General Information

General study subjects of Hezârfen Aeronautics and Space Technologies Institute focus on Space Science and Aeronautical, Electronics, Computer and Industrial Engineering applications related to aeronautical-space system and cyberspace.

Also, Hezârfen Aeronautics and Space Technologies Institute publishes an international refereed “Aeronautics and Space Technologies” journal which is printed twice times in a year since 2003, and it is indexed in lots of academic databases.

Who can apply?

Students who are personnel of Turkish Armed Forces and civilian can apply to ASTIN.

For Application Requirements and Detailed Information

www.hho.edu.tr/huten

Contact

Hezârfen Aeronautical and Space Technologies Institute
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Phone: +90-212-663 24 90/4366
Fax: +90-212-662 85 51
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Hezârfen Aeronautics and Space Technologies Institute

Aeronautical Engineering Department

Master Science Programs

-Aeronautical Engineering

-UAV Technologies

Doctorate Programs

-Aeronautical Engineering

Space Sciences Department

Master Science Programs

-Space Technologies

-Space Sciences

-Aerospace Policies and Law

-International Aerospace Policies and Law (without Thesis)

Doctorate Programs

-Space Sciences

-Satellite Technologies

-Aerospace Policies and Law

Electronics Engineering Department

Master Science Programs

-Electronics Engineering

-Communication Systems Engineering

-Control Systems Engineering

-Electronic Warfare

Doctorate Programs

-Electronics Engineering

Computer Engineering Department

Master Science Programs

-Software Engineering

-Cyber Security

-Information Technologies (Without Thesis)

Doctorate Programs

-Computer Engineering

Industrial Engineering Department

Master Science Programs

-Industrial Engineering

-Operation Engineering

-Modeling and Simulation

-Engineering and Technologies Management (Without Thesis)

Doctorate Programs

-Industrial Engineering

Aeronautical Engineering

The vision of the Aeronautical Engineering program is to give the required scientific background and the skills to the man power that support the activities in aviation and can follow the development in Air-Space Field. Aviation is going under a rapid change due to the developments in science and technology, with the modern and advanced technology it has.

Personnel who are graduates of Aeronautical Engineering field and other branches who fulfill the general requirements set by Aeronautical Engineering Department can be admitted to the graduate programs. Graduates of different majors need to attend an additional program.

M.S. Programs

- **Aeronautical Engineering**
- **UAV Technologies**

Ph.D. Program

- **Aeronautical Engineering**

M.S. Programs

- Aeronautical Engineering

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Seminar	0	1	0	0	7.5
						TOTAL:	30

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 120

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 501		Engineering Mathematics	3	0	0	3	7.5
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
HM 503		Optimization Techniques in Engineering	3	0	0	3	7.5
HM 504		Applied Numerical Methods	3	0	0	3	7.5
HM 511		Frictional Flow	3	0	0	3	7.5
HM 512		Advanced Gas Dynamics	3	0	0	3	7.5
HM 515		Internal Fluid Mechanics	3	0	0	3	7.5
HM 519		Computational Fluid Dynamics	3	0	0	3	7.5
HM 520		Advanced Heat Transfer	3	0	0	3	7.5
HM 521		Compressible Flow	3	0	0	3	7.5
HM 523		Incompressible Flow	3	0	0	3	7.5
HM 529		UAV Designing	3	0	0	3	7.5
HM 530		Advanced Aircraft Design	3	0	0	3	7.5
HM 531		Foundations of Solid Mechanics	3	0	0	3	7.5
HM 532		Structural Dynamics	3	0	0	3	7.5
HM 533		Vibration Theory	3	0	0	3	7.5
HM 534		Stability of Structures	3	0	0	3	7.5
HM 535		Aeroelastisit	3	0	0	3	7.5
HM 537		Mechanics of Composite Materials	3	0	0	3	7.5
HM 540		Finite Element Method	3	0	0	3	7.5

HM 541		Mechanical Properties of Materials	3	0	0	3	7.5
HM 543		Aerospace Materials and Manufacturing Methods	3	0	0	3	7.5
HM 551		Advanced Flight Mechanics	3	0	0	3	7.5
HM 552		Flight Control Systems I	3	0	0	3	7.5
HM 553		Flight control systems II	3	0	0	3	7.5
HM 555		Advanced Flight Dynamics	3	0	0	3	7.5
HM 556		Flight Dynamics and Control	3	0	0	3	7.5
HM 560		Avionics and navigation systems	3	0	0	3	7.5
HM 561		linear control systems	3	0	0	3	7.5
HM 563		Genetic Algorithms	3	0	0	3	7.5
HM 570		Aircraft Materials and Examinations	3	0	0	3	7.5
HM 575		Structure Inspection with Microscope	3	0	0	3	7.5
HM 622		Hypersonic Aerodynamics	3	0	0	3	7.5
HM 623		Turbulence	3	0	0	3	7.5
HM 624		Combustion	3	0	0	3	7.5
HM 625		Unstable and Turbulent Flow	3	0	0	3	7.5
HM 630		Flow-Induced Vibrations	3	0	0	3	7.5
HM 636		Theory of Plates and shells	3	0	0	3	7.5
HM 638		random vibrations of structures	3	0	0	3	7.5
HM 641		materials selection and Processes	3	0	0	3	7.5
HM 645		Microelectromechanical Systems	3	0	0	3	7.5

M.S. Programs

-UAV Technologies

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 501		Engineering Mathematics	3	0	0	3	7.5
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
HM 503		Optimization Techniques in Engineering	3	0	0	3	7.5
HM 504		Applied Numerical Methods	3	0	0	3	7.5
HM 511		Frictional Flow	3	0	0	3	7.5
HM 512		Advanced Gas Dynamics	3	0	0	3	7.5
HM 515		Internal Fluid Mechanics	3	0	0	3	7.5
HM 519		Computational Fluid Dynamics	3	0	0	3	7.5
HM 520		Advanced Heat Transfer	3	0	0	3	7.5
HM 521		Compressible Flow	3	0	0	3	7.5
HM 523		Incompressible Flow	3	0	0	3	7.5
HM 529		UAV Designing	3	0	0	3	7.5
HM 530		Advanced Aircraft Design	3	0	0	3	7.5
HM 531		Foundations of Solid Mechanics	3	0	0	3	7.5
HM 532		Structural Dynamics	3	0	0	3	7.5
HM 533		Vibration Theory	3	0	0	3	7.5
HM 534		Stability of Structures	3	0	0	3	7.5
HM 535		Aeroelastisit	3	0	0	3	7.5
HM 537		Mechanics of Composite Materials	3	0	0	3	7.5
HM 540		Finite Element Method	3	0	0	3	7.5
HM 541		Mechanical Properties of Materials	3	0	0	3	7.5
HM 543		Aerospace Materials and Manufacturing Methods	3	0	0	3	7.5
HM 551		Advanced Flight Mechanics	3	0	0	3	7.5
HM 552		Flight Control Systems I	3	0	0	3	7.5

HM 553		Flight control systems II	3	0	0	3	7.5
HM 555		advanced flight dynamics					
HM 556		Flight Dynamics and Control	3	0	0	3	7.5
HM 560		Avionics and navigation systems	3	0	0	3	7.5
HM 561		linear control systems	3	0	0	3	7.5
HM 563		Genetic Algorithms	3	0	0	3	7.5
HM 570		Aircraft Materials and Examinations	3	0	0	3	7.5
HM 575		Structure Inspection with Microscope	3	0	0	3	7.5
HM 622		Hypersonic Aerodynamics	3	0	0	3	7.5
HM 623		Turbulence	3	0	0	3	7.5
HM 624		Combustion	3	0	0	3	7.5
HM 625		Unstable and Turbulent Flow	3	0	0	3	7.5
HM 630		Flow-Induced Vibrations	3	0	0	3	7.5
HM 636		Theory of Plates and shells	3	0	0	3	7.5
HM 638		random vibrations of structures	3	0	0	3	7.5
HM 641		materials selection and Processes	3	0	0	3	7.5
HM 645		Microelectromechanical Systems	3	0	0	3	7.5

Ph.D. Program
-Aeronautical Engineering

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 246

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 501		Engineering Mathematics	3	0	0	3	7.5
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
HM 503		Optimization Techniques in Engineering	3	0	0	3	7.5
HM 504		Applied Numerical Methods	3	0	0	3	7.5
HM 511		Frictional Flow	3	0	0	3	7.5
HM 512		Advanced Gas Dynamics	3	0	0	3	7.5
HM 515		Internal Fluid Mechanics	3	0	0	3	7.5
HM 519		Computational Fluid Dynamics	3	0	0	3	7.5
HM 520		Advanced Heat Transfer	3	0	0	3	7.5
HM 521		Compressible Flow	3	0	0	3	7.5
HM 523		Incompressible Flow	3	0	0	3	7.5
HM 529		UAV Designing	3	0	0	3	7.5
HM 530		Advanced Aircraft Design	3	0	0	3	7.5
HM 531		Foundations of Solid Mechanics	3	0	0	3	7.5
HM 532		Structural Dynamics	3	0	0	3	7.5
HM 533		Vibration Theory	3	0	0	3	7.5
HM 534		Stability of Structures	3	0	0	3	7.5
HM 535		Aeroelastisit	3	0	0	3	7.5
HM 537		Mechanics of Composite Materials	3	0	0	3	7.5
HM 540		Finite Element Method	3	0	0	3	7.5
HM 541		Mechanical Properties of Materials	3	0	0	3	7.5
HM 543		Aerospace Materials and Manufacturing Methods	3	0	0	3	7.5
HM 551		Advanced Flight Mechanics	3	0	0	3	7.5

HM 552		Flight Control Systems I	3	0	0	3	7.5
HM 553		Flight control systems II	3	0	0	3	7.5
HM 555		Advanced Flight Dynamics	3	0	0	3	7.5
HM 556		Flight Dynamics and Control	3	0	0	3	7.5
HM 560		Avionics and navigation systems	3	0	0	3	7.5
HM 561		linear control systems	3	0	0	3	7.5
HM 563		Genetic Algorithms	3	0	0	3	7.5
HM 570		Aircraft Materials and Examinations	3	0	0	3	7.5
HM 575		Structure Inspection with Microscope	3	0	0	3	7.5
HM 622		Hypersonic Aerodynamics	3	0	0	3	7.5
HM 623		Turbulence	3	0	0	3	7.5
HM 624		Combustion	3	0	0	3	7.5
HM 625		Unstable and Turbulent Flow	3	0	0	3	7.5
HM 630		Flow-Induced Vibrations	3	0	0	3	7.5
HM 636		Theory of Plates and shells	3	0	0	3	7.5
HM 638		random vibrations of structures	3	0	0	3	7.5
HM 641		materials selection and Processes	3	0	0	3	7.5
HM 645		Microelectromechanical Systems	3	0	0	3	7.5

Contents of Graduate Courses

HM 500 Master of Science Theses: Program of research lead-ing to M.Sc. degree arranged between the student and a faculty member. Students register to this course starting from the begin-ning of their third semester for researching and writing the thesis project.

HM 501 Engineering Mathematics: Linear Space and Opera-tors. Matrix algebra. Tensor Fields. Complex Analysis. Calcu-lations of Variations. Differential Equations; Power Series and Solution of Special Functions. Solutions of Boundary-Value Problems. Transformation Methods. Green Function. Partial Dif-ferential Equations.

HM 502 Advanced Engineering Mathematics: Differential Equations, Power Series, Legendre Functions, Gamma Func-tions, Integration, Bessel Functions, Laplace Transformations, Quantative Methods and Numerical Solutions of Differential Equations, Boundry Value Problems Complex Numbers, and Complex Plane.

HM 503 Optimization Techniques in Engineering: Basic Ideas. Functions with One Variable. Free Functions with 'N' Variables. Forced Functions with 'N' Variables. Approach Techniques. Du-ality. Structural Optimization. General Design Applications.

HM 504 Advanced Applied Numerical Methods: Matrix So-lutions; Gauss Elimination, Jacobi, Gauss-Seidel, SOR , Kylov and Multigrid Methods. Interpolation Method. Numerical Inte-gral Method. Numerical Differential Method; Finite Differences, Finite Element, Finite Volume Methods; Validity, Methods of Spectrum and

Analysis of Wave Numbers. Methods for Ordi-nary Differential Equations; Validity and Stability. Error Analy-sis. Partial Differential Equations.

HM 511 Viscous Flow: Basic Laws for Continuum. Vortices Equation. Viscous Flow of Incompressible Fluids. Exact Solu-tions. Boundary Layer. Stability of Laminar Boundary Layer. Transition to Turbulent Flow. Boundary Layer of Compressible Fluids.

HM 512 Advanced Gas Dynamics: Unsteady 1-Dimensional Flow. Explosion Waves. Steady 2-Dimensional Flows. Similar-ity Rules at Subsonic Flows. Processes of Supersonic Flows . Method of Characteristics. Oblique and Normal Shock Waves.

HM513 Boundary Layer Theory: Basic Laws and Navier-Stokes Equations. Exact Solutions of Navier-Stokes Equations. Dynamics of Vortices. Low Reynolds Number Flows. Similarity Solutions of Normal and Thin Boundary Layers. Techniques of Integral Solutions. Jet Wake Regions and Mixed Layers. Hydro-dynamics Stability and Turbulence.

HM 514 Potential Flow: Solving the Linear and Non-linear States of Potential Flow Equations. Solutions of Oscillating, Random and Stable Flows Around the Profiles and Wings. The-odorsen, Wagner, Küssner and Cicala Functions. Obtaining and Solutions of the Aerodynamics Coefficients Matrices.

HM 515 Internal Fluid Mechanics: General Characteristics of the Internal Flows Around the Compressors and Turbines. Un-steady Cyclic Flows. Theory of Rotors. Viscosity and Effects of Compressibility. Loses and Inefficiency. Secondary Flows. In-stability of Turbo-Machine Flows.

HM 518 Turbulent Boundary Layers: Laminar and Turbulent Boundary Layer Equations. Falkner-Skan Transformations. Tur-bulence Models. Finite Difference and Interactive Methods for Boundary Layers. Numerical Solutions.

HM 519 Computational Fluid Dynamics: Continuum Laws, Euler and Navier-Stokes Equations. Finite Difference Solutions of Parabolic, Elliptic and Hyperbolic Equations and Analysis of their Stability. Techniques of Obtaining Solutions Net. Analysis of Euler and Navier-Stokes Equations of 2-D and 3-D Compress-ible Viscous/Inviscid Flows. Finite Volume Method. “Flux-Vec-tor Splitting” Method.

HM 520 Advanced Heat Transfer: Advanced Analysis of Con-duction, Convection and Radiation Heat Transfers.

HM 521 Compressible Flow: In order to give the required in-formation to the students about compressive aerodynamics , ba-sic notions can be met in practical applications.

HM 522 Advanced Aircraft Engine Design: Characteristics and Performance of Aircraft Engines. 2-D and 3-D Flows. Theo-ries of Compressors and Turbines. Design and Performance Cal-culation of Aircraft Engines.

HM 523 Uncompressible Flow: In order to give the required information to the students to perform computer applications let-ting numerical calculations of flow around 3-D objects without creating solution grids.

HM 530 Advanced Aircraft Design: Introduction. Methods of Aircraft Designs. Roskam Method of Aircraft Design. Specifica-tion of Aircraft Missions. Calculation of Aircraft Weights (Total Weight, Payload Weight, Fuel Weight etc.). Pre-sizing.

HM 531 Fundamentals of Solid Mechanics: Analysis of De-formations and Stresses. Introduction to Elasticity, Generalized Hook Law and Boundary Conditions. Principle of Minimum Potential Energy, Stresses; Torque, Bending and Shearing on Beams. Torque Analysis of Non-circular Beams.

HM 532 Structural Dynamics: Introduction. Lagrange Equa-tions. Continuous Systems. Euler Equations for Beams. Finite Element Method. Vibrations. Superposition of Modes. Meth-od of Direct Integration.

HM 533 Theory of Vibration: Free and Forced Vibrations. Characteristic Frequencies and Modes. Generalized Coordi-nates and Normal Modes. Free and Forced Vibrations of Sim-ple and Continuous Systems. Axial and Torque Oscillation of Sticks.

HM 534 Stability of Structures: Basic Elastic Stability The-ory. Balance of Deformed Systems. Equilibrium of Stable and Unstable Conditions. Branching Points, Limit Points and Criti-cal Loads. Energy Method. Rayleigh-Ritz Method. Stability of Straight Columns. Torque Analysis of Twisted Beams. Stability of Plates. Stability of Shells. Non-Linear Problems. Stability of Real Beams, Plates and Shells.

HM 535 Aeroelasticity: Introduction. Nature of Problems and Experiments. Errors Caused by the Flutter Effect. Flight-Flutter Tests. Linear Theoretical Aeroelasticity Models. Non-linear Theoretical Aero-elasticity Models. Theories of Aerodynam-ics. Structural Behaviors of Turbulent Boundary under Variable Pressures. Comparison of Theoretical and Experimental Solu-tions.

HM 537 Mechanics of Composite Materials: Plastic De-formation of Materials, Stress Equations, Motion Equations. Stress and Plastic Deformation Equations of Layers. Strength of Fibred Layers. Hygro-Thermal Behavioral Analysis of Lay-ers. Theories of Layered Beams. Classical Plate Theory and Analysis of Torque, Bending and Vibration Effects on Beams. Introduction to Linear and Elastic Refractions.

HM 540 Finite Element Methods: Introduction. Basic princi-ples of Finite Element Method. Principle of Minimum Potential Energy. Coordinate Transformations. Unification and Applica-tion of Boundary Conditions. Analysis of joints and Frames. Space Joint Element. Space Frame Element. Plane Frame Ele-ment. Rod Element. Analysis of Plates. Membrane Element. Bending Behavior of Plates. Shell Elements. Using Softwares. Application of Finite Element Method on Some Aircraft Struc-tures. Vibration Problems.

HM 541 Mechanical Properties of Materials: Mechanical Behaviors of Composites, Ceramics, Polymers and Metals be-ing used in the Field of Aeronautics. Simple and Joint Tensed Systems, Elastic and Plastic Behaviors, Mechanical Strengthen, Fatigue and Mechanical Tests.

HM 551 Advanced Flight Mechanics: Flight Mechanics and Advance Topics at Control. Optimum Control, Separate Data Control Systems. Aeroelasticity Effects. Pilot Models and Non-linear Effects.

HM 552 Flight Control Systems I: Introduction to Motion Equations of an Aircraft. Stability and Dynamics of Aircraft. Dynamic Effects of Structural Elasticity. Discomfiture Effect-ing Aircraft Motion. Flight and Control. Methods of Design-ing Control Systems.**HM 553 Flight Control Systems II:** Stability of Complex Structures. Altitude Control Systems. Navigation Control Systems. Active Control Systems. Helicopter Flight Control Systems. Digital Control Systems. Adaptable Flight Control Systems.

HM 555 Advanced Flight Dynamics: Reference Coordinates and Transformations. General Equations of Non-perpetual Mo-tion and Applications on Aircraft, Helicopter and Space Vehi-cles. Stability Effects. Flight at Turbulent Atmosphere.

HM 560 Avionics and Navigation Systems: Navigation Ele-ment Related to the Position and Motion of an Aircraft. Ground Radio-Navigation Systems, Satellite Radio-Navigation Sys-tems, Global Positioning System (GPS), Differential Global Positioning System (DGPS), Inertia Navigation System (INS), Gimballed Inertia Navigation System, Analytic (Strapdown) Inertia Navigation System, Air Data System, Doppler and Alti-tude Radars, Landing Systems, Joint Navigation Systems, GPS Supported Inertia Navigation System.

HM 561 Linear Control Systems: Introduction to the Theory of Modern Control Systems. Equations of Position Variables and Position Space. Vectors. Canonical Forms and Independent

Systems. Time Response of Position Space Systems. Transfor-mation Methods. Control and Observation. Lyapunov Stability Analysis. Design of Control Element for Position Space. Qua-dratic Optimal Control Systems.

HM 563 Genetic Algorithms: The purpose of this course is to teach Genetic Algorithms and the basics of Evolutionary Al-gorithms methods and demonstrate the application of these al-gorithms to the Aeronautical Engineering problems and create projects for different problems.

HM 570 Aircraft Materials and Inspection: In this course, production and the evaluation of metallic, ceramic, composite, and polymer materials that increase the aircraft performance and have strength against mechanical ,physical and chemical effects is taught. The direction of aircraft materials develop-ments is addressed. In addition experimental forces analysis and inspection without fault is taught. Thus it is aimed to have graduate students in Aeronautical engineering who has ad-vanced knowledge on aircraft materials and inspection.

HM 590 Graduate Seminar: Presentation involving current research given by graduate students and invited speakers in the aim of increasing the interests of the other students about dif-ferent subjects of aeronautics. This course is obligatory for the graduate students.

HM 591 M.Sc. Specialization Field Course: Investigation on study fields and developments on these study fields of all stu-dents, under the supervision of an advisor, who are progressing their M.Sc. thesis.

HM 600 Ph.D. Thesis: Program of research leading to Ph.D. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their fifth semester while the research program or write-up of thesis is in progress.

HM 622 Hypersonic Aerodynamics: Specialties of Hyperson-ic Flows and Inviscid Hypersonic Flow Theory. Similarities, Small Perturbation and Surface Inclination Methods. Burst Waves Method, Low Density Aerodynamics, High Tempera-ture Aerodynamics.

HM 623 Turbulence: Mass Averaged and Reynolds Time Av-eraged Navier-Stokes Equations, Related Problems, Turbulent Energy and Vortex Equilibrium. Internal and External Turbu-lent Flow. Statistical Turbulence Model. Transition from Lami-nar to Turbulent Flow.

HM 624 Combustion: Chemical Thermodynamics. Chemica. Kinetics. Conservation Equations of Multi-Input Reactions. Detonation of Pre-Mixed gases. Laminar Flames of Pre-Mixed Inputs. Gas Diffusion Flames and Combustion of Liquid Drop-lets. Turbulent Flames. Combustion of Two Phase Systems. Chemically Reacted Boundary Layer Flow.

HM 636 Theory of Plates and Shells: Bending of Rectangular Plates. Simply Bended of Plates. Circular Plates. Simply Sup-ported Rectangular Plates. Navier Solution. Different Bound-ary Conditions of Rectangular Plates. Approximate Solution Method of Plate Theory. General Theory of Cylindrical Shells.

HM 638 Random Vibrations of Structures: Probability Dis-tribution, Averages, Group Averages. Correlations, Fourier Analysis. Spectrum Density Narrow and Wide Band Processes. Response of Linear Systems. Transfer of Random Vibrations. Statistics of Narrow Band Processes. Multi-Dimensional Spec-trum Analysis. Response of Steady Linear Systems under Ran-dom Perturbations.

HM 556 Flight Dynamics and Control: Students will learn flight equations in the context of flight dynamics; teaching the methods by which the aircraft can calculate the response to control or external influences by giving equations expressing the longitudinal and lateral movement of the plane; to demonstrate the application of control theories to flight speed. Introduction, Fluid Mechanics and Basic Concepts in Aerodynamics, Static, Stability and Control, Equations of Motion of the Plane, Longitudinal Motion, Lateral Motion, Control of the Plane or Responses to Atmosphere Effects, Automatic Control Theories, Application of Control Theories to aircraft.

HM 570 Aircraft Materials and Inspections: Mechanical, physical and chemical resistance to aircraft impacts on aircraft The selection criteria of production characteristics of metallic, ceramic, polymer and composite materials affecting aircraft performance positively. The direction of development in aircraft materials is given. In addition, non-destructive testing is taught by experimental stress analysis applied to aircraft structural members. Thus, it is aimed to ensure that Aviation graduate students have advanced knowledge about aircraft materials and inspections.

HM 625 Instabilities and Turbulence: Instability, unpredictability and disorder are very often encountered in natural, technological, ecological, economic and social systems with important consequences on forecasting, design and decision making. These concepts have been historically introduced in the study of the laminar-turbulent transition in fluid flows, where they still represent an active field of research. Some questions of interest in this context are: Why `laminar' solutions, having a maximum degree of symmetry, become unstable and are replaced by less symmetric solutions? What are the reasons of unpredictability in non-linear systems? Is there anything predictable in turbulent flows? The scope of this course is to present our current understanding of these issues.

HM630 Flow Induced Vibrations: General concepts. Fluid forces from vibrating bodies. Fluid oscillator. Current-oscillator and object-oscillator concepts. Forced vibrations. Self-excited vibrations. Nonlinear vibrations. Classification of simple stimulation mechanisms. Example of depot-pipe-valve-balance pillar modeling.

HM 641 Materials Selection and Processing: Methods of Selection Processes for Materials being used at Aeronautical Industry. Methods of Determination of Risk and Cost Evalu-ations.

HM 645 MEMS (Micro-Electro-Mechanical Systems): This course is an introduction to MEMS intended for graduate and senior students. Silicon-based integrated MEMS promise reli-able performance, miniaturization and low-cost production of sensors and actuator systems with broad applications in data storage, biomedical systems, inertial navigation, micromanipu-lation, optical display and microfluid jet systems. The course covers such subjects as materials properties, fabrication tech-niques, basic structure mechanics, sensing and actuation prin-ciples, circuit and system issues, packaging, calibration and testing.

HM 690 Ph.D. Seminar: To increase the interest of the stu-dents for studying in different fields of Aeronautical engineer-ing science. Ph.D. students have to take this course and to fulfill their requirements.

HM 691 Ph.D. Specialization Field Course: Investigation on study fields and developments on these study fields of all stu-dents, under the supervision of an advisor, who are progressing their Ph.D. thesis.

Space Science

The vision of the Space Sciences Department is determined as to make Aeronautics and Space Technologies Institute Turkey's outstanding education and technologic information center.

It is the mission objective of the Space Program to train and educate personnel required in Turkey, in aerospace sciences, technologies, and especially design and evaluation of satellite systems.

Personnel, who are graduates of Aeronautical Engineering field and other branches and fulfill the general requirements set by Aeronautical Engineering Department, can be admitted to the graduate programs. Graduates of different majors need to at-tend an additional program.

Programs

Ph.D. Programs

-Satellite Technologies

-Space Science

-Aerospace Policy and Law

M.S. Programs

- Satellite Technologies

- Space Science

- Aerospace Policy and Law (without thesis)

M.S. Programs

-Satellite Technologies

-Space Science

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective III	3	0	0	3	7.5
SEC0006		Elective IV	3	0	0	3	7.5
SEC0007		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES

Code	Req.	Title	Lecture	Practical	Lab.	Local Credit	ECTS
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
UZ 508		Introduction To Space Technology	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
UZ 501		Introduction to the Concept of Space and Policy	3	0	0	3	7.5
UZ 502		Orbital Dynamics	3	0	0	3	7.5
UZ 503		Satellite Architecture and Subsystems	3	0	0	3	7.5
UZ 504		Satellite Mission and System Design	3	0	0	3	7.5
UZ 505		Satellite Communications	3	0	0	3	7.5
UZ 506		Remote Sensing Systems	3	0	0	3	7.5
UZ 507		Optical Systems Design	3	0	0	3	7.5
UZ 508		Introduction To Space Technology	3	0	0	3	7.5
UZ 510		Imaging Radar Design	3	0	0	3	7.5
UZ 511		Space Law	3	0	0	3	7.5
UZ 512		Operation and Management of Satellite Systems	3	0	0	3	7.5
UZ 513		Space Management, Marketing And Trade	3	0	0	3	7.5
UZ 515		International Space Policies	3	0	0	3	7.5
UZ 516		Communication Systems and Policies	3	0	0	3	7.5
UZ 517		International Strategic Management	3	0	0	3	7.5
UZ 518		Air and Spacecraft Sensors And İnstruments	3	0	0	3	7.5
UZ 519		Spacecraft Control Systems	3	0	0	3	7.5
UZ 520		Design and Construction of Space Structures And Bases	3	0	0	3	7.5
UZ 525		Space law and policy	3	0	0	3	7.5
UZ 529		Space Environment	3	0	0	3	7.5
UZ 530		Orbital Mechanics	3	0	0	3	7.5
UZ 531		Design and control of Satellite Systems	3	0	0	3	7.5
UZ 532		Drive Your Rocket	3	0	0	3	7.5
UZ 590		Graduate Seminar (Non-Credit)	3	0	0	3	7.5
UZ 591		Specialization Field Course	3	0	0	3	7.5
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5

M.S. Programs
-Aerospace Policy and Law

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective III	3	0	0	3	7.5
SEC0006		Elective IV	3	0	0	3	7.5
SEC0007		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
UZ 525		Space law and Policy	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
UZ 501		Introduction to the Concept of Space and Policy	3	0	0	3	7.5
UZ 502		Orbital Dynamics	3	0	0	3	7.5
UZ 503		Satellite Architecture and Subsystems	3	0	0	3	7.5
UZ 504		Satellite Mission and System Design	3	0	0	3	7.5
UZ 505		Satellite Communications	3	0	0	3	7.5
UZ 506		Remote Sensing Systems	3	0	0	3	7.5
UZ 507		Optical Systems Design	3	0	0	3	7.5
UZ 508		Introduction To Space Technology	3	0	0	3	7.5
UZ 510		Imaging Radar Design	3	0	0	3	7.5
UZ 511		Space Law	3	0	0	3	7.5
UZ 512		Operation and Management of Satellite Systems	3	0	0	3	7.5
UZ 513		Space Management, Marketing And Trade	3	0	0	3	7.5
UZ 515		International Space Policies	3	0	0	3	7.5
UZ 516		Communication Systems and Policies	3	0	0	3	7.5
UZ 517		International Strategic Management	3	0	0	3	7.5
UZ 518		Air and Spacecraft Sensors And İnstruments	3	0	0	3	7.5
UZ 519		Spacecraft Control Systems	3	0	0	3	7.5
UZ 520		Design and Construction of Space Structures And Bases	3	0	0	3	7.5
UZ 525		Space law and policy	3	0	0	3	7.5
UZ 529		Space Weather	3	0	0	3	7.5
UZ 530		Orbital Mechanics	3	0	0	3	7.5
UZ 531		Design and control of Satellite Systems	3	0	0	3	7.5
UZ 532		Drive Your Rocket	3	0	0	3	7.5
UZ 590		Graduate Seminar (Non-Credit)	3	0	0	3	7.5
UZ 591		Specialization Field Course	3	0	0	3	7.5
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5

Ph.D. Program

-Satellite Technologies

-Space Science

-Aerospace Policy and Law

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective III	3	0	0	3	7.5
SEC0006		Elective IV	3	0	0	3	7.5
SEC0007		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 246

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
UZ 508		Introduction To Space Technology	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
UZ 501		Introduction to the Concept of Space and Policy	3	0	0	3	7.5
UZ 502		Orbital Dynamics	3	0	0	3	7.5
UZ 503		Satellite Architecture and Subsystems	3	0	0	3	7.5
UZ 504		Satellite Mission and System Design	3	0	0	3	7.5
UZ 505		Satellite Communications	3	0	0	3	7.5
UZ 506		Remote Sensing Systems	3	0	0	3	7.5
UZ 507		Optical Systems Design	3	0	0	3	7.5
UZ 508		Introduction To Space Technology	3	0	0	3	7.5
UZ 510		Imaging Radar Design	3	0	0	3	7.5
UZ 511		Space Law	3	0	0	3	7.5
UZ 512		Operation and Management of Satellite Systems	3	0	0	3	7.5
UZ 513		Space Management, Marketing And Trade	3	0	0	3	7.5
UZ 515		International Space Policies	3	0	0	3	7.5
UZ 516		Communication Systems and Policies	3	0	0	3	7.5
UZ 517		International Strategic Management	3	0	0	3	7.5
UZ 518		Air and Spacecraft Sensors And İnstruments	3	0	0	3	7.5
UZ 519		Spacecraft Control Systems	3	0	0	3	7.5
UZ 520		Design and Construction of Space Structures And Bases	3	0	0	3	7.5
UZ 525		Space law and policy	3	0	0	3	7.5
UZ 529		Space Environment	3	0	0	3	7.5
UZ 530		Orbital Mechanics	3	0	0	3	7.5
UZ 531		Design and control of Satellite Systems	3	0	0	3	7.5
UZ 532		Drive Your Rocket	3	0	0	3	7.5
UZ 590		Graduate Seminar (Non-Credit)	3	0	0	3	7.5
UZ 591		Specialization Field Course	3	0	0	3	7.5
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5

Contents of Graduate Courses

UZ 500 Master of Science Theses: Program of research lead-ing to M.S. degree arranged between the student and a faculty member. Students register to this course starting from the be-ginning of their third semester for researching and writing the thesis project.

UZ 501 Introduction to Space Terms and Policies: What is space, physical properties, why space, history of space sciences, development of the space technologies, application fields and benefits to us, space industry and trade, dilemmas and policies in international space, space law, cooperation in space, space policies of various countries.

UZ 502 Orbital Dynamics: Axes and geometrical systems of bodies in space, world centered geometry, Kepler Laws, sat-ellite parameters, orbital and satellite trajectory calculations, perturbations, earth based observation of satellite trajectories, line of sight and projection, launch and entry to the atmosphere, space medium.

UZ 503 Satellite Architecture and Subsystems: General types of satellites, bus and basic satellite functions, structure and mechanisms, attitude detection and control, communica-tion, control and data processes, power, thermal design, posi-tion finding and navigation, types of payload, payload to satel-lite interfaces, rocket to satellite interface.

UZ 504 Satellite Mission and System Design: Concept of satellite mission, identifying mission requirements and its defi-nition, mission architecture decision, payload design; observa-tional payload, communication payload, mass budget. Power budget, link budget, satellite manufacture and tests, integration with the launch systems, ground base systems, education and management, accounting, and security standards.

UZ 505 Satellite Communication: Transmission architecture, data size and speed, space communication techniques, trans-mitted power, received power, noise, carrier to noise ratio, ef-fects of the medium, modulation techniques, polarization, spec-trum utilization, S, C, L, and Ku band specifications, analog transmission, digital transmission, ground base antenna and systems, FDMA, TDMA, CDMA, satellite networks.

UZ 506 Remote Sensing Systems: Electromagnetic radiation and remote sensing, passive and active sensing, fields of appli-cations, military applications, optical detection, IR, NIR, ther-mal sensing, SLAR, SAR, image forming, general image speci-fications; resolution, OTF, PSF, etc., image processing, sensing systems and specifications, design based on requirements.

UZ 507 Optical Systems Design: Types of cameras, types of films, sensor types, spectral radiometry, steps of design, princi-ples of optics, Fourier Optics, resolution, OTF, PSF, carrier vs. noise performance, spectral processing, prism and grating tech-niques, radiometric calibration, geometric and spectral filters.

UZ 508 Introduction to Space Technologies: What is space, physical properties, why space, history of space sciences, de-velopment of the space technologies, satellite parameters, pow-er formal design, position finding and navigation, application fields and benefits to us, space industry and trade, dilemmas and policies in international space, space law, international space organizations and policies, cooperation in space, space policies of various countries.

UZ 510 Imaging Radar Design: Principles of radar, angular resolution, distance resolution, sensitivity and clarity, attenua-tion, signal to noise ratio, receivers, reflection, scattering, PPI and B-scan radars, real aperture radar, synthetic aperture radar (SAR), image forming with SAR, SAR image processing, white noise, SAR satellite systems.

UZ 511 Space Law: International treaties on space, unarming space, UN Peaceful Use of Space Treaty, issues on boundaries of space, results of accidents in space, rights of use in space, rights and responsibilities of the countries, garbage problem, recent issues.

UZ 512 Satellite Systems Administration and Management: Definition of space and ground systems of the satellite systems and their interface, satellite control systems, space and ground segments definition interface, satellite control functions, ground base major functions, ground base main components, management principles, management costs, education, space logistics, legal requirements, options.

UZ 513 Space Management, Marketing and Trade: Space as an industrial and trade medium, communication sector, direct TV and radio transmission sector, growing satellite-internet sector, remote sensing sector, major contenders of the fields, pricing, costs, marketing techniques, competitions.

UZ 515 International Space Policies: USA, Russia, European Space Agency, European countries, Canada, Japan, India, Is-rael, Korea, and Brazil's space policies, interactions of those policies, UN Peaceful Use of Space Treaty, international space cooperation organizations and their scopes, joint projects.

UZ 516 Communication Systems and Policies: Communica-tion architecture, data size and rate, space communication tech-niques, antennas, transmitted and received power, communica-tion policies, and fields of application.

UZ 520 Space Structures and Bases Design and Construc-tion: Basic principles needed to be followed in constructing and designing bases in free space or bodies like the Moon or the Mars, Properties of this environment, Differences from earth environment Applied forces and their effects on structure de-sign, using, supplying and process of local material, protecting from radiation, supplying power, oxygen and water, preparing life conditions, processing and neutralizing of environmental disposals, transportation on the Moon and Mars, Providing and carrying on communication between space bases and earth.

UZ 590 Graduate Seminar: Presentation involving current research is given by graduate students and invited speakers in the aim of increasing the interests of the other students about different subjects of space sciences. This course is obligatory for the graduate students.

UZ 591 M.Sc. Specialization Field Course: Investigation on study fields and developments on these study fields of all stu-dents, under the supervision of an advisor, who are progressing their M.Sc. thesis.

UZ 600 Ph.D. Thesis: Program of research leading to Ph.D. degree, arranged between a student and the faculty member. Students register to this course in the fifth semester while the research program or write-up of the thesis is in progress.

UZ 690 Ph.D. Seminar: Program of research leading to Ph.D. degree, arranged between a student and the faculty member. Students register to this course in the fifth semester while the research program or write-up of the thesis is in progress.

UZ 691 Ph.D. Specialization Field Course: Investigation on study fields and developments on these study fields of all stu-dents, under the supervision of an advisor, who are progressing their Ph.D. thesis.

UZ 518 Weather spacecraft sensors and Appliances: air and spacecraft general information about Sensors, pressure sensors, static and dynamic pressure sensors, pressure sensors calibration of Pitot-static instruments and sensors, sensors, true air speed, Mach number indicator, angle of attack and side strap, sensors, altitude sensors, baro altimeter, radar altimeter, altitude of inertia by the method of measurement, vertical flight speed sensor, distance measurement, Doppler radar speed sensor, inertial sensors, accelerometer (accelerometer), overload indicator, accelerometer errors, Gyros, Two-axis and single-axis gyroscopes, Laser gyroscopes, Orientation sensors, Magnetometers, analog and discrete sun sensors, Horizon scanners, Star sensor, GPS (Global Positioning System) sensor to determine location and orientation, Astronomical navigation methods, multiple sensor data fusion

UZ 519 Spacecraft Control Systems: control systems purpose and types of spacecraft, orbital parameters, coordinate systems, Euler angles, direction cosines, quaternions, Gibbs-Rodriguez parameters, Euler's equations for rotational motion, the earth gravitational field the Earth's magnetic field, Solar pressure, atmospheric effect, attitude determination methods, the three-axis orientation sensing, sensors and control actuators, torque shifting techniques, Reaction tekerlik, control moment gyroscopes, spacecraft attitude dynamics, attitude stabilization, Spin stabilization method Gravity gradient stabilization System, Magnetic stabilization system, three-axis active attitude stabilization and control, spacecraft trajectories and flight the

equations of motion, spacecraft motion control , orbit determination and orbit control, orbit and attitude maneuvers

UZ 529 Space Weather: the atmosphere and the sun's heliospheric environment, solar activity, the magnetosphere and the magnetic regions, the ionosphere and ionospheric storms, magnetic storms, ionospheric radio communications, up natural atmosphere: termosfer and characteristics, variability, electromagnetic radiation, solar, space, satellites, satellite orbit and atmospheric properties of radiation types and effects on plasma and neutral atmosphere

UZ 530 Orbital mechanics: a brief history, the Law of attraction movement and the special Earth's orbit, circular orbits near the surface basic design calculations for mechanical energy and angular momentum Conservation, the equation of the orbit, ellipse, parabola, and hyperbola orbits of the basic features of the natural coordinates of the orbit, La Grange coefficients, time-dependent position ,in three dimensions the trajectories, the determination of the orbital elements state vector coordinate transformations, coordinate systems, using three position vectors, orbit determination, sidereal time, jules date, orbital maneuvers, interplanetary trajectories, and two restricted three-body problem, fundamentals of rocket propulsion, space environment

UZ 531 Design and Control of Satellite Systems: spacecraft missions, systems engineering, project description, spacecraft subsystems, mass and margin reviews, budget and power margin to the other margin, alternative analysis, trajectory analysis, space environment and spacecraft effects, and space propulsion systems, satellite attitude determination and control, Electrical Power Systems, thermal control , data, and command management, satellite communications systems , structures and mechanisms for satellites, launch systems , spacecraft operations and ground operations

UZ 532 Rocket Impulse: introduction to rocket impulse, impulse equation, speed exhaust energy and efficiency performance values, nozzle theory and thermodynamic relations, flight performance of rocket types and characteristics, student presentations

Electronics Engineering

Electronic engineering, one of the fundamental engineering branches, has gained great importance in this century where technology shows rapid developments. The vision of elec-tronic engineering program is to give required knowledge and skills to the manpower who will take place in communication, information technologies and defense area.

Personnel who are graduates of electronic engineering field and from other branches who fulfill the general requirements set by Electronic Engineering Department can be admitted to the graduate programs. Graduates of different majors need to attend an additive program.

Programs

M.S. Programs

-Electronics Engineering

-Communication Systems Engineering

-Control Systems Engineering

-Electronic Warfare

Ph.D. Program

-Electronics Engineering

M.S. Programs

-Electronics Engineering

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Compulsory I	3	0	0	3	7.5
SEC0006		Elective I	3	0	0	3	7.5
SEC0007		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES							
Code	**Req**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
EL 502		Theory of functions of a Complex Variable	3	0	0	3	7.5
EL 503		Random Signals and Statistical Signal Processing	3	0	0	3	7.5
EL 506		Microcontroller Based System Design	3	0	0	3	7.5
EL 507		Microwave Circuit Design	3	0	0	3	7.5
EL 510		Optimal Control Theory	3	0	0	3	7.5
EL 511		Linear System Theory	3	0	0	3	7.5
EL 512		Fuzzy Control	3	0	0	3	7.5
EL 513		Numerical Optimization	3	0	0	3	7.5
EL 520		Advanced Digital Signal Processing	3	0	0	3	7.5
EL 521		Digital Audio Processing	3	0	0	3	7.5
EL 522		Digital Video Processing	3	0	0	3	7.5
EL 529		High Frequency Planar RF Circuits	3	0	0	3	7.5
EL 530		Imaging Radar and Signal Processing	3	0	0	3	7.5
EL 531		Information Theory	3	0	0	3	7.5
EL 532		Computer Aided Design of Microwave Circuits	3	0	0	3	7.5
EL 533		Satellite Communication Systems	3	0	0	3	7.5
EL 534		Microwave Radar Systems	3	0	0	3	7.5
EL 535		Radar Systems	3	0	0	3	7.5
EL 536		Communication Systems	3	0	0	3	7.5
EL 537		Linear Control Systems	3	0	0	3	7.5
EL 538		Electromagnetic Calculation Methods	3	0	0	3	7.5
EL 539		Wireless Communication	3	0	0	3	7.5
EL 540		Image Processing and Applications	3	0	0	3	7.5
EL 541		Machine Learning and Genetic Algorithms	3	0	0	3	7.5
EL 542		Smart Systems	3	0	0	3	7.5
EL 543		Applied electromagnetic theory	3	0	0	3	7.5
EL 544		Sensor Technologies and Applications	3	0	0	3	7.5
EL 542		Applied Electromagnetic Theory	3	0	0	3	7.5
EL 545		Advanced Electronic Warfare	3	0	0	3	7.5
EL 550		Modeling of Electronic Components	3	0	0	3	7.5
EL 555		Optical Networks	3	0	0	3	7.5
EL 615		Radio Wave Communication Systems	3	0	0	3	7.5
EL 616		Biologically-Inspired and Nano-Fundamentals of Communication	3	0	0	3	7.5
EL 620		Adaptive Systems	3	0	0	3	7.5
EL 637		Nonlinear Control Systems	3	0	0	3	7.5

M.S. Programs
-Communication Systems Engineering

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Compulsory I	3	0	0	3	7.5
SEC0006		Elective I	3	0	0	3	7.5
SEC0007		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
EL 502		Theory of functions of a Complex Variable	3	0	0	3	7.5
EL 503		Random Signals and Statistical Signal Processing	3	0	0	3	7.5
EL 506		Microcontroller Based System Design	3	0	0	3	7.5
EL 507		Microwave Circuit Design	3	0	0	3	7.5
EL 510		Optimal Control Theory	3	0	0	3	7.5
EL 511		Linear System Theory	3	0	0	3	7.5
EL 512		Fuzzy Control	3	0	0	3	7.5
EL 513		Numerical Optimization	3	0	0	3	7.5
EL 520		Advanced Digital Signal Processing	3	0	0	3	7.5
EL 521		Digital Audio Processing	3	0	0	3	7.5
EL 522		Digital Video Processing	3	0	0	3	7.5
EL 529		High Frequency Planar RF Circuits	3	0	0	3	7.5
EL 530		Imaging Radar and Signal Processing	3	0	0	3	7.5
EL 531		Information Theory	3	0	0	3	7.5
EL 532		Computer Aided Design of Microwave Circuits	3	0	0	3	7.5
EL 533		Satellite Communication Systems	3	0	0	3	7.5
EL 534		Microwave Radar Systems	3	0	0	3	7.5
EL 535		Radar Systems	3	0	0	3	7.5
EL 536		Communication Systems	3	0	0	3	7.5
EL 537		Linear Control Systems	3	0	0	3	7.5
EL 538		Electromagnetic Calculation Methods	3	0	0	3	7.5
EL 539		Wireless Communication	3	0	0	3	7.5
EL 540		Image Processing and Applications	3	0	0	3	7.5
EL 541		Machine Learning and Genetic Algorithms	3	0	0	3	7.5
EL 542		Smart Systems	3	0	0	3	7.5
EL 543		Applied electromagnetic theory	3	0	0	3	7.5
EL 544		Sensor Technologies and Applications	3	0	0	3	7.5
EL 542		Applied Electromagnetic Theory	3	0	0	3	7.5
EL 545		Advanced Electronic Warfare	3	0	0	3	7.5
EL 550		Modeling of Electronic Components	3	0	0	3	7.5
EL 555		Optical Networks	3	0	0	3	7.5
EL 615		Radio Wave Communication Systems	3	0	0	3	7.5
EL 616		Biologically-Inspired and Nano-Fundamentals of Communication	3	0	0	3	7.5
EL 620		Adaptive Systems	3	0	0	3	7.5
EL 637		Nonlinear Control Systems	3	0	0	3	7.5

M.S. Programs
-Control Systems Engineering

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Compulsory I	3	0	0	3	7.5
SEC0006		Elective I	3	0	0	3	7.5
SEC0007		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
EL 511		Linear System Theory	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
EL 502		Theory of functions of a Complex Variable	3	0	0	3	7.5
EL 503		Random Signals and Statistical Signal Processing	3	0	0	3	7.5
EL 506		Microcontroller Based System Design	3	0	0	3	7.5
EL 507		Microwave Circuit Design	3	0	0	3	7.5
EL 510		Optimal Control Theory	3	0	0	3	7.5
EL 511		Linear System Theory	3	0	0	3	7.5
EL 512		Fuzzy Control	3	0	0	3	7.5
EL 513		Numerical Optimization	3	0	0	3	7.5
EL 520		Advanced Digital Signal Processing	3	0	0	3	7.5
EL 521		Digital Audio Processing	3	0	0	3	7.5
EL 522		Digital Video Processing	3	0	0	3	7.5
EL 529		High Frequency Planar RF Circuits	3	0	0	3	7.5
EL 530		Imaging Radar and Signal Processing	3	0	0	3	7.5
EL 531		Information Theory	3	0	0	3	7.5
EL 532		Computer Aided Design of Microwave Circuits	3	0	0	3	7.5
EL 533		Satellite Communication Systems	3	0	0	3	7.5
EL 534		Microwave Radar Systems	3	0	0	3	7.5
EL 535		Radar Systems	3	0	0	3	7.5
EL 536		Communication Systems	3	0	0	3	7.5
EL 537		Linear Control Systems	3	0	0	3	7.5
EL 538		Electromagnetic Calculation Methods	3	0	0	3	7.5
EL 539		Wireless Communication	3	0	0	3	7.5
EL 540		Image Processing and Applications	3	0	0	3	7.5
EL 541		Machine Learning and Genetic Algorithms	3	0	0	3	7.5
EL 542		Smart Systems	3	0	0	3	7.5
EL 543		Applied electromagnetic theory	3	0	0	3	7.5
EL 544		Sensor Technologies and Applications	3	0	0	3	7.5
EL 542		Applied Electromagnetic Theory	3	0	0	3	7.5
EL 545		Advanced Electronic Warfare	3	0	0	3	7.5
EL 550		Modeling of Electronic Components	3	0	0	3	7.5
EL 555		Optical Networks	3	0	0	3	7.5
EL 615		Radio Wave Communication Systems	3	0	0	3	7.5
EL 616		Biologically-Inspired and Nano-Fundamentals of Communication	3	0	0	3	7.5
EL 620		Adaptive Systems	3	0	0	3	7.5
EL 637		Nonlinear Control Systems	3	0	0	3	7.5

M.S. Programs
-Electronic Warfare

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Compulsory I	3	0	0	3	7.5
SEC0006		Elective I	3	0	0	3	7.5
SEC0007		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
EL 545		Advanced Electronic Warfare	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
EL 502		Theory of functions of a Complex Variable	3	0	0	3	7.5
EL 503		Random Signals and Statistical Signal Processing	3	0	0	3	7.5
EL 506		Microcontroller Based System Design	3	0	0	3	7.5
EL 507		Microwave Circuit Design	3	0	0	3	7.5
EL 510		Optimal Control Theory	3	0	0	3	7.5
EL 511		Linear System Theory	3	0	0	3	7.5
EL 512		Fuzzy Control	3	0	0	3	7.5
EL 513		Numerical Optimization	3	0	0	3	7.5
EL 520		Advanced Digital Signal Processing	3	0	0	3	7.5
EL 521		Digital Audio Processing	3	0	0	3	7.5
EL 522		Digital Video Processing	3	0	0	3	7.5
EL 529		High Frequency Planar RF Circuits	3	0	0	3	7.5
EL 530		Imaging Radar and Signal Processing	3	0	0	3	7.5
EL 531		Information Theory	3	0	0	3	7.5
EL 532		Computer Aided Design of Microwave Circuits	3	0	0	3	7.5
EL 533		Satellite Communication Systems	3	0	0	3	7.5
EL 534		Microwave Radar Systems	3	0	0	3	7.5
EL 535		Radar Systems	3	0	0	3	7.5
EL 536		Communication Systems	3	0	0	3	7.5
EL 537		Linear Control Systems	3	0	0	3	7.5
EL 538		Electromagnetic Calculation Methods	3	0	0	3	7.5
EL 539		Wireless Communication	3	0	0	3	7.5
EL 540		Image Processing and Applications	3	0	0	3	7.5
EL 541		Machine Learning and Genetic Algorithms	3	0	0	3	7.5
EL 542		Smart Systems	3	0	0	3	7.5
EL 543		Applied electromagnetic theory	3	0	0	3	7.5
EL 544		Sensor Technologies and Applications	3	0	0	3	7.5
EL 542		Applied Electromagnetic Theory	3	0	0	3	7.5
EL 545		Advanced Electronic Warfare	3	0	0	3	7.5
EL 550		Modeling of Electronic Components	3	0	0	3	7.5
EL 555		Optical Networks	3	0	0	3	7.5
EL 615		Radio Wave Communication Systems	3	0	0	3	7.5
EL 616		Biologically-Inspired and Nano-Fundamentals of Communication	3	0	0	3	7.5
EL 620		Adaptive Systems	3	0	0	3	7.5
EL 637		Nonlinear Control Systems	3	0	0	3	7.5

Ph.D. Program

- Electronics Engineering

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	3	7.5
SEC0007		Elective IV	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective V	3	0	0	3	7.5
SEC0006		Elective VI	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 246

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
HM 502		Advanced Engineering Mathematics	3	0	0	3	7.5
EL 502		Theory of Functions of a Complex Variable	3	0	0	3	7.5
EL 503		Random Signals and Statistical Signal Processing	3	0	0	3	7.5
EL 506		Microcontroller Based System Design	3	0	0	3	7.5
EL 507		Microwave Circuit Design	3	0	0	3	7.5
EL 510		Optimal Control Theory	3	0	0	3	7.5
EL 511		Linear System Theory	3	0	0	3	7.5
EL 512		Fuzzy Control	3	0	0	3	7.5
EL 513		Numerical Optimization	3	0	0	3	7.5
EL 520		Advanced Digital Signal Processing	3	0	0	3	7.5
EL 521		Digital Audio Processing	3	0	0	3	7.5
EL 522		Digital Video Processing	3	0	0	3	7.5
EL 529		High Frequency Planar RF Circuits	3	0	0	3	7.5
EL 530		Imaging Radar and Signal Processing	3	0	0	3	7.5
EL 531		Information Theory	3	0	0	3	7.5
EL 532		Computer Aided Design of Microwave Circuits	3	0	0	3	7.5
EL 533		Satellite Communication Systems	3	0	0	3	7.5
EL 534		Microwave Radar Systems	3	0	0	3	7.5
EL 535		Radar Systems	3	0	0	3	7.5
EL 536		Communication Systems	3	0	0	3	7.5
EL 537		Linear Control Systems	3	0	0	3	7.5
EL 538		Electromagnetic Calculation Methods	3	0	0	3	7.5
EL 539		Wireless Communication	3	0	0	3	7.5
EL 540		Image Processing and Applications	3	0	0	3	7.5
EL 541		Machine Learning and Genetic Algorithms	3	0	0	3	7.5
EL 542		Smart Systems	3	0	0	3	7.5
EL 543		Applied electromagnetic theory	3	0	0	3	7.5
EL 544		Sensor Technologies and Applications	3	0	0	3	7.5
EL 542		Applied Electromagnetic Theory	3	0	0	3	7.5
EL 545		Advanced Electronic Warfare	3	0	0	3	7.5
EL 550		Modeling of Electronic Components	3	0	0	3	7.5
EL 555		Optical Networks	3	0	0	3	7.5
EL 615		Radio Wave Communication Systems	3	0	0	3	7.5
EL 616		Biologically-Inspired and Nano-Fundamentals of Communication	3	0	0	3	7.5
EL 620		Adaptive Systems	3	0	0	3	7.5
EL 637		Nonlinear Control Systems	3	0	0	3	7.5

Contents of Graduate Courses

EL 500 Master of Science Theses: Program of research lead-ing to M.Sc. degree, arranged between student and a faculty member. Students register to this course in all semesters start-ing from the beginning of their third semester while the re-search program or write-up of thesis is in progress.

EL 502 Theory of Functions of Complex Variables: Complex plane, Definitions of Metric and Limit, Functions on complex plane, Power function, Trigonometric function, Branch cuts, Differentiation and Integration on complex plane, Cauchy-Riemann equations, Cauchy theorem, Jordan theorem, Differ-entiation of regular functions, Residues, Summation of infinite series, Liouville theorem, Maximum absolute value theorem, Mean value theorem and Taylor series.

EL 503 Random Signals and Statistical Signal Processing: Random vectors, Discrete time stochastic processes; Gaussian-Markov discrete time models in the rational and state spaces; estimation: parameter estimation, Wiener and Levinson filters, Kalman filters: filtering and estimation, stability, adaptive fil-tering.

EL 510 Optimal Control Theory: The optimal control prob-lem, basic concepts and descriptions. Performance index, con-trol variables and shortenings. Computing of variations. The principle of Pontryagin's maximalise. The linear regulator problem. Minimum time, minimum control power and orbit tracking problem. The applications of the minimum time, min-imum control power and orbit tracking problems.

EL 511 Linear System Theory: System description and clas-sification of systems. State space representation of systems. Linearization of nonlinear systems. Relations between state space representation and transfer function. Transfer matrix of multi input and multi output systems. Analysis of linear, time-invariant and varying systems, state transition matrix. Con-trollability. Stability of systems, Liapunov's theory, stability analysis with Liapunov criteria.

EL 512 Fuzzy Control: Mathematics and control of fuzzy systems, Fuzzy Systems and their properties, Design of fuzzy systems from the input-output data, Adaptive and non-adaptive fuzzy control, Fuzzy relationship equations, Fuzzy arithmetics, Fuzzy Linear programming and probability theorem.

EL 513 Numerical Optimization: Analytical and numeri-cal aspects of finite dimensional optimization, Unconstrained and constrained problems, iterative solutions; steepest descent methods, linear programming, nonlinear programming and Kuhn-Tucker theory, dynamics programming and multi-vari-ables optimization. Examples and computer implementations.

EL 520 Advanced Digital Signal Processing: Discrete time signals and systems, Discrete time Fourier transform, Linear time-invariant systems, Sampling of continuous time signals, Variation of sampling rate, Interpolation, Decimation, Z-trans-form, Transform domain analysis of the linear time-invariant systems, Discrete time system structures, Discrete Fourier transform, Fast Fourier Transform and filter design methods.

EL 521 Digital Speech Processing: Digital signal processing techniques, applying analysis and synthesis of speech process-ing, Digital models for the speech signal. waveform coders. Time domain and frequency domain methods for speech pro-cessing, Linear Predictive coding of speech, man-machine communication by voice, speech decomposition, speaker de-composition.

EL 522 Numerical Image Processing: To demonstrate to the students the numeric showing of images, application of basic mathematical processes to the images and the image improve-ment by mathematical processes. After creation of image and the term numerical image, histogram term and improvement of image by histograms and contrast correction process is told. Afterwards two major subjects are being held. First starting with spatial domain, neighboring calculations and folding methods of image processing are told. Then Fourier transform subject is started. Fourier transform subject is discussed with various examples by sparing enough time. Bringing front the folding process, the equality of two environments will be em-phasized. Image improvement, filtering, rotation, similar ap-plications is showed and discussed weighted on transformation environment. For this purpose, ideal Gaussian, Butterworth, mean, median and adaptive filters and different noise type and degeneration models is taught. As the last subject of the term color and properties of color images is taken into consider-ation. Computer programming homework is assigned in order to have students

learn subjects via application. Developed stu-dents programs are presented as reports , controlled and applied individually with examples.

EL 530 Imaging Radar and Signal Processing: Microwave imaging concept, theory of Synthetic Aperture Radar (SAR), Digital Signal Processing of frequency modulation pulse com-pression SAR systems, analysis of signal, image and noise, In-verse Synthetic Aperture Radar(ISAR) and image processing, three dimension imaging of incoherent monopulse radar, two dimension range and cross-range imaging of rotation objects, iterative imaging formation methods, resolution, aperture syn-thesize, power requirement and fading statistics, phase and motion errors, ambiguity functions and optimum design crite- ria, multi polarization SAR, SAR simulation.

EL 531 Information Theory: Information concept. Entropy; Mutual and constraint entropies. Source coding. Unique and immediate codes. Coding theory. Optimum Hoffman cod-ing. Communication channel models. Analog channels and measuring of information. Continuous time Gauss channels. Channel capacity and measurement methods. Channel coding. Noise coding theory which senses and corrects the errors. Po-rite codes. Periodic codes. BCH and convolution codes. Cod-ing and decoding designs.

EL 532 CAD of Microwave Circuits: Principles of CAD of microwave circuits, matrix representations of microwave cir-cuits, scattering matrices, transistor amplifiers at microwave frequencies and oscillator design, mixers, noise, directional couplers, power splitters and phase shifters.

EL 533 Satellite Communication Systems: Satellite orbits, Satellite system structure, and communication subsystems, Communication techniques: multiplexing, modulation and coding. Link analysis, Ground station technologies, properties of satellite communication systems.

EL 534 Microwave Radar Systems: Introduction to Radar, properties of radar systems, radar range equations, transmit-ters, receivers and antennas, trends on signal wave shape de-sign, signal processing techniques, noise and clutter, pulse compression, propagation, SAR, CW and FM radars, Pulsed Doppler Radar, remote sensing radar and laser radar.

EL 535 Radar Systems: By giving properties of signals used in radar, properties of radar and systems, radar cross section, propagation, radar equation, continuous wave radar, moving target radars, surveillance radar, artificial array radars, and ap-plication examples targets to get knowledge about radars.

EL 540 Image Processing and Applications: Two-Dimen-sional filter design; 2-D Z-transform and discrete time Fourier transform, edge detection and subroutines, image enhance-ment, image recognition, image coding, image analysis of 2-D signals.

EL 541 Machine Learning and Genetic Algorithms: Ba-sic concepts. Representation of information. Transformations among the data representation. Feature extraction of methods on 2-D and 3-D objects. Learning of the machine via searching and classification methods. Neural network algorithms. Genet-ic algorithms. Selection, production, crossover and mutation. Shannon theorem. Genetic algorithm operators and techniques. Genetic learning.

EL 542 Intelligent Systems: Fuzzy logic, fuzzy sets, opera-tions on fuzzy sets, fuzzy control, neural networks, mathemati-cal modeling of neurons, classification methods, least squares method, error back propagation method, neural networks with Gauss central basis function, definition of fuzzy image, fuzzy classification.

EL 550 Modeling of Electronic Components: Necessity of the modeling, CAD modeling, diode modeling, BJT models, EMI models, improved EM models, Gummel Poon model, JFET and MOSFET models, determination of model param-eters, measurement methods, applying models to CAD.

EL 555 Optical Networks: This course will provide students with a fundamental understanding of optical network design, control, and management. The topics which will be covered in this course include: Optical network design, optical network modeling, routing and wavelength assignment algorithms, op-tical network simulation tools and techniques.

EL 590 Graduate Seminar: Presentation involving current research given by graduate students and invited speakers in the aim of increasing the interests of the other students about different subjects of electronics. This course is obligatory for the graduate students.

EL 591 M.Sc. Specialization Field Course: Investigation on study fields and developments on these study fields of all stu-dents, under the supervision of an advisor, who are progressing their M.Sc. thesis.

EL 600 Ph.D. Thesis: Program of research leading to Ph.D. degree arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their fifth semester while the research pro-gram or write-up of thesis is in progress.

EL 615 Radio Wave Communication Systems: In this course; it is aimed to give required knowledge to the students to perform theory and application on Radio Wave Communica-tion Systems.

EL 690 Ph.D. Seminar: To increase the interest of the students for studying in different fields of electronic science. Ph.D. stu-dents have to take this course and to fulfill their requirements.

EL 691 Ph.D. Specialization Field Course: Investigation on study fields and developments on these study fields of all stu-dents, under the supervision of an advisor, who are progressing their Ph.D. thesis.

EL 506 Design of Microcontroller Based Systems: Microcontroller arthitecture, memory arthitectures, programming languages (Assembler, CSS, C), data analysis, A/D and D/A converters, communication peripheral and methods, transducers, peripheral management, sensor network and management.

EL 507 Design of Microwave Circuits: Introduction to microwave circuits, transmission line theory, impedance matching, noise in microwave circuits, distortion and nonlineart effects in microwave circuits, antennas and electromagnetic wave propagation, two-port networks ans s-parameters, microwave amplifier design.

EL 538 Computational Electrognetics Methods: EM field and wave theory, classification of EM problems, calculation of first and second order derivatives by finite differences method, solution of one and three dimensional wave propagation and reflection problems by the finite differences time domain (FDTD) method, application of finite differences methods to cylindirical structures, solution of some problems by the method of moments, introduction to the finite elements method, introduction to the finite elements method, application of the finite elements method to the laplace, poisson and wave equation methods.

EL 539 Wireless Communication: Wired and wireless systems, factors limiting the communication systems, electromagnetic spectrum, atmospherical properties and and signal propagation, layers of communication systems, coverage area of wireless systems, pico, micro, macro and satellite cells, channel interference, radio resource management, advantages of wireless communication, ISM band antennas and concepts, antenna gain, free space propagation model, far field and near fiels computations, path loss, isotropic path loss, shadowing, experimental path loss models, OKUMURA- HATA, Cost 237- line model, Cost 231-WALFISH-IKEGAMI line model, channel effects, reflection, refraction, scattering, propagation paramemeters and short distance fading, fundamentals of system design: cellular channel dedication, handshaking strategies, reusage of the channels, optimumu receiver structures, digital channel dedication, optimum receiver design, digital modulations, wave shaping, equalization, channel estimation, standarts, 1G, 2G, 3G ve 4G systems, IEEE 802.11, IEEE 802.16, Bluetooth systems, cellular structure, CDMA systems, frequency hopping systems, OFDM systems, receiver and transmitter arthitectures, channel coding systems.

EL 543 Applied Electromagnetics Theory: The aim is to help the post graduate students implement the solution of electromagnetics problems and develop design applications. Maxwell solutions, numerical methods, modelling and simulation with CST, other softwares, evaluation of the projects.

EL 544 Receiver Technologies and Applications: Receiver structures, communication protocols, sensor networks, microcontroller infrastructureand programming techniques are taught in this course. Receiver and transducer characteristics, electrical principles of reception, transducers, structural and functional classification, temperature transducers, tension transducers, optical receivers, inductive and capacitive receivers, microprocessor arthitecture and programming techniqes, sensor networks and management, computer communication, network technologies.

EL 545 Advanced Electronic Warfare: History of electronic warfare, electronic defense concept and electronic listening and direction finding, electronic support measures, radar warning systems, passive and

active electronic countermeasures, electronic counter-counter measures, radar techniques, tracking radar, radar operation principle, block diagram, equation,target detection, doppler effect, high frequency and microwave radar antennas and arrays, microwave and milimetric wave radars, over the horizon and subsurface radars, passive radar, acoustic radar, IR / Laser guided weapon and missiles, radar evasion: RCS reduction and RF jamming techniques, Surface Aperture Radar (SAR) applications.

EL 616 Fundamentals of Bilogically-Inspired Nano Communication: In this lesson, concepts on Fundamentals of Bilogically-Inspired Nano Communication will be taught. Laws and dynamics of the existing bilologically inspired communication protocols and algorithms will be inverstigated. The chapters are: diffufion based molecular communication, neural communication, terrahertz electromagnetic communication, molecular array communication, communication based on Förster Resonance Energy Transfer (FRET), molecular interconnected channel communication, pheromon based communication, information fundamentals of the nano-scaled molecular communication, noise, attenuation, delay, reliability, error control, existing and future applications of minimum energy coding, nano-scaled molecular communication, health applications, laboratuvary on chip, nanosensor networks, now and future of the research on nano-scaled molecular communication technologies.

EL 620 Adaptive Systems: In this lesson, the adaptive control, parameter definition in real time, armax models, model-reference adaptive control, pole placement, gradient approach, model reference adaptive systems based on SPR law, pre-adaptive control (direct and indirect), predictive cotrol subjects are taught.

EL 637 Non-Linear Control Systems: Classical systems, analysis and design methods, analysis of nonlinear systems, phase plane analysis, stability of nonlinear systems, lyapunov theorem, nonlinear control system design, feedback linearization, partial feedback linearization, adaptive control, sliding mode control, missing actuator systems, high level sliding mode control for missing actuator systems

Computer Engineering

The purpose of Computer Engineering program in our institute is to provide qualified personnel, who are good at computer and information technology and able to deal with the data ex-change methods among various disciplines in the era of high technology.

Personnel, who are graduates of Computer Engineering field and other branches and fulfill the general requirements set by Computer Engineering Department, can be admitted to the graduate programs. Graduates of different majors need to at-tend an additional program.

Programs

M.S. Programs

-Software Engineering

-Cyber Security

-Information Technology (Without Thesis)

Ph.D. Program

-Computer Engineering

M.S. Programs

- Software Engineering

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	3	7.5
SEC0007		Elective IV	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective V	3	0	0	3	7.5
SEC0006		Elective VI	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
BM 501		Object-Oriented Programming Languages and Systems	3	0	0	3	7.5
BM 502		Algorithm Analyses	3	0	0	3	7.5
BM 503		Programming Languages	3	0	0	3	7.5
BM 504		Real-Time Programming	3	0	0	3	7.5
BM 505		Advanced Topics in Software Engineering	3	0	0	3	7.5
BM 511		Discrete mathematics	3	0	0	3	7.5
BM 512		Probability Theory and Stochastic Processes	3	0	0	3	7.5
BM 521		Database Management Systems	3	0	0	3	7.5
BM 522		Object-Oriented Database Systems	3	0	0	3	7.5
BM 523		Distributed Database Systems	3	0	0	3	7.5
BM 525		Distributed Systems	3	0	0	3	7.5
BM 527		Special Topics in Distributed Systems	3	0	0	3	7.5
BM 528		Cyber Warfare and Security	3	0	0	3	7.5
BM 531		Computer Networks and Communications	3	0	0	3	7.5
BM 532		Basic Protocols in Computer Networks	3	0	0	3	7.5
BM 533		Computer Network Security	3	0	0	3	7.5
BM 534		Cryptography	3	0	0	3	7.5
BM 535		Mobile Agent Systems	3	0	0	3	7.5
BM 541		Image Processing	3	0	0	3	7.5
BM 542		Computer Vision	3	0	0	3	7.5
BM 543		Shape Recognition	3	0	0	3	7.5
BM 551		Parallel information processing and multiprocessor systems	3	0	0	3	7.5
BM 552		Parallel Programming	3	0	0	3	7.5
BM 553		Distributed Data Processing	3	0	0	3	7.5
BM 554		Distributed Operating Systems	3	0	0	3	7.5
BM 555		Multi-Core Programming	3	0	0	3	7.5
BM 556		Number Theory	3	0	0	3	7.5
BM 561		Artificial Intelligence	3	0	0	3	7.5
BM 563		Artificial Neural Networks	3	0	0	3	7.5
BM 564		Advanced Computer Architecture	3	0	0	3	7.5
BM 565		Advanced Computer Networks	3	0	0	3	7.5
BM 566		Wireless Sensor Networks	3	0	0	3	7.5
BM 567		Advanced Artificial Intelligence and Evolutionary Algorithms	3	0	0	3	7.5
BM 568		Machine Learning	3	0	0	3	7.5
BM 571		Object-Oriented Analysis of Information Systems	3	0	0	3	7.5
BM 572		Analysis of Social Networks	3	0	0	3	7.5
BM 581		Simulation, Modeling and Analysis	3	0	0	3	7.5
BM 603		Advanced Microprocessor Systems	3	0	0	3	7.5
BM 610		Advanced Signal Processing	3	0	0	3	7.5

M.S. Programs
- Cyber Security

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Compulsory III	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective IV	3	0	0	3	7.5
SEC0007		Elective V	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
BM 528		Cyber Warfare and Security	3	0	0	3	7.5
BM 531		Computer Networks and Communications	3	0	0	3	7.5
BM 533		Computer Network Security	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
BM 501		Object-Oriented Programming Languages and Systems	3	0	0	3	7.5
BM 502		Algorithm Analyses	3	0	0	3	7.5
BM 503		Programming Languages	3	0	0	3	7.5
BM 504		Real-Time Programming	3	0	0	3	7.5
BM 505		Advanced Topics in Software Engineering	3	0	0	3	7.5
BM 511		Discrete mathematics	3	0	0	3	7.5
BM 512		Probability Theory and Stochastic Processes	3	0	0	3	7.5
BM 521		Database Management Systems	3	0	0	3	7.5
BM 522		Object-Oriented Database Systems	3	0	0	3	7.5
BM 523		Distributed Database Systems	3	0	0	3	7.5
BM 525		Distributed Systems	3	0	0	3	7.5
BM 527		Special Topics in Distributed Systems	3	0	0	3	7.5
BM 528		Cyber Warfare and Security	3	0	0	3	7.5
BM 531		Computer Networks and Communications	3	0	0	3	7.5
BM 532		Basic Protocols in Computer Networks	3	0	0	3	7.5
BM 533		Computer Network Security	3	0	0	3	7.5
BM 534		Cryptography	3	0	0	3	7.5
BM 535		Mobile Agent Systems	3	0	0	3	7.5
BM 541		Image Processing	3	0	0	3	7.5
BM 542		Computer Vision	3	0	0	3	7.5
BM 543		Shape Recognition	3	0	0	3	7.5
BM 551		Parallel information processing and multiprocessor systems	3	0	0	3	7.5
BM 552		Parallel Programming	3	0	0	3	7.5
BM 553		Distributed Data Processing	3	0	0	3	7.5
BM 554		Distributed Operating Systems	3	0	0	3	7.5
BM 555		Multi-Core Programming	3	0	0	3	7.5
BM 556		Number Theory	3	0	0	3	7.5
BM 561		Artificial Intelligence	3	0	0	3	7.5
BM 563		Artificial Neural Networks	3	0	0	3	7.5
BM 564		Advanced Computer Architecture	3	0	0	3	7.5
BM 565		Advanced Computer Networks	3	0	0	3	7.5
BM 566		Wireless Sensor Networks	3	0	0	3	7.5
BM 567		Advanced Artificial Intelligence and Evolutionary Algorithms	3	0	0	3	7.5
BM 568		Machine Learning	3	0	0	3	7.5
BM 571		Object-Oriented Analysis of Information Systems	3	0	0	3	7.5
BM 572		Analysis of Social Networks	3	0	0	3	7.5
BM 581		Simulation, Modeling and Analysis	3	0	0	3	7.5
BM 603		Advanced Microprocessor Systems	3	0	0	3	7.5
BM 610		Advanced Signal Processing	3	0	0	3	7.5

M.S. Programs

- Information Technology (**Without Thesis**)

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	3	7.5
						TOTAL:	30

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0007		Elective VII	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Term Project	0	0	0	0	15
						TOTAL:	30

Program TOTAL ECTS: 90

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
BT 332		Operating Systems	3	0	0	3	7.5
BT 211		Data structures and algorithms	3	0	0	3	7.5
BT 372		Computer Organization	3	0	0	3	7.5
BT 321		Data Base Systems	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
BT 451		Software Engineering	3	0	0	3	7.5
BT 322		Data Mining	3	0	0	3	7.5
BT 202		Object-Oriented Programming	3	0	0	3	7.5
BT 446		Internet Programming	3	0	0	3	7.5
BT 323		Grid Computing	3	0	0	3	7.5
BT 471		Microprocessors and Microcomputers	3	0	0	3	7.5

Ph.D. Program

- Computer Engineering

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	3	7.5
SEC0007		Elective IV	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective V	3	0	0	3	7.5
SEC0006		Elective VI	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 246

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
BM 501		Object-Oriented Programming Languages and Systems	3	0	0	3	7.5
BM 502		Algorithm Analyses	3	0	0	3	7.5
BM 503		Programming Languages	3	0	0	3	7.5
BM 504		Real-Time Programming	3	0	0	3	7.5
BM 505		Advanced Topics in Software Engineering	3	0	0	3	7.5
BM 511		Discrete mathematics	3	0	0	3	7.5
BM 512		Probability Theory and Stochastic Processes	3	0	0	3	7.5
BM 521		Database Management Systems	3	0	0	3	7.5
BM 522		Object-Oriented Database Systems	3	0	0	3	7.5
BM 523		Distributed Database Systems	3	0	0	3	7.5
BM 525		Distributed Systems	3	0	0	3	7.5
BM 527		Special Topics in Distributed Systems	3	0	0	3	7.5
BM 528		Cyber Warfare and Security	3	0	0	3	7.5
BM 531		Computer Networks and Communications	3	0	0	3	7.5
BM 532		Basic Protocols in Computer Networks	3	0	0	3	7.5
BM 533		Computer Network Security	3	0	0	3	7.5
BM 534		Cryptography	3	0	0	3	7.5
BM 535		Mobile Agent Systems	3	0	0	3	7.5
BM 541		Image Processing	3	0	0	3	7.5
BM 542		Computer Vision	3	0	0	3	7.5
BM 543		Shape Recognition	3	0	0	3	7.5
BM 551		Parallel information processing and multiprocessor systems	3	0	0	3	7.5
BM 552		Parallel Programming	3	0	0	3	7.5
BM 553		Distributed Data Processing	3	0	0	3	7.5
BM 554		Distributed Operating Systems	3	0	0	3	7.5
BM 555		Multi-Core Programming	3	0	0	3	7.5
BM 556		Number Theory	3	0	0	3	7.5
BM 561		Artificial Intelligence	3	0	0	3	7.5
BM 563		Artificial Neural Networks	3	0	0	3	7.5
BM 564		Advanced Computer Architecture	3	0	0	3	7.5
BM 565		Advanced Computer Networks	3	0	0	3	7.5
BM 566		Wireless Sensor Networks	3	0	0	3	7.5
BM 567		Advanced Artificial Intelligence and Evolutionary Algorithms	3	0	0	3	7.5
BM 568		Machine Learning	3	0	0	3	7.5
BM 571		Object-Oriented Analysis of Information Systems	3	0	0	3	7.5
BM 572		Analysis of Social Networks	3	0	0	3	7.5
BM 581		Simulation, Modeling and Analysis	3	0	0	3	7.5
BM 603		Advanced Microprocessor Systems	3	0	0	3	7.5
BM 610		Advanced Signal Processing	3	0	0	3	7.5

Contents of Graduate Courses

BM 500 Master of Science Theses: Program of research lead-ing to M.Sc. degree, arranged between a student and the fac-ulty member. Students register to this course in all semesters starting from the beginning of their third semester while the research program or write-up of the thesis is in progress.

BM 501 Object-Oriented Programming Languages and Systems: Introduction to object-oriented programming lan-guages, introduction to object-oriented programming, class, object, method, entities, encapsulation, message passing, in-heritance, polymorphism, programming with Smalltalk, C++, Java.

BM 502 Analysis of Algorithms: Basic concepts in algo-rithms, mathematical requirements, recursive equalities and inequalities, complexity measurements, O, and other notations. Complexity analysis of classical algorithms in different fields, sorting, searching, graphs, mapping, matrix operations, trans-formations, introduction to NP-C complexity.

BM 503 Programming Languages: Brief historical perspec-tive, concept of binding, run-time structure of Pascal-like lan-guages, parameter passing, type constructors, abstract data types, encapsulation, type compatibility, type checking, poly-morphism, statement-level control structures, unit-level con-trol structures, coroutines, exceptions, concurrent units, current research issues.

BM 504 Real-Time Programming: Real-time software na-ture, real-time operating systems, real-time communication, job scheduling and resource management, formal methods, programming languages and tools, real-time kernels, Tempo, PSOS+, RT kernel, real-time programming using kernels, de-sign issues.

BM 505 Advanced Topics in Software Engineering: Project concept, project, definition, project operations, modeling, prin-ciples of system engineering, project management techniques, planning, organization, control, evaluation, reporting and deliv-ering the project, cost/advantage analysis, risk analysis, project definition methods, job definition and planning, network plan-ning and PERT, critical path method, resource analysis, esti-mating the project scope, date and cost, planning probability, project control methods, control points, investigation, modi-fication of control, reporting, subject management, software maintenance concept, life cycle maintenance, CASE tools.

BM 511 Discrete Mathematics: Prime numbers, prime number relativity, mod and congruence relation, Fermat and Chinese remainder theory, product functions, recurrence relations and solution methods, exponential generator function, convolu-tions, algebraic structures, groups, group codes, chains, Polya counting method, modular arithmetic, Graphs and trees; con-nection, Euler and Hamilton Graphs, Searching and sorting on trees, relativity.

BM 512 Probability Theory and Stochastic Processes: Prob-ability space and classification of stochastic processes, Markov and half-Markov chains in discrete and continuous parameter space, introduction to renewal theory, birth and death processes and queue theory application.

BM 521 Database Management Systems: Introduction to database concepts, the theory of relational database model, semantic database models, extended relational data model, de-ductive database, distributed database, object oriented database and expert database systems, uncertainty in database systems, and other recent research topics.

BM 522 Object-Oriented Database Systems: Introduction to object-oriented database systems, object-oriented database system manifesto, exodus storage manager, ORION object-oriented DBMS, O2 object-oriented DBMS, R trees, R+ trees and R* trees, implementation issues for object-oriented data-base systems.

BM 523 Distributed Database Systems: An overview of dis-tributed database, a review of databases, concurrency control in centralized DBMSs, concurrency control in distributed da-tabases, serializability theory 3, two phase locking, timestamp ordering serialization, graph checking, time interval technique, optimistic methods, handling replicated data multiversion data, distributed database design, recovery query processing in dis-tributed DBMSs.

BM 525 Distributed Systems: Distributed systems provide sharing of systems sources and information on computer net-works. In order to create wide area application on internet it is required to know the general structure of distributed systems, their basic properties and some existing systems. The course will provide students the principles of developing distributed applications on internet.

BM 527 Special Topics in Distributed Systems: Detailed investigating of topics which are still under research field of distributed systems such as the error tolerance , security, object oriented distributed systems, distributed file systems, document based systems. This course will create vision to the students about worldwide distributed wide area systems and problems.

BM 532 Basic Protocols in Computer Networks: Routing, optimality principle, finding the shortest path, flooding method, distance vector and network connection algorithms, flow and congestion control, threshold flow design, traffic control, congestion preventing, bridges, routing in internet, OSPF and BGF protocols, point to point transportation, transportation services, TCP protocol, OSI reference model, ANSI notation, CMIP protocol, SNMP protocol, internet management, net-work security, basic cryptography, and digital signature.

BM 533 Data Security and Protection in Computer Net-works: Symmetric ciphers,(classical and modern), Data En-cryption Standard(DES), authentication, key management, asymmetric (public key) ciphers, and digital signatures.

BM 534 Cryptography: Introduction, history, classical meth-ods, symmetric algorithms and DES, technical analysis of information. Selective topics in number theory, arithmetic al-gorithms, RSA, El Gamal, digital signature, DSS, protocols, applications.

BM 541 Image Processing: Introduction, image enhancement, contrast and alteration dynamic boundaries, smoothing, image restoration, reducing noise and fuzziness, image coding, sam-pling, lossless coding methods, Huffman coding, coding meth-ods with loss, transformation coding, mixed-transformation coding, interframe coding, coding based on model, pyramid coding, image separation, thresholding, defining edges, con-necting edges, dividing regions, establishing image in projec-tions, fourier-slice method, filtering and reflecting back meth-od, establishing arithmetic image, binary image processing and parallel algorithms, recognition of image, fourier descriptors, moments, geometric descriptors, model adaptation.

BM 542 Computer Vision: Introduction to computer vision, forming vision, modeling the vision, methods of obtaining vi-sion, low-level problems, smoothing, defining edges, linking edges, multi-scale approaches, medium-level problems, estab-lishing scene, toning, obtaining vision from motion and stereo, range visions, high-level problems, conceptual networks, gen-eralized cylinders and Hough transformation.

BM 543 Pattern Recognition: An introduction to the machine recognition of one, two or higher dimensional patterns, statis-tical and linguistic approaches, survey of application areas, Bayes Decision Theory, decision boundaries, classifiers and discriminant functions, estimation of parameters, clustering, feature selection, structural approaches to PR, neural network recognizers, applications.

BM 551 Parallel Processing and Multiprocessor Systems: Introduction to parallel processing, Flynn's classification, gained parameters, UMA, NUMA, COMA models, vector supercomputers and SIMD models, Pram and VLSI models, system interconnection architectures: common way, multi gate memories, crossbar, key module, multi layer interconnection network, rotated network, pocket consistent problem, observa-ble way protocols, guide based protocols, hardware based syn-chronization mechanisms, multicomputer structures, message transmission mechanism, parallelism in programs, program partitioning and job arrangement, program flow mechanisms, vector process principles, multivectoral multiprocessors, chained vector processes, SIMD order, delay and hide tech-niques, multifibre work principles, fine grain multicomputers,measurable and multifibre architectures, and Data flow archi-tecture.

BM 552 Parallel Programming: Introduction to parallel pro-gramming, application fields, problems related to parallel al-gorithms: synchronization, communication, critical sections, synchronization mechanisms: semaphores, monitors and the others, verification methods and application examples, commu-nication principles based on message transmission, rendezvous structure, parallel programming methods in operating

systems, parallel programming languages: CSP, OCCAM, ADA and the others, design and examination of the classical parallel pro-gramming algorithm examples.

BM 553 Distributed Computing: Distributed file services, disc service, motion service, classification and catalogue serv-ices, OSI file service, deadlock in distributed systems, dead-lock sensitive algorithms in central and distributed systems, solving deadlock, resource protection, access supervision ap-proaches, access matrix model, data flow model, security ker-nel mechanism, distributed matrix access control, distributed security kernel verification, communication security and user authentication, security topics in distributed computer system's interprocess communication, digital signatures, security serv-ices and mechanisms in distributed systems, security services in ISO/OSI models.

BM 554 Distributed Operating Systems: Introduction to distributed systems, communication in distributed systems, client-server architecture, remote method calling, synchroniza-tion in distributed systems, clock synchronization, Lamport al-gorithm, Ricart and Agrawala algorithms, Goscinski distributed synchronized algorithms, distributed system models, classifi-cation services, names, paths, addresses, process management in distributed systems, remote transaction on the processes, emigration of the processes, process emigration mechanism in Demos/MP, resource allocation, resource managers, load shar-ing algorithms, load balancing algorithms, distributed operat-ing system examples.

BM 561 Artificial Intelligence: Introduction, programming language: LISP: array, tree, heap, queue and table structures, information display: production rules, including hierarchies, propositional account, inference rules, frames, semantic net-works, restrictions and systematical approaches, search, hy-pothesis and testing, depth first search, width first search, intuitional search, optimal search, game trees and reflexive

search, minimax search, alpha-beta reduction, learning de-scription trees, artificial neural networks, perceptions, genetic algorithms, expert systems, natural language process, speech recognition, computer vision.

BM 562 Expert Systems: Basic Concepts, inference machine, database, data collection, data representation and control, au-tomatic comparison, indefiniteness representation, practical problem solving, practical and theoretical progress in expert systems, known expert system samples, software tools and architectures for expert system design, and expert system de-sign.

BM 563 Artificial Neural Networks: Application fields of artificial neural networks, linear sensors, multi layer sensors, vector quantifiers, radial based function networks, expert mix-tures, multiradial based function network, combination of mul-tiexperts, combination of multi learners, comparison of clas-sifying algorithms, genetic algorithms.

BM 571 Object-Oriented Analysis and Design of the In-formation Systems: Analysis and design of information sys-tems, object orientation, object oriented analysis and design of Coad-Yourdon, application of OOD criterion, examination of the other approaches; Booch, Rumbaugh, Shlaer-Mellor and Jacobsen approaches.

BM 581 Simulation Modeling and Analysis: Fundamental theoretical concepts of discrete simulation, a selected simu-lation language to be taught, overview of analog computer simulation, review of basic probability and statistics, select-ing input probability distribution, random number generators, output data analysis for a single system, statistical techniques.

BM 555 Multi-Core Programming: Introduction to parallel computing, parallel computer memory architectures parallel programming models design of parallel programs, programming model the NVIDIA CUDA architecture NVIDIA CUDA architecture, NVIDIA CUDA architecture, programming Dec face, the hardware implementation of the NVIDIA CUDA architecture, NVIDIA CUDA architecture performance.

BM 556 Number Theory: The arithmetic of integers; divisibility and Euclidean algorithm, prime numbers, linear equations diofant, modular arithmetic, classical cryptography, carpimsal functions; euler-Phi function, divisor function, sum of divisors function, Mobius functions, primitive roots, public-key cryptography, quadratic, rest, continued fractions.

BM 566 Wireless Sensor Networks: Wireless Sensor network (wsn) concept, the wsn node WSN applications military environmental applications , industrial models, and models the structure of wsn nodes energy expenditure, kaa layers, the physical, link, network layers, for kaa cross-layer structures, analytic network process approach, the differences between AHP and ANP., calculation procedures, case studies., Varieties KAA, kaa types (underground, underwater, nano), student presentations, Various WSN protocols.

BM 567 Advanced Artificial İntelligence and Evolutionary Algorithms: What is artificial intelligence uninformed search, informed search, search in a competitive environment, neural networks and fuzzy logic, genetic algorithm, local search algorithms, ant colony optimization, particle Swarm optimization, simulated annealing, bee colony optimization

BM 572 Social Network Analysis: Social network analysis databases and tools, data mining algorithms, Graph-based algorithms, the detection of a closed group, clustering algorithms, classification algorithms, web search

BM 603 Advanced Microprocessor Systems: Modern processors, optimization techniques, parallel computer architectures, Parallelism, parallel programming, hybrid parallel programming, student presentations.

Database systems: database concepts, introduction to the theory of relational database model, semantic database models. Extended relational data model, Tutorial, database systems, distributed database systems, object-oriented database systems, and expert database systems. Uncertainty in database systems. Other new subjects of study.

BT 471 Microprocessors and Microcomputers: The general structure and functioning of the microprocessor, the microprocessor input/output units and functioning. Addressing the structure and use of Assembler programming., machine language, recorders, hardware structures, RAM, ROM, EPROM, EEPROM,memory structures , examination of the internal structure of the microprocessor, the microprocessor arithmetic logic and control unit, accumulator structure, microprocessor data path, data path structure, microcomputer design, addressing, logic, machine language commands run on the microcomputer, assembler, machine language transformations language, assembler language commands, analog and digital converters.

BT 332 Operating Systems: Operating systems history, main features and components of operating systems, operating systems classification, operating systems, architectures, and computer resources and resource sharing, operating system services, memory management, processor management, input / output unit management, file management, operating system The characteristics of multi-user systems, interactive systems, time-sharing systems, real time systems, distributed and centralized time-sharing systems, distributed and centralized operations

BT 211 Data structures and Algorithms: Object-oriented programming, linked lists, searching and sorting algorithms, stacks and queues, binary search tools and hash tables, trees.

BT 372 Computer Architecture: Basic computer architecture principles. Design of computer architecture and organization. Sequential circuits, registers, counters, memories, Plas, and an examination of the structure and working principles of cache. MISS ISA and the study of architecture. ISA design and details. The control unit and microprogrammed control unit of the operating principles of examination.

BT 446 Internet Programming: Internet programming this course provides students with the ability to produce complete web solutions using Internet technologies to teach techniques and aims to provide.. Programming languages that are used on the internet, introduction to programming Internet programming languages (HTML, CSS, Javascript, PHP) according to the settings that are used for internet programming and program development environments, editors, introduction to programming, variables, constants, arrays, and functions (character, numeric, logical, date, etc.) program flow control statements (if, Switch, case, etc.) and to use the program and use loop statements (do-while, for, loop, etc.) server and environment variables and their use use of cookies in Internet programming, HTTP requests and responses send over the internet via the internet connect to the database and to perform operations, the information in the database listing, sorting, modification, for educational purposes are the main issues which will be addressed in the development of a dynamic Internet Application. At the end of the course, students will course topics related to engineering and

technology management problems linked to some problems in analytical techniques to gain perspective and to suggest, are expected to play a role in the problem solving process.

BT 202 Object-oriented Programming: Object-orientation the benefits of object-oriented programming languages, introduction to class, object, method, Property, Containment, message passing, Inheritance structure, multiple inheritance, structure and Polymorphism. In Smalltalk programming, C++ programming, Java programming.

Industrial Engineering

Industrial Engineering is the branch that designs and applies to the systems that use man power, knowledge, materials most ef-fectively needed to design and produce products. The vision of Industrial Engineering Program is to give the required knowledge and the skills to the manpower who will be assigned to the fields: Total Source Planning, Supply Chain Management, and Technol-ogy Management.

Personnel, who are graduates of Industrial Engineering field and from other branches and fulfill the general requirements set by Industrial Engineering Department, can be admitted to the gradu-ate programs. Graduates of different majors need to attend an ad-ditional program.

Programs

Ph.D. Program

-Industrial Engineering

M.S. Programs

-Industrial Engineering

-Operation Research

-Modeling and Simulation

-Engineering and Technology Management (Without Thesis)

M.S. Programs

-Industrial Engineering

-Operation Research

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
EM 522		Stochastic Processes and Applications	3	0	0	3	7.5
EM 501		Linear Optimization	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
EM 502		Discrete Optimization	3	0	0	3	7.5
EM 503		Nonlinear Optimization	3	0	0	3	7.5
EM 505		Multi-Objective Decision Making	3	0	0	3	7.5
EM 506		Project Scheduling and Network Theory	3	0	0	3	7.5
EM 507		Decision Analysis	3	0	0	3	7.5
EM 508		Research Methods	3	0	0	3	7.5
EM 510		Simulation Modeling and Analysis	3	0	0	3	7.5
EM 511		System Theory	3	0	0	3	7.5
EM 513		Dynamics of Social Economics Systems	3	0	0	3	7.5
EM 514		Agent-Based Simulation	3	0	0	3	7.5
EM 515		Artificial Learning	3	0	0	3	7.5
EM 522		Stochastic Processes and Applications	3	0	0	3	7.5
EM 524		Stochastic risk modeling	3	0	0	3	7.5
EM 525		Experimental Design and Analysis	3	0	0	3	7.5
EM 527		Reliability theory and Applications	3	0	0	3	7.5
EM 528		Queueing Theory	3	0	0	3	7.5
EM 529		Statistical Data Analysis	3	0	0	3	7.5
EM 531		Design of Production Systems	3	0	0	3	7.5
EM 532		Advanced Production Planning and Control Techniques	3	0	0	3	7.5
EM 533		Scheduling and Sequencing	3	0	0	3	7.5
EM 534		Modern Production Systems	3	0	0	3	7.5
EM 535		Manufacturing Information Systems	3	0	0	3	7.5
EM 537		Computer Integrated Manufacturing Systems	3	0	0	3	7.5
EM 538		Uman-Machine Information and Control Systems	3	0	0	3	7.5
EM 539		Product Design Methodology and Techniques	3	0	0	3	7.5
EM 540		Quality Engineering	3	0	0	3	7.5
EM 551		Evaluation of Business Processes	3	0	0	3	7.5
EM 552		Forecasting and Time Series	3	0	0	3	7.5
EM 553		Scheduling and Sequencing	3	0	0	3	7.5
EM 555		Investment Planning	3	0	0	3	7.5
EM 556		investment analysis and portfolio management	3	0	0	3	7.5
EM 558		stochastic models in Finance	3	0	0	3	7.5
EM 559		simulation financial engineering	3	0	0	3	7.5
EM 563		Strategic Planning	3	0	0	3	7.5
EM 564		R & D Management	3	0	0	3	7.5
EM 565		Supply Chain Management	3	0	0	3	7.5
EM 566		Business Intelligence and Data Mining	3	0	0	3	7.5
EM 570		Modern Heuristic Methods	3	0	0	3	7.5
EM 603		Graphs and Network Analysis	3	0	0	3	7.5

EM 604		Large Scale Optimization	3	0	0	3	7.5
EM 605		Dynamic Systems Modeling and Analysis	3	0	0	3	7.5
EM 608		Advanced Stochastic Processes	3	0	0	3	7.5
EM 620		Strategic Cost Management	3	0	0	3	7.5
EM 626		Inventory Control Theory	3	0	0	3	7.5
EM 692		Special Topics in Industrial Engineering	3	0	0	3	7.5

M.S. Programs
-Modeling and Simulation

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective III	3	0	0	3	7.5
SEC0006		Elective IV	3	0	0	3	7.5
SEC0007		Elective V	3	0	0	3	7.5
SEC0007		Compulsory III	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	36

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 126

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
EM 522		Stochastic Processes and Applications	3	0	0	3	7.5
EM 510		Simulation Modeling and Analysis	3	0	0	3	7.5
EM 525		Experimental Design and Analysis	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
EM 501		Linear Optimization	3	0	0	3	7.5
EM 502		Discrete Optimization	3	0	0	3	7.5
EM 503		Nonlinear Optimization	3	0	0	3	7.5
EM 505		Multi-Objective Decision Making	3	0	0	3	7.5
EM 506		Project Scheduling and Network Theory	3	0	0	3	7.5
EM 507		Decision Analysis	3	0	0	3	7.5
EM 508		Research Methods	3	0	0	3	7.5
EM 510		Simulation Modeling and Analysis	3	0	0	3	7.5
EM 511		System Theory	3	0	0	3	7.5
EM 513		Dynamics of Social Economics Systems	3	0	0	3	7.5
EM 514		Agent-Based Simulation	3	0	0	3	7.5
EM 515		Artificial Learning	3	0	0	3	7.5
EM 522		Stochastic Processes and Applications	3	0	0	3	7.5
EM 524		Stochastic risk modeling	3	0	0	3	7.5
EM 525		Experimental Design and Analysis	3	0	0	3	7.5
EM 527		Reliability theory and Applications	3	0	0	3	7.5
EM 528		Queueing Theory	3	0	0	3	7.5
EM 529		Statistical Data Analysis	3	0	0	3	7.5
EM 531		Design of Production Systems	3	0	0	3	7.5
EM 532		Advanced Production Planning and Control Techniques	3	0	0	3	7.5
EM 533		Scheduling and Sequencing	3	0	0	3	7.5
EM 534		Modern Production Systems	3	0	0	3	7.5
EM 535		Manufacturing Information Systems	3	0	0	3	7.5
EM 537		Computer Integrated Manufacturing Systems	3	0	0	3	7.5
EM 538		Uman-Machine Information and Control Systems	3	0	0	3	7.5
EM 539		Product Design Methodology and Techniques	3	0	0	3	7.5
EM 540		Quality Engineering	3	0	0	3	7.5
EM 551		Evaluation of Business Processes	3	0	0	3	7.5
EM 552		Forecasting and Time Series	3	0	0	3	7.5
EM 553		Scheduling and Sequencing	3	0	0	3	7.5
EM 555		Investment Planning	3	0	0	3	7.5
EM 556		investment analysis and portfolio management	3	0	0	3	7.5
EM 558		stochastic models in Finance	3	0	0	3	7.5
EM 559		simulation financial engineering	3	0	0	3	7.5
EM 563		Strategic Planning	3	0	0	3	7.5
EM 564		R & D Management	3	0	0	3	7.5
EM 565		Supply Chain Management	3	0	0	3	7.5
EM 566		Business Intelligence and Data Mining	3	0	0	3	7.5
EM 570		Modern Heuristic Methods	3	0	0	3	7.5

EM 603		Graphs and Network Analysis	3	0	0	3	7.5
EM 604		Large Scale Optimization	3	0	0	3	7.5
EM 605		Dynamic Systems Modeling and Analysis	3	0	0	3	7.5
EM 608		Advanced Stochastic Processes	3	0	0	3	7.5
EM 620		Strategic Cost Management	3	0	0	3	7.5
EM 626		Inventory Control Theory	3	0	0	3	7.5
EM 692		Special Topics in Industrial Engineering	3	0	0	3	7.5

M.S. Programs

-Engineering and Technology Management (Without Thesis)

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Elective III	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective IV	3	0	0	3	7.5
SEC0006		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	3	7.5
						TOTAL:	30

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0007		Elective VII	3	0	0	3	7.5
SEC0007		Elective VII	3	0	0	3	7.5
		Term Project	0	0	0	0	15
						TOTAL:	30

Program TOTAL ECTS: 90

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
MTY 502		Engineering and Management of Technology Projects	3	0	0	3	7.5
MTY 597		Strategic Planning and Management	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
MTY 501		Applied Statistics	3	0	0	3	7.5
MTY 502		Engineering and Management of Technology Projects	3	0	0	3	7.5
MTY 503		Operations Research For Managers	3	0	0	3	7.5
MTY 512		Engineering Economics and Finance	3	0	0	3	7.5
MTY 521		Strategic Technology Management	3	0	0	3	7.5
MTY 531		Team building and Communication	3	0	0	3	7.5
MTY 538		Human Computer Interaction	3	0	0	3	7.5
MTY 551		Cleaner Production Technologies	3	0	0	3	7.5
MTY 554		Financial Management In Engineering	3	0	0	3	7.5
MTY 555		Design Of Information Systems	3	0	0	3	7.5
MTY 564		R & D Management	3	0	0	3	7.5
MTY 580		Data Mining	3	0	0	3	7.5
MTY 581		Entrepreneurship and İnnovation	3	0	0	3	7.5
MTY 582		Brand Management	3	0	0	3	7.5
MTY 584		Business Analysis	3	0	0	3	7.5
MTY 585		Strategic Logistics Management	3	0	0	3	7.5
MTY 586		Contemporary Approaches To Organisational Behaviour	3	0	0	3	7.5
MTY 587		Ergonomics In Management	3	0	0	3	7.5
MTY 588		Human Resources Management	3	0	0	3	7.5
MTY 589		System modeling and Simulation	3	0	0	3	7.5
MTY 590		Energy Management	3	0	0	3	7.5
MTY 591		Project-I (Non-Credit)	3	0	0	3	7.5
MTY 592		Project-II (non-credit)	3	0	0	3	7.5
MTY 593		Optimization and Development of Solution Techniques	3	0	0	3	7.5
MTY 594		Supply Chain Management	3	0	0	3	7.5
MTY 595		Risk assessment and Management	3	0	0	3	7.5
MTY 596		Total Quality Management	3	0	0	3	7.5
MTY 597		Strategic planning and Management	3	0	0	3	7.5
MTY 598		Leadership	3	0	0	3	7.5
MTY 599		Special topics in Engineering and Technology Management					

Ph.D. Program

-Industrial Engineering

CURRİCULUM

1.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective I	3	0	0	3	7.5
SEC0006		Elective II	3	0	0	3	7.5
SEC0007		Compulsory I	3	0	0	3	7.5
SEC0007		Compulsory II	3	0	0	0	7.5
						TOTAL:	30

1.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
SEC0005		Elective III	3	0	0	3	7.5
SEC0006		Elective IV	3	0	0	3	7.5
SEC0007		Elective V	3	0	0	3	7.5
SEC0007		Elective VI	3	0	0	3	7.5
		Seminar	0	1	0	0	6
						TOTAL:	30

2.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

2.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

3.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Fall Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

4.Year - Spring Semester							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Laboratory**	**Local Credit**	**ECTS**
END 5000		M.Sc. Thesis	0	1	0	0	30
						TOTAL:	30

Program TOTAL ECTS: 246

COMPULSORY COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
EM 522		Stochastic Processes and Applications	3	0	0	3	7.5
EM 501		Linear Optimization	3	0	0	3	7.5

ELECTİVE COURSES							
Code	**Req.**	**Title**	**Lecture**	**Practical**	**Lab.**	**Local Credit**	**ECTS**
EM 501		Linear Optimization	3	0	0	3	7.5
EM 502		Discrete Optimization	3	0	0	3	7.5
EM 503		Nonlinear Optimization	3	0	0	3	7.5
EM 505		Multi-Objective Decision Making	3	0	0	3	7.5
EM 506		Project Scheduling and Network Theory	3	0	0	3	7.5
EM 507		Decision Analysis	3	0	0	3	7.5
EM 508		Research Methods	3	0	0	3	7.5
EM 510		Simulation Modeling and Analysis	3	0	0	3	7.5
EM 511		System Theory	3	0	0	3	7.5
EM 513		Dynamics of Social Economics Systems	3	0	0	3	7.5
EM 514		Agent-Based Simulation	3	0	0	3	7.5
EM 515		Artificial Learning	3	0	0	3	7.5
EM 522		Stochastic Processes and Applications	3	0	0	3	7.5
EM 524		Stochastic risk modeling	3	0	0	3	7.5
EM 525		Experimental Design and Analysis	3	0	0	3	7.5
EM 527		Reliability theory and Applications	3	0	0	3	7.5
EM 528		Queueing Theory	3	0	0	3	7.5
EM 529		Statistical Data Analysis	3	0	0	3	7.5
EM 531		Design of Production Systems	3	0	0	3	7.5
EM 532		Advanced Production Planning and Control Techniques	3	0	0	3	7.5
EM 533		Scheduling and Sequencing	3	0	0	3	7.5
EM 534		Modern Production Systems	3	0	0	3	7.5
EM 535		Manufacturing Information Systems	3	0	0	3	7.5
EM 537		Computer Integrated Manufacturing Systems	3	0	0	3	7.5
EM 538		Uman-Machine Information and Control Systems	3	0	0	3	7.5
EM 539		Product Design Methodology and Techniques	3	0	0	3	7.5
EM 540		Quality Engineering	3	0	0	3	7.5
EM 551		Evaluation of Business Processes	3	0	0	3	7.5
EM 552		Forecasting and Time Series	3	0	0	3	7.5
EM 553		Scheduling and Sequencing	3	0	0	3	7.5
EM 555		Investment Planning	3	0	0	3	7.5
EM 556		investment analysis and portfolio management	3	0	0	3	7.5
EM 558		stochastic models in Finance	3	0	0	3	7.5
EM 559		simulation financial engineering	3	0	0	3	7.5
EM 563		Strategic Planning	3	0	0	3	7.5
EM 564		R & D Management	3	0	0	3	7.5
EM 565		Supply Chain Management	3	0	0	3	7.5

EM 566		Business Intelligence and Data Mining	3	0	0	3	7.5
EM 570		Modern Heuristic Methods	3	0	0	3	7.5
EM 603		Graphs and Network Analysis	3	0	0	3	7.5
EM 604		Large Scale Optimization	3	0	0	3	7.5
EM 605		Dynamic Systems Modeling and Analysis	3	0	0	3	7.5
EM 608		Advanced Stochastic Processes	3	0	0	3	7.5
EM 620		Strategic Cost Management	3	0	0	3	7.5
EM 626		Inventory Control Theory	3	0	0	3	7.5
EM 692		Special Topics in Industrial Engineering	3	0	0	3	7.5

Contents of Graduate Courses

EM 500 Master of Science Theses: Program of research leading to M.Sc. degree, arranged between student and a faculty member. Students register to this course in all semesters starting from the beginning of their third semester while the research program or write-up of thesis is in progress.

EM 501 Linear Optimization: Linear programming in ma-trix form. The revised, dual, and primal-dual simplex methods. Bounded variables. Duality and sensitivity analysis. The trans-portation and assignment algorithms. Basic concepts of decom-position.

EM 502 Discrete Optimization: The linear minimal cost flow problem and its solution by the network simplex algorithm. Max-imal flow, shortest route and circulation problems. The integer programming problem and its solution by branch and bound and decomposition methods. Lagrangian relaxation.

EM 503 Nonlinear Optimization: Review of convex sets and functions. Local and global optima. Basic methods of constrained optimization. Lagragian duality.

EM 504 Large Scale Optimization: Decomposition, partition-ing and compact inverse methods to deal with large and sparse optimization. Special structures such as Leontief substitution sys-tems, production-inventory models. Simplex method with upper bounds and generalized upper bounding. Constraint relaxation methods. Branch and bound and Bender's partitioning methods to solve mixed integer linear programs.

EM 505 Multiobjective Decision Making: Formulation of the general multiobjective programming problem, classification of multiobjective programming methods; generating techniques, preference oriented methods, multiple-decision-maker methods. Multiobjective analysis of certain problems in public sector.

EM 506 Project Scheduling and Network Theory: Introduc-tion to graph theory; shortest path and related algorithms; net-work flow algorithms; matching and covering algorithms; travel-ing salesman problem and extensions; Chinese postman problem and extensions; problems of location on a network; stochastic network.

EM 507 Decision Analysis: Bayesian decision models; decision trees; value of information; utility theory, use of judgmental prob-ability, study of strategies; economics of sampling; risk sharing and decisions; implementation of decision models.

EM 508 Research Methods: It is aimed to improve the students' ability of thinking and studying scientifically and make them able to use the scientific method by staying away from every sort of prejudice at their studies and researches by this lesson. Method information, which will be able to carry on a research in scien-tific discipline and reach the conclusion, is given with this aim. Within this scope; the subjects, Information and Its Source, Defi-nition of Science, Its Function and Sorts, Definition of Scientific Method and Its Basic Qualities, Definition of Research, Its Sorts and Qualities, Research Proposal and Report Preparation are dis-cussed. Research subject is also examined in details and studied under the title of The Process and The Techniques of

The Re-search as Introduction, Method, Findings and Interpretation, Ab-stract, Judgment and Proposals. In the Introduction part; Problem, Objective, Importance, Hypothesis, Restraint and Definitions, in the Method part; Research Model, Universe and Sample, Data and Their Collection, Handling, Solution and Interpretation of Data take place. In a research, content of Findings and Interpreta-tion, Abstract, Judgment and Proposals and 'how they should be written' are discussed. Forming Bibliography, Indicating Bibli-ography, Techniques of Quotation are studied. Discussion of a Research Proposal and a Thesis Proposal which will be prepared by the students. In a scientific article, Title, Authors and their Addresses, Introduction, Short Summary, Material and Method, Conclusions, Writing of Acknowledgement, Forming of the Bib-liography and Attribution to the Resources are discussed. How Scanning/Evaluation Article will be written is studied.

EM 510 Simulation Modeling and Analysis: Simulation meth-odology, model formulation, systems dynamics, overview of simulation languages, generating random variants, output data analysis, model validation, variance reduction techniques, experi-mental design and optimization.

EM 511 System Theory: Analysis of linear continuous systems; controllability, observability, and stability; applications to physi-cal, ecological, and socio-economic systems; control systems; introduction to optimal control.

EM 512 System Modeling: Systems concepts; basic quantitative techniques used in systems approach; use of computers in model-ing, industrial dynamics, econometric modeling; case studies on selected large scale systems.

EM 513 Dynamics of Socio-Economic Systems: The course uses computer simulation as an experimental platform to study and analyze the dynamics of socio-economic problems. The course has two broad objectives: The first one is to learn dy-namic systems approach and systems simulation as a methodol-ogy to study and understand complex, dynamic socio-economic problems. Students will learn the concepts of stocks and flows, negative and positive feedback loops, structure and causal-loop diagrams and various typical behavior patterns. The second objective of the course is to expose the students to a variety of real socio-economic case studies and demonstrate how systems ap-proach and simulation can be used to tackle such problems. A system simulation software will be heavily utilized through the course.

EM 515 Artificial Intelligence Expert Systems and Decision Support Systems: Introduction to artificial intelligence. Knowl-edge representation using formalized symbolic logic, dealing with uncertainties and inconsistencies, structured knowledge. Knowl-edge acquisition, organization and expert systems. Intelligent de-cision support systems: integration of DSS, DBMS and ES.

EM 521 Statistical Decision Making: Order statistics and re-lated distributions; sufficiency and related theorems; point esti-mation, criteria for selecting estimators, methods of estimation; Neyman Pearson theory; likelihood ratio tests; Bayes and mini-max procedures; sequential procedures; confidence estimation; general linear hypothesis; analysis of variance; non-parametric statistical inference.

EM 522 Stochastic Processes: Probability spaces and classifi-cation of stochastic processes. Markov chains with discrete and continuous parameter spaces; characterization and limiting be-havior. Birth and death processes and their application to queuing theory.

EM 523 Advanced Stochastic Processes: Limiting behavior and potentials of Markov chains; Markov processes and infinitesimal generators; renewal theory and regenerative processes; Markov renewal processes; Brownian motion and its sample path analy-sis.

EM 525 The Design and Analysis of Experiments: The way in which information is used in inference making will be discussed by covering linear statistical models, multiparameter hypotheses, incomplete block designs. Random and mixed models.

EM 526 Inventory Control Theory: Description and charac-teristics of inventory models; deterministic economic lot size models; stationary stochastic inventory models; optimal single period.

EM 531 Production Systems Analysis: State-of -the-art tools for gaining perspective in management and control of manufac-turing function in organizations supported by case studies. An evaluative treatment of

materials management, master produc-tion scheduling and production planning from a bottom-up per-spective. Material Requirements Planning (MRP) versus Just-in -Time (JIT) implementations. Optimized Production Technology (OPT). Differences in make-to-order and assemble-to-order pro-duction settings. Computer support, system conversion and inte-gration issues in manufacturing planning and control.

EM 532 Production Planning and Scheduling: Analysis of some specific problem areas within the context of planning and scheduling of production activities. Definition, formulation and available solution procedures for aggregate planning, lot sizing. Scheduling in manufacturing systems, scheduling in service sys-tems, design and operation of scheduling systems.

EM 534 Modern Production Systems: Turning the already ex-isting production systems lies in the basis of factories could be the most important solution for the firms to stay on their feet in the computetive environment in time. This course including vital subjects, systems design and adaptation to the firms, preserving flexibility in dynamic and changing production systems targets to give students deep information about production systems

EM 536 Advanced Production Systems: Impact of computer aided design and manufacturing on production planning; data base for manufacturing; classification and coding; manufacturing information systems; computer aided process planning; opera-tions research models in assembly lines, automated flow lines, group technology, and flexible manufacturing systems.

EM 538 Man-Machine Information & Control Systems : Dis-plays and controls. Human decision making process. Information theory. Human communication essentials. Cybernetics. Control systems. Behavioral control theory.

EM 540 Quality Engineering: Introduction to Quality Engineer-ing. Parameter design by Taguchi design of experiment, Tagu-chi's Loss Function. Tolerance design and tolerancing. Online feedback quality control. Online process parameter control.

EM 551 Business Process Reengineering: The course concen-trates on engineering of organizational processes and systems. The focus is on fundamental redesign of strategic and value-adding business processes. Organizations are modeled as systems in order to gain insight into their structure, processes and per-formance. This knowledge is used in engineering more effective organizations and information systems to provide value-added support for organizational evolution.

EM 552 Forecasting and Analysis of Time Series: Forecasting methodology and techniques, moving averages, exponential smoothing. Winters method, Box-Jenkins models, and Bayesian methods.

EM 554 Financial Management in Engineering: Financial ap-plications in Designing, Production, Facility Construction, and Strategical Planning of organizations and financial management of technical processes and advanced-technology-facilities.

EM 555 Investment Planning: Analysis of industrial projects, review of project appraisal techniques; technological feasibil-ity; economic and financial feasibility; capital budgeting models; portfolio models; uncertainty and risk analysis; project manage-ment techniques; case studies.

EM 560 Engineering & Technology Management: Basic issues in technology management and problem solving in high-technol-ogy organizations. Methods for identifying or solving problems, including use of case studies and field research. Planning tech-nological change in diversified corporations; understanding in-vention - the heart of technological change; implementing new technology in new products/services/ manufacturing; forecasting the economic impacts of technological change; forecasting tech-nological change and planning research.

EM 561 Human Resources Management: Human capital con-cept; people, productivity and the quality of working life; evalu-ation of human resources management; legal and social contexts of personnel decisions; analyzing and designing jobs; determin-ing human resources requirement; recruiting; screening and selecting employees; orienting and training employees; identifying and developing management talent; appraising

employee perfor-mance; managing careers; compensation management; assessing the costs and benefits of personnel activities; international dimen-sions of human resources management.

EM 562 Communication and Team Building: Development of oral and written communication skills; fundamentals of report writing and technical document preparation; fundamentals of pre-paring and delivering public speech and presentations; design of research in managerial decision making; design and presentation of survey studies; conflict management; criticize and apprecia-tion; team building; project teams; quality circles; management of team dynamics;

EM 563 Strategic Planning: Methods and techniques of strate-gic management, that is, formulation, implementation and evalu-ation of actions that enable an organization to achieve its mission and objectives. Strategic Choice and Decision Making, Strategy Implementation Process Structure and Planning Style, Strategy Review, Evaluation and Control.

EM 565 Supply Chain Management: Fundamentals of supply chain management and enterprise resources planning (ERP); ag-gregate production planning: static, dynamic, nonlinear and lot sizing models; operations scheduling: flow shops and job shops; materials management and materials requirement planning (MRP); capacity resources planning (CRP); distribution system management; implementation of manufacturing management strategies.

EM 570 Modern Heuristic Methods: Meta Heuristic Methods is being used in last years where solution is difficult and not eco-nomic due to the big solution space (especially combinatoric optimization problems) with defined algorithms. In this course, beginning with simple heuristic methods, general methods and application areas and meta heuristics methods will be taught such as restricted search, evolutionary algorithms.

EM 590 Graduate Seminar: This seminar is designed to pro-mote research interest in various areas of IE. Master's students must register and fulfill departmental requirements of the semi-nar.

EM 591 M.Sc. Specialization Field Course: Investigation on study fields and developments on these study fields of all stu-dents, under the supervision of an advisor, who are progressing their M.Sc. thesis.

EM 600 Ph.D. Thesis: Program of research leading to Ph.D. de-gree, arranged between a student and the faculty member. Stu-dents register to this course in the fifth semester while the re-search program or write-up of the thesis is in progress.

EM 602 Operational Research for Managers: It is targeted to teach the theory of methods and solving processes of Operational Research and by the help of this information detection of man-agement politics and activities scientifically.

EM 610 Strategic Cost Management: Strategic investigation and the importance of cost in private and government organiza-tions, the differences between service and production systems will be defined and cost application techniques will be investi-gated. Presentations for the top management, reporting systems, financial look to the reporting systems will be studied and balance between disciplines will be tried to be established. Application and integration of activity based cost systems and efficiency of cost reducing systems of organization systems will be examined.

EM 690 Ph.D. Seminar: To increase the interest of the students for studying in different fields of industrial science. Ph.D. stu-dents have to take this course and fullfill the requirements.

EM 691 Ph.D. Specialization Field Course: Investigation on study fields and developments on these study fields of all stu-dents, under the supervision of an advisor, who are progressing their Ph.D. thesis.

MTY 503 Operational Research for Managers: It is targeted to teach the theory of methods and solving processes of Operational Research and by the help of this information detection of management politics and activities scientifically.

MTY 512 Engineering Economics: Basic Concepts, Cost Concept, Time Value of Money, Measuring Value of Investments, Comparison of Investment Alternatives, Relationship between Investment and Taxes, Break-even, Sensivity and Risk Analysis.

MTY 501 Applied Statistics: Random variables; probability distributions and densities; central limit theorem; point estimation; Range Estimation; Onsav Testing; linear regression and Correlation; review of numerical information.

MTY 502 Engineering and management of technology projects: Technology and change. Technology-related concepts. The transition from conventional technology to high technology. Technology management approaches. Technological competitive strategies. Sur / petition for Strategic Planning. Future opportunities for investment projects selection. R & D activities and regulations. Innovative institution. Customer-oriented design. Deterministic and stochastic models. Working models for innovative management team. Technoparks. Total information management (TIM), change management. Management Information Systems (mis). The restructuring of the organization (Business Process reengineering). Learning organisations learning organisations). Comparison (benchmarking). Leadership and teamwork.

MTY 503 Operational Research for Managers: It is targeted to teach the theory of methods and solving processes of Operational Research and by the help of this information detection of management politics and activities scientifically.

MTY 512 Engineering Economics: Basic Concepts, Cost Concept, Time Value of Money, Measuring Value of Investments, Comparison of Investment Alternatives, Relationship between Investment and Taxes, Break-even, Sensivity and Risk Analysis.

MTY 521 Strategy and Technology Management: Basic concepts, strategy development and strategy management, techniques used in strategy management (BCG, GE portfolio analysis Hofer, portfolio analysis, SWOT Analysis, McKinsey 7S model, value analysis), technological change, global competition and Technology Management, Technology Management, critical success factors, theory of inventive problem solving, industry analysis (Porter's 5 force model for the sample application), types of innovations, competitor analysis,. R & D and innovation, R & D policies, theory of inventive problem solving

MTY 531 Team building and Communication: Review of statistical methods. The creation of the working environment with different ideas. The tools that are used in team work. Statistical process control. The starting team, supporting teams, concluding/project teams. The creation of team spirit. Managing team dynamics. Managing conflicts.

MTY 538 Human Computer Interaction: he role of HCI in engineering and Technology Management, Technology acceptance model, the components of HCI, interaction concept and types of interaction the physical size of the human cognitive structure and information processing models, the concept of usability, usability assessment criteria and methods, heuristic review, user testing, model-based approach.User experience, 5-element model, mobile usability, the availability of grants and application examples in manufacturing and service sector.

MTY 551 Cleaner Production Technologies: Cleaner production,waste reduction, pollution prevention, pollution prevention methods and measurement methods for the evaluation of product life cycle environmentally conscious design, Yesil-tech, eco-efficiency

MTY 554 Financial Management In Engineering: Definition and objectives of financial management, financial analysis, financial planning, cash flow forecasting and analysis, capital management, and tactical financial decisions, definition and objectives of Management Accounting, Financial Accounting, Principles and techniques of costing, decision making

MTY 555 Design Of Information Systems: Data, information, knowledge, knowledge Processes, knowledge management, explicit and implicit information, document and content management systems, knowledge sharing, intellectual capital, intellectual capital, measurement, standardization and documentation, and the importance of Culture in information management, knowledge management models, knowledge management portals and Intranets, knowledge mapping, information management, responsible for Strategic Management and knowledge management

MTY 564 R & D Management: Innovation management, innovation models, degree of innovation, organizational characteristics that facilitate the innovation process, intellectual property management, global R & D in the economy, strategic alliances and networks, R & D management and industrial scope, R & D management and business strategies in connection with R & D projects the classification of R & D projects project evaluation and selection , open innovation, technology transfer models, management of new product development process

MTY 580 Data Mining: Introduction to data mining, steps of data mining, data mining techniques, classification, Clustering, Association/Association rules, text mining, web mining, data mining applications

MTY 581 Entrepreneurship and Innovation: Technology-focused initiatives, opportunities, and threats. Analysis of all the stages for the transformation of the enterprise business initiatives. Case-based methods and new analysis of the life cycle of resident enterprises. The method to be described with the creation of new ideas, evaluation, and can be used for business development. Funding and resource usage.

MTY 582 Brand Management: The basic concepts associated with the brand and the brand, creative strategy and message strategy in terms of brand positioning, brand management-simulations and case studies based applications and various brand

MTY 584 Business Analysis: Business-related concepts and terminology, the concept of job analysis, activities during business analysis, preparation of job descriptions, preparation of business requirements, use of job analysis information human resources management functions

MTY 585 Strategic Logistics Management: The concept of logistics and logistics management, evolution of logistics, and logistics Purposes, strategic Logistics Management, International Logistics, Logistics, quality, logistics costs, logistics and Transportation, Transportation Management, and 3PL outsourcing Concepts, organization, 3PL, logistics, reverse Logistics, Logistics systems analysis and design

MTY 586 Contemporary Organisational Behaviour: Approaches: organizational image, identity, organizational justice, citizenship, organizational health, and ethics, organizational stress, burnout and alienation

MTY 587 Ergonomics in Management: Physical Human Ergonomics, Physical Ergonomics, Human-Machine System Ergonomics, Human-Computer Ergonomics In The System, Occupational Health And Safety

MTY 588 Human Resources Management: Human capital the concept of work life of employees, efficiency and quality, human resources management, legal and social contexts of personnel decisions, work study, and design, provision of human resources needs, job training, monitoring employees, and selecting employees, orientation and training, the discovery and development of management skills, evaluation of the performance of employees, careers management, substitution management, the costs and benefits of the activities of the staff, ınternational dimension of human resource management.

MTY 589 System Modeling and Simulation: System, Model and Simulation Concepts, Simulation By Hand, Statistical Models for Simulation, Random Numbers and Random Variables, Input Data Modelling, Verification and Validation, Output Analysis, Comparing Alternative Systems

590 MTY Energy management: Relevant legislation and the concept of energy efficiency, energy policy, energy-intensive industrial sectors, energy economics, economic analysis of projects, Energy Investment models, energy forecasting, energy management policies comparison of

MTY 591 Project-I (Non-Credit): The overall aim of this course is practical project on a topic related to engineering and technology management students by doing the work is to present the results both verbally and in writing.

MTY 593 Optimization and Development of Solution Techniques: Input, Direct optimization techniques, Search Heuristics, in the general context of meta-heuristics, step-by-step Solution to create a (constructive) based meta-heuristics (GRASP, ant colony Optimization), computer applications (MATLAB, C, or in a different language), the replacement of solution-based meta-heuristics (Local Search, Search, Banned), the limit value (threshold Accepting), simulated annealing and computer implementations, Solution of the recombination-based meta-Heuristics (genetic algorithms, distributed Search), advanced meta-heuristics (Variable neighborhood search, Particle Swarm Optimization, Bee Colonies And Others), Engineering Design Optimization, Meta-Heuristics In Cellular Manufacturing, Meta-Heuristics, Production Planning And Scheduling Meta-Heuristics Case Study.

MTY 594 Supply Chain Management: Introduction to Supply Chain Management, Supply Chain Strategies, Strategic Fit, Distribution Systems Planning, Distribution Network Decisions, Supply-Demand Planning in Supply Chain, Inventory Management in Supply Chain, Information Technologies and Supply Chain Management

MTY 595 Risk Assessment and Management: Introduction the concepts of risk, a numerical expression of risk, Probabilistic risk assessment, multi-objective Decision Trees, in which three event theory, risk and decision-making, organization-wide risk management, risk, information security and national

MTY 596 Total Quality Management: Statistical techniques in quality management, quality root cause analysis of problems, design and implementation of experiments, Measurement System Analysis and design, The use of the Sigma techniques, lean techniques for continuous improvement in the implementation of knowledge, skills and Competence

MTY 597 Strategic Planning and Management: Methods and techniques in strategy management must perform an assessment of the activities to accomplish organization's mission and objectives, formulation and implementation, strategic choice and decision making, strategy implementation Process structure and planning Approaches, strategy review, evaluation and control.

MTY 598 Leadership: Basic concepts of management, Management activities, and the functioning of organisations, the internal and external elements that affect the performance of the organization, change management, organizational culture, leadership, team building and motivation

MTY 599 Special Topics in Engineering and Technology Management: Linear programming and solution methods, graph theory, Routing, traveling salesman problem, artificial intelligence and applications, metasezgisel, simulation and applications, multi-criteria decision making techniques.