summer

This program prepares professionals for a career in transportation engineering to provide and run efficient, economic, and safe transportation networks. Topics include traffic flow theory (macroscopic and microscopic flow, shock wave analysis, queuing theory, bottleneck analysis, etc.), geometric design of highways, traffic control and operation (signal theory, coordination, multimodal operation, roundabouts control, etc.), highway safety modeling (impact studies, auditing, traffic conflict analysis, etc.), intelligent transportation systems (connected vehicles, travel demand management, etc.), and human factors in traffic safety (e.g. vision processing). Advanced tools applied in this field will also be covered, such as data science and machine learning (e.g. neural networks, classification, vector machines).

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Master of Internet of Things and Embedded Systems

As the world is quickly turning digital, Internet of Things (IoT) is emerging as a key driver of the 4th industrial revolution and an indispensable tool in today's economy, for both industrial and homes applications. This multidisciplinary program is designed to prepare professionals to master the quickly expanding field of IoT. It aims to ensure a comprehensive exposure and deep understanding of all elements of IoT, from embedded and real-time systems all the way to the cloud, in order for graduates to take full advantage of this rapidly growing job market.

This program provides a full coverage of all topics related to the Internet of Things (IoT), including smart systems (sensors and actuators, performance characteristics, feedback control, data acquisition, embedded systems, etc.), regular and industrial IoT (design and architecture, wireless personal area networks, low power wide area networks, machine-to-machine and machine to-cloud communication, process control systems, industrial control systems. cyber-physical systems, digital twins, etc.), and internet and cloud computing (data centers and cloud services, mobile and web applications, RESTful APIs, XaaS pyramid, etc.). The programs also covers embedded software engineering (embedded system architectures, programming and implementation guidelines, optimizing for memory and power, etc.), real-time systems (concurrency and timing, thread synchronization, inter-task communication, etc.). Moreover, the programs also covers IoT security (encryption, certificates, anonymity, blockchain and credential management systems, vulnerabilities, etc.), and big data analytics (smart clouds, machine learning and visualization of big data, privacy, etc.).

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Master of Maintenance and Reliability

This interdisciplinary program offers a mastery level knowledge and modern skills that are critical for keeping engineered systems and equipment up, safe, and well configured to achieve maximum performance, reliability, and utilization while minimizing failure, downtime, and cost. As plants and industrial systems are tuned for maximum performance, and many are mission-critical, the need for professionals well versed in the latest IR4.0 and digitalization technologies and who are knowledgeable in keeping these systems reliable is increasing rapidly.

The program will prepare professionals from various engineering background to develop proactive maintenance and reliability strategies that keep systems safe to operate with high availability and reliability. It covers maintenance management (strategy, forecasting, capacity planning, preventive, standards, auditing, etc.), advanced reliability (measures, reliability curve, assessment, failure analysis and prediction, reliability growth, etc.), maintenance data analytics (regression, association rules, clustering and classification, automated data mining, scheduling, etc.), and intelligent condition maintenance (e.g. residual lifecycle, condition monitoring and inspection, preventive maintenance decision optimization). The program also covers turnarounds (systems approach, phases, scoping, preparation, scheduling, execution, startup, etc.), optimization and simulation (mathematical models that include linear, nonlinear, and chance constrained programming and their application in various areas of maintenance), HSE systems (hazards, risks, risk management, environmental impact risk assessment, etc.), and life cycle costing (e.g. techniques, managing risk and uncertainty, depreciation, replacement, breakeven analysis).

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Master of Materials Science and Engineering

This multidisciplinary program prepares professionals to fully understand the science of materials and how this science can be used to engineer these materials. This is key to driving product innovation in all industries from aviation, medical equipment, and gadgets, all the way to environmentally friendly and biodegradable products.

This program focuses on the desire to increase in the mechanical and environmental longevity of components in manufacturing, with wide applicability to materials processing, oil and gas, and manufacturing industries. Topics include the structures and mechanical, electrical, and thermal properties of non-metallics, and the processing of ceramics, polymers, and composites. Students learn materials selection and design, mechanical design process, product shape, multiple constraints, conflicting objectives, hybrid materials, the impact of materials selection on the environment, composite materials and their application, fibers, matrices, etc. Topics also cover polymers (homogeneous and heterogeneous polymerization processes, engineering properties of polymers, etc.), and the failure of materials.

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Master of Petrochemical Engineering

The world is increasingly moving to using conventional energy sources as feedstock to petrochemical materials, rather than just burning them as fuels. This multidisciplinary program prepares professionals for this highly demanded sector, especially with the rapid growth of petrochemical industries in the region.

This is a specialized program that provides a thorough understanding of the direct and indirect routes for converting oils to chemicals, macular theories of adsorption and catalysis, type of polymerization reaction, and the principle of material processing with focus on polymers. The program also covers industrial fluidized bed reactors coupled with risk assessment methods, performance assessment, human reliability modeling, and SHARP method with quantitative models. Crude oil characterization and PVT analysis, asphaltene instability, and hydrate formation are discussed as well. Other topics include key concepts on sequential modular and equation-oriented simulators, construction and convergence of petrochemical processes, tearing and convergence algorithms.

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Master of Polymer Science and Engineering

This multidisciplinary program provides students with modern knowledge and practical experience in polymer chemistry and engineering, a profession prized in the job market as the world is shifting from using hydrocarbons not only as fuels, but also into using them in the petrochemical industry and non-metallics, as well as from commodity to specialty chemicals.

This program includes the synthesis, characterization, and applications of various polymeric materials. Topics include polymerization reactions, polymerization techniques (step-growth, radical, ionic, ring-opening, transition metal catalysts), complex coordination polymerization, copolymerization, and addition polymerization using anionic, cationic, and radical processes. Other topics include polymer kinetics, stereochemistry, structure, and structure-property relationships, as well as polymer characterization, processing, rheology, homogeneous and heterogeneous polymerization processes, specialty polymers, industrial reactions of polymers, as well as the applications of polymeric materials in the oil and gas industry. In addition, the sustainability and degradation of polymers are also discussed.

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Master of Project Management

Everything starts with a project. Oftentimes the success of th entire organization hinges on the successful planning and execution of its project, wither in construction, energy, IT, or other sectors. This interdisciplinary program prepares students with the proper tools, cutting-edge research, and knowledge needed to effectively manage complex projects, thus launching or boosting their careers in this critically important phase of companies in a plethora of sectors, and facilitating their participation in this quickly growing job segment.

The program exposes students to a wide of subjects that are imperative for daily practices in project management. The programs covers project management fundamentals (planning, scheduling, critical path method, project evaluation, critical chain, etc.), project leadership (communication, stakeholder management, stakeholder identification, conflict resolution techniques, etc.), project procurement and quality assurance (procurement planning, make-or-buy, negotiations, contract types, incentives, quality standards, etc.), and loss prevention (e.g. risk management, job safety analysis, protective equipment, environmental hazards).

The programs also covers global project management (the tools and techniques that, when effectively used to manage a set of interdependent projects as a single program, result in improved performance), and equips the students with relevant technical tools, such as data science (handling, visualization, sampling, modeling, etc.) and managerial finance (e.g. risk and return, pricing, capital budgeting, firm valuation, capital structure, payout policy, leasing).

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Master of Quantitative Finance

This multidisciplinary program is designed to provide knowledge and essential skills to quantitatively model, simulate, and solve real-world problems arising in modern finance. The objective is to meet the growing demand for highly qualified professionals and executives in the domains of banking, investment, derivatives, financial consulting, financial engineering, risk management, and fund investment. The program prepares the student for a successful career in numerous sectors, including banking, healthcare, investment, fund management, and the like.

One-Year Master's Degree consists of Two Semesters + Summer

This program equips participants with practical quantitative methods suitable for tackling a wide range of financial and economic issues. It covers financial engineering (pricing theory, options dynamic hedging, asset return process, etc.), option pricing (financial markets, forwards, derivatives, self-financing portfolios, non-anticipative strategies, Black-Scholes valuation, etc.), financial stochastic analytics (Gaussian, Brownian motion, stochastic integral, Lévy characterization theorem, etc.), and interest rate and credit risk (credit markets short rate models, forwards and futures, structural credit risk models, credit default swaps, etc.). The program delves into important quantitative foundations, such as stochastic systems simulation (queueing models, simulation languages, random number simulation, etc.), probability, mathematical statistics, statistical inference (estimators, unbiased estimation, consistency, sufficiency, completeness, etc.), and numerical methods (multistep, Runge-Kutta, shooting and bisection, finite difference, equilibrium and non-equilibrium models, etc.).

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Master of Quantum Computing

This multidisciplinary program delves into the next generation of computing, which will take compute power and the ability to solve extremely complex problems, whether in medicine, modeling, or telecommunication to the next level, and is therefore demanded by many employers in these and other sectors.

The program covers quantum theory and how it is applied in the fields of computing and communication. It covers the concepts of qubits, superposition, entanglement, quantum gates, and quantum algorithms in order to understand the difference between classical and quantum computing. Other topics include quantum electrodynamics, including cavity and circuit qubits, quantum superconductivity, non-linear harmonic oscillators, etc. Students are introduced to quantum computing concepts such as quantum hardware, processors, circuits, instruction sets, quantum programming languages, quantum error correction, algorithms, and quantum cryptography. Students learn how to design, simulate, and test the core parts of a superconducting Qubit.

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Master of Reservoir Characterization

This program offers geoscientists and engineers an interdisciplinary specialization and advanced skills in reservoir characterization. This program integrates geology, geophysics, petroleum engineering, environmental sciences, advanced numerical models, uncertainty analysis, stochastic modeling, artificial intelligence, and economic analysis. It allows students to advance their careers by acquiring in-depth knowledge of this critically important phase of reservoir development.

One-Year Master's Degree consists of Two Semesters + Summer

In this program, students will master advanced methods in reservoir geology (including reservoir architecture and geometry, stress fractures, etc.), basin and petroleum system modeling, reservoir management (including development plans, monitoring, optimization, etc.), imaging of the reservoir with various methods (e.g. seismic, microseismic, gravity, electromagnetics, cross-well tomography) and the use of these to map the subsurface by integration multiple sources of data (using logs, cores, seismic, etc.) to do joint and constrained inversion and interpretation of datasets. The program also covers petrophysics and well log interpretation using integration with core and outcrop data to produce sedimentologic and stratigraphic models. The program includes extensive coverage of creating models using conventional methods (e.g. multivariate geostatistics) and artificial intelligence (e.g. neural networks, fuzzy logic, genetic algorithms, etc.), and the use of these in geological assessment, reservoir engineering, and drilling applications.

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Master of Robotics and Autonomous Systems

This multidisciplinary program brings together students from various engineering backgrounds and equips them with the necessary education to lead a successful career in this quickly rising discipline. Robots are becoming ubiquitous, from medical robotic surgeries all the way to warehouse management and package delivery, as well as the maintenance and operations of manufacturing plants. They touch all aspects of our lives.

The program covers subjects related to mechatronics, robotics, and UAVs (drones). Students develop the skills required to understand, design, and implement smart systems and robots to solve engineering problems. Topics include artificial intelligence, machine learning, the fundamentals of autonomous system (including sensing, reasoning, and acting). Also, it covers robotics-specific topics such as power sources, machine vision, actuation (e.g. linear actuators and electric motors), manipulation, locomotion (walking, rolling, climbing, etc.), environmental navigation, and human-robot interaction (including speech recognition and gestures). Applications are wide-ranging, and include industrial robots, as well as those used in the military, construction, agriculture, and in medical fields.

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Master of Smart and Sustainable Cities

Cities and communities around the world face many complex challenges to secure their future energy, mobility, health, and environmental needs in a sustainable manner. Smart advanced technologies and engineering solutions will play a pivotal role in providing key answers to these challenges. This interdisciplinary program offers advanced knowledge and skills to develop and deploy such technologies and solutions that enable urban planning professionals and leaders to effectively design, build, and manage the sustainable and smart cities of the future.

One-Year Master's Degree consists of Two Semesters + Summer

This program provides a wide range of subjects covering fundamentals of smart sustainable cities. It covers the fundamentals (land use, energy systems, mobility modes, infrastructure systems, etc.), sustainable urban development (transportation, water, energy social infrastructure, etc.), sustainable neighborhoods (sensitive site design, ecology conservation, biodiversity, mixed use development, walkability, etc.), and intelligent transportation systems (e.g. connected vehicles, travel demand management).

The program also equips the student with the necessary tools to become effective in this field, such as urban sustainability planning methods (decision theory, data classification, statistical sampling, hypothesis testing, etc.), environmental economics (market failure, externality, common and public goods, economic environmental valuation, circular economy, etc.), urban informatics (remote sensing, spatial data structures, global GIS databases, photogrammetric systems, space borne sensors, etc.), and big data analytics (e.g. smart clouds, machine learning and visualization of big data, privacy).

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Master of Supply Chain Management

This interdisciplinary program provides students with the skills and competence necessary for managing global supply chains, and paves the way for further professional certification in this field. It is one of the most sought after career advancement tracks, as supply chain management has become an essential component of the success of many businesses, not just globally, but also locally.

This program covers the systematic and strategic coordination management for supplying goods and services required by the end customer. Topics include supply chain strategies, drivers, transportation, sourcing, distribution networks, global networks, sustainability, and procurement (supplier management purchasing, policies, procedures, global sourcing, cost management, negotiation, etc.). Other topics cover logistics, including lean systems, market distribution, manufacturing, production forecasting, inventory control, optimization, warehouse management, deterministic and stochastic inventory systems, capacity planning, and material requirement planning. Students are equipped with the skills to manage and run effective and efficient supply chain businesses.

One-Year Master's Degree consists of Two Semesters + Summer

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Master of Sustainable and Renewable Energy

This multidisciplinary program equips professionals with the knowledge required to address the challenges of transforming the energy sector into a highly efficient and reliable one, focusing on two complimentary sectors that are highly prized in the job market, which are the sustainable use of conventional energy and the rapid rise of renewables.

This program covers various renewable energy technologies, including solar (photovoltaic and concentrated solar power), wind, hydrogen, geothermal, and waste-to-energy systems, as well as energy storage options such as electrical (e.g. batteries and super capacitors), fuel cells, and thermal storage. Students understand the components of renewable energy systems at and their performance and study the integration of renewable systems with storage and conventional systems. The program also covers sustainable energy systems (including energy outlook and the environment, global warming, and techno-economic analysis). The program also includes renewable energy project management, grid integration, smart grids, net-zero buildings, and touches on renewable energy policy and environmental law.

One-Year Master's Degree consists of Two Semesters + Summer

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Master of Unconventional Hydrocarbon Resources

Maximizing economic production of unconventional resources is a critical objective of the oil and gas industry. Specializing in this rapidly growing topic is key to becoming a successful professional in this global field. This multidisciplinary program helps engineers and geoscientists master the fundamentals of unconventional resources from different perspectives and provides them with the advanced technical tools to manage them effectively. It also bridges the gap between the subsurface of the unconventional resources and hydrocarbon production.

In this program, students will learn advanced, multidisciplinary methods in evaluating and producing unconventional hydrocarbon resources. This includes the engineering (single-well performance forecasting, flow in ultralow permeability reservoirs, hydraulic fracturing and their clusters, etc.), geomechanics and petrophysics (e.g. boreholes tresses, instability, sand production, etc.), reserves estimation and whole-reservoir production forecasting at a level required to act as a reserves estimator, and advanced topics such as depositional settings and heterogeneity of unconventional reservoirs. The program devotes time to dive into hydraulic fracturing (e.g. 2D and P3D fracture design, fracture chemistry, diagnostics, etc.), and also covers natural gas engineering, production optimization, well completion parameters, artificial lift systems, and underground gas storage. The program also covers Uncertainty quantification, including statistical methods that address the modeling, assessment, propagation, and management of uncertainties (stochastic modeling, Monte Carlo methods, etc.).

One-Year Master's Degree consists of Two Semesters + Summer

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Master of Visual Computing

Visual computing is an emerging field of significant importance for many current and future needs and technologies. It combines computer graphics, computer vision, and interactive techniques in order to advance cutting-edge methodologies for processing, manipulation, interpretation, and rendering of visual data. This multidisciplinary program is provides advanced working knowledge and technological skills to understand and contribute to high-level innovative solutions in various domains, such as healthcare (medical image processing), security, defense, computer aided design and manufacturing, robotics, animation, computer games, and virtual reality.

This program enables scientists and engineers in the areas of computer vision and computer graphics (CG) to expand their skills in the application of both traditional and cutting-edge techniques. Topics include computer vision (image representation, filtering, classification, segmentation, feature detection, motion estimation, etc.), natural language processing (victor semantics, syntactic parsing, semantic analysis, machine translation, etc.), CG imaging (light, colors, shading, ray tracing, texture mapping, bump mapping, anti-aliasing, etc.), CG modeling (parametric and implicit curves and surfaces, meshes, point clouds, etc.), and CG animation (shape and motion modeling, rigid bodies, deformable objects, fluids, interactive dynamic animations, etc.). The program also covers numerical methods, visual computing mathematics (e.g. discrete and continuous differential geometry of curves and surfaces and geometry processing on meshes) and deep learning for computer vision (e.g. using machine learning for object detection and recognition, convolutional neural networks, recurrent neural networks, supervised and unsupervised learning, and deep neural generative models for 3D geometry).

One-Year Master's Degree consists of Two Semesters + Summer

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Master of Water Desalination and Treatment

Water scarcity is one of the biggest challenges facing humanity today, and is expected to become even more acute in the future. This interdisciplinary program provides the necessary skills to tackle key challenges in the entire water cycle, from resources to waste, including water storage, state-of-the-art desalination technologies, domestic and industrial wastewater treatment, and water pollution. The application of this knowledge is universal across numerous sectors, including oil and gas, petrochemicals, healthcare, agriculture, and others. Having an advanced degree in this important field is an essential addition to those looking for a successful career in these industries.

One-Year Master's Degree consists of Two Semesters + Summer

The program offers a comprehensive coverage of the full hydrologic cycle. Topics include engineering hydrology (hydrologic cycle, precipitation, runoff, flood routing, etc.), water resources and pollution (e.g. water footprint, virtual water, groundwater and ocean pollution), groundwater remediation (mass transport in porous media, contaminant hydrogeology, risk assessment, ex-situ and in-situ remediation methods, etc.), and industrial wastewater treatment (e.g. treatment standards, pollution prevention, waste reduction, design of physico-chemical processes, equalization, neutralization).

The programs covers several advanced topics in desalination, include thermal desalination (solar stills, humidification/dehumidification, single and multiple effect evaporation, etc.), membrane desalination (membrane transport theory, concentration polarization, membrane fouling, reverse-osmosis system design, etc.), material degradation in desalination (corrosion, wear, mitigation practices, acid cleaning, etc.), rate controlled separation processes (e.g. crystallization, adsorption, adsorption, ion exchange, rate based modeling, breakthrough curves).

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Master of Wireless Communication Networks

This multidisciplinary program prepares professionals for the exciting and rapidly expanding industry of wireless communications. The world is increasingly abandoning the wire, so future careers in communication will invariably depend on professionals who fully understand wireless protocols and devices at multiple scales.

This program focuses on contemporary and novel topics in wireless communications, including network layering, digital communication, wireless protocols (from 2G to 5G, leading to 6G), spectrum regulation, management, and security. Topics include space representation of signals, detection of signals in noise, band-pass modulation techniques, cellular systems, propagation modeling, digital transmission techniques, diversity, and multiple access techniques. Other topics include optical fibers, waveguides, light sources, IoT principles and application requirements, network management standards, models, and protocols, frequency planning, spectrum management authorities, global interoperability, standardization bodies, testing and certifications, and wireless communications development.

One-Year Master's Degree consists of Two Semesters + Summer

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