

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

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

<b>Total Credits of the Program</b>	No less than	79	Credit
<b>Curriculum Structure</b>			
1) Core Courses	No less than	31	Credit
1.1) Seminar		4	Credit
IST 697 Seminar (GD)			1(0-0-0)
1.2) Professional Development		3	Credit (non credit)
IST 691 Professional Development (SU)			3(3-0-6)
1.3) Leadership in Science and Engineering		3	Credit (non credit)
IST 692 Leadership in Science and Engineering (SU)			3(3-0-6)
1.4) English for Academic Research		3	Credit
IST 698 English for Academic Research (GD)			1(--)
1.5) Compulsory Core Courses	No less than	9	Credit
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	No less than	15	Credit
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 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 IST 524 Advanced Big Data Management (GD)			3(3-0-6)
IST 525 IST 525 Computer Architectures (GD)			3(3-0-6)
IST 531 IST 531 Advanced Cyber Securities (GD)			3(3-0-6)
IST 532 Embodied Artificial Intelligence (GD)			3(3-0-6)
IST 533 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 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	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)
<b>16.3) Petrobased Engineering and Advanced Materials</b>		
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)
<b>16.4) Bioresource Engineering</b>		
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	Composite and Hybrid Materials (GD)	3(3-0-6)
<b>16.5) Molecular Design and Functional Polymers</b>		
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" (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)
2) Thesis			No less than	48	Credit
	IST 699	Thesis (SU)			0(0-0-0)