

This version of the curriculum is applicable to students admitted during the academic years 2022–2026.

Doctor of Philosophy Program in Information Science and Technology (International Program)

2.2: Research and Coursework (5-year program) IST

Total Credits of the Program

No less than 79 Credits

Curriculum Structure

1) Core Courses	No less than	31 Credits
1.1) Seminar	No less than	4 Credits
IST 697 Seminar (GD)		1(---)
1.2) Professional Development	3	Credits (non-Credits)
IST 691 Professional Development: Entrepreneurial Skills (SU)		3(3-0-6)
IST 691 Professional Development: Business Foundation (SU)		3(3-0-6)
IST 691 Professional Development: Independent Study (SU)		3(3-0-6)
IST 691 Professional Development (SU)		3(3-0-6)
1.3) Leadership in Science and Engineering	3	Credits (non-Credits)
IST 692 Leadership in Science and Engineering: Entrepreneurial Skills (SU)		3(3-0-6)
IST 692 Leadership in Science and Engineering: Independent Study (SU)		3(3-0-6)
IST 692 Leadership in Science and Engineering: Critical Thinking and Effective Communication (SU)		3(3-0-6)
1.4) English for Academic Research	3	Credits
IST 698 English for Academic Research (GD)		1(--)
1.5) Compulsory Core Courses		9 Credits
IST 501 Mathematical Foundations (GD)		3(3-0-6)
IST 502 Data Structures (GD)		3(3-0-6)
IST 503 Algorithm Design and Analysis (GD)		3(3-0-6)
1.6) Compulsory Elective Courses		15 Credits
1.6.1) Frontiers in Information Science and Technology		
IST 511 Computer Network (GD)		3(3-0-6)
IST 512 Operating System (GD)		3(3-0-6)
IST 513 Programing Languages (GD)		3(3-0-6)
IST 514 Data Manipulation for Applied Machine Intelligence (GD)		3(3-0-6)
IST 515 Computational Machine Intelligence and Applications (GD)		3(3-0-6)
IST 516 Robot Operating System (GD)		3(3-0-6)
IST 521 Neural Networks (GD)		3(3-0-6)
IST 522 Optimization and Numerical Methods (GD)		3(3-0-6)
IST 523 Advanced Cloud Computing and Distributed System (GD)		3(3-0-6)

IST 524 Advanced Big Data Management (GD)	3(3-0-6)
IST 525 Computer Architectures (GD)	3(3-0-6)
IST 531 Advanced Cyber Securities (GD)	3(3-0-6)
IST 532 Embodied Artificial Intelligence (GD)	3(3-0-6)
IST 533 Advanced Robotics (GD)	3(3-0-6)
IST 534 Artificial Intelligence in Biomedical and Health Informatics (GD)	3(3-0-6)
IST 551 Probability for Information Science (GD)	3(3-0-6)
IST 553 Principles of Mathematical Analysis (GD)	3(3-0-6)
IST 555 Convex and Combinatorial Optimization (GD)	3(3-0-6)
IST 557 Network Optimization (GD)	3(3-0-6)
IST 571 Computer Vision (GD)	3(3-0-6)

1.6.2) Frontiers in Energy and Materials Technology

CHE 511 Principles of Biofuel Engineering (GD)	3(3-0-6)
CHE 512 Oil and Natural Gas Technologies (GD)	3(3-0-6)
CHE 513 Residue Oil Upgrading (GD)	3(3-0-6)
CHE 611 Electrochemical Engineering (GD)	3(3-0-6)
CHE 612 Electrochemical Energy Systems (GD)	3(3-0-6)
CHE 613 Fuel Processing Technologies (GD)	3(3-0-6)
MSE 522 Synthesis and Processing of Electronic and Photonic Materials (GD)	3(3-0-6)
MSE 525 Electrochemical Processing of Materials (GD)	3(3-0-6)
MSE 541 Materials for Energy Environmental and Biological Applications (GD)	3(3-0-6)
MSE 542 Photovoltaic and Solar Cell Materials and Devices (GD)	3(3-0-6)
MSE 543 Sensor and Transducer Materials and Technology (GD)	3(3-0-6)
MSE 625 Semiconductor Materials, Devices, and Technology (GD)	3(3-0-6)
MSE 626 Surface Coating Technology (GD)	3(3-0-6)
MSE 642 Nano Electronic and Photonics Materials and Devices (GD)	3(3-0-6)

1.6.3) Petrobased Engineering and Advanced Materials

CHE 521 Applied Catalysis (GD)	3(3-0-6)
CHE 522 Design and Preparation of Heterogeneous Catalysts (GD)	3(3-0-6)
CHE 621 Applied Surface and Colloid Chemistry (GD)	3(3-0-6)
CHE 622 Quantum Simulation of Molecules and Materials (GD)	3(3-0-6)
MSE 502 Chemical Synthesis of Materials (GD)	3(3-0-6)
MSE 504 Characterization of Materials (GD)	3(3-0-6)
MSE 514 Electrical, Magnetic, and Optical Properties of Materials (GD)	3(3-0-6)
MSE 524 Sol-Gel Nano Materials and Processing (GD)	3(3-0-6)
MSE 533 Thermal Analysis (GD)	3(3-0-6)

MSE 544 Advanced Ceramics and Applications (GD)	3(3-0-6)
MSE 545 Catalytic Materials and Applications (GD)	3(3-0-6)
MSE 616 Chemistry and Physics of Nanostructures (GD)	3(3-0-6)
MSE 619 Frontiers in Materials Science and Technology (GD)	3(3-0-6)
MSE 631 X-ray Science and Applications (GD)	3(3-0-6)
MSE 632 Surface Analysis and Spectroscopy (GD)	3(3-0-6)
MSE 633 Solid State Spectroscopy (GD)	3(3-0-6)
MSE 641 Magnetic Materials and Data Storage Materials and Technology (GD)	3(3-0-6)

1.6.4) Bioresource Engineering

CHE 531 Biological Engineering (GD)	3(3-0-6)
CHE 532 Biomass and Biological Waste Utilization (GD)	3(3-0-6)
CHE 533 Food Chemistry and Microbiology (GD)	3(3-0-6)
CHE 631 Properties and Characterization of Biomaterials (GD)	3(3-0-6)
MSE 521 Advanced Synthesis for Organic and Inorganic and Biological Materials (GD)	3(3-0-6)
MSE 645 Biomaterials and Soft Materials (GD)	3(3-0-6)

1.6.5) Molecular Design and Functional Polymers

CHE 541 Polymer Structure and Property (GD)	3(3-0-6)
CHE 542 Polymerization Engineering (GD)	3(3-0-6)
CHE 543 Computational Polymer Science and Engineering (GD)	3(3-0-6)
CHE 544 Polymer Processing (GD)	3(3-0-6)
CHE 641 Polymers Physics (GD)	3(3-0-6)
MSE 526 Rheology and Processing of Polymers (GD)	3(3-0-6)
MSE 614 Elasticity and Plasticity in Materials and Viscoelasticity of Polymers (GD)	3(3-0-6)
MSE 621 Composite Materials and Processing (GD)	3(3-0-6)
MSE 624 Molecular Design of Functional Polymers (GD)	3(3-0-6)
MSE 643 High-Performance Structural Materials (GD)	3(3-0-6)

1.6.6) Green Process Engineering, Process Control, and Others

CHE 551 Advanced Process Control (GD)	3(3-0-6)
CHE 552 Computer Process Control (GD)	3(3-0-6)
CHE 553 Computer-aided Computation for Chemical Engineers (GD)	3(3-0-6)
CHE 554 Chemical Reactor Analysis, Design and Scale-up (GD)	3(3-0-6)
CHE 555 Energy Conservation and Management (GD)	3(3-0-6)
CHE 556 Safety and Environmental Risk Analysis (GD)	3(3-0-6)
CHE 557 Cleaner Technology, Life Cycle Assessment and Eco-Design (GD)	3(3-0-6)
CHE 651 Control Theory (GD)	3(3-0-6)

CHE 652 Model-Based Control (GD)	3(3-0-6)
CHE 653 Multiphase Reactors (GD)	3(3-0-6)
CHE 654 Multifunctional Reactors (GD)	3(3-0-6)
MSE 515 Modeling and Simulation of Materials (GD)	3(3-0-6)
MSE 523 Ceramic Processing (GD)	3(3-0-6)
MSE 623 Advanced Cement-based Materials (GD)	3(3-0-6)

1.6.7) Frontier Research, Selected Topics, Seminar and Thesis

IST 696 Selected Topics: "Applications of Computational Intelligence for Brain-Computer Interface" (GD)	3(3-0-6)
IST 696 Selected Topics: "Database Systems" (GD)	3(3-0-6)
IST 696 Selected Topics: "Introduction to IST Research" (GD)	3(3-0-6)
IST 696 Selected Topics: "Mathematical Foundation for Data Science" (GD)	3(3-0-6)
IST 696 Selected Topics: "Robot Operating System I" (GD)	3(3-0-6)
IST 696 Selected Topics: "Computer Vision" (GD)	3(3-0-6)
IST 696 Selected Topics: "Natural Language Processing" (GD)	3(3-0-6)
IST 696 Selected Topics: "Probability" (GD)	3(3-0-6)
IST 696 Selected Topics: "Network Optimization" (GD)	3(3-0-6)
IST 696 Selected Topics: "Modeling and Simulation of Complex Systems" (GD)	3(3-0-6)
IST 696 Selected Topics: "Principles of Mathematical Analysis" (GD)	3(3-0-6)
IST 696 Selected Topics: "Quantum Computing: Principles and Application" (GD)	3(3-0-6)
IST 696 Selected Topics: "Pattern Recognition" (GD)	3(3-0-6)
IST 696 Selected Topics: "Critical Thinking and Effective Communication" (GD)	3(3-0-6)
IST 696 Selected Topics: "Complex Systems and Metaheuristic Algorithms" (GD)	3(3-0-6)
IST 696 Selected Topics: "Secure and Scalable Machine Learning System" (GD)	3(3-0-6)

2) Thesis

No less than 48 Credits

IST 699 Thesis (SU)	1-48
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