NEAR EAST
UNIVERSITY

DEPARTMENT OF Materials Science and Nanotechnology Engineering

Course and Program Outcomes Matrix

2021-2022

Courses List with Near East University credits and ECTS

Please see the attached example of the diploma supplement which is given to all graduates of our university free of charge. It ıs arranged in English.

The diploma supplement is a document the purpose of which is to provide sufficient independent data to improve the international "transparency" and fair academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.). It is designed to provide a description of the nature, level, context, content and the status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free from any value judgments, equivalence statements or suggestions about recognition

COURSE OBJECTIVES AND CONTENTS:

YEAR 1

General Physics I (course type: required; course code: PHY 101)

Course objectives: The objective of this course is to provide students with a thorough understanding of the basic concepts of physics, rigorous description of physical phenomena and to improve students' problem-solving abilities.

Course content: Measurement, vectors, kinematics, force, mass. Newton's laws, applications of Newton's laws. Work and kinetic energy. Conservation of linear momentum. Impulse, collisions, rotation, moments of inertia. Torque, angular momentum, conservation of angular momentum, static equilibrium.

General Chemistry I (course type: required; course code: CHM 101)

Course objective: By the end of this course, students should understand the fundamental concept of atomic theory, chemical equations, thermochemistry and hands-on laboratory works.

Course content: A basic course with emphasizing the metric system. Introduction to atomic theory, stoichiometry. The structural and physical properties of matter. Periodic relationship among elements and periodic table. Gaseous state. Thermochemistry. Energy and enthalpy. Electronic structure of atoms. Electrochemistry. Chemical bonding.

Calculus I (course type: required; course code: MTH 101)

Course objective: At the end of this course students are expected to have a clear understanding of the ideas of Calculus as a solid foundation for subsequent courses in mathematics and other disciplines as well as for direct application to real life situations.

Course content: Functions, limits and continuity. Derivatives. Mean value theorem. Sketching graphs. Definite integrals, infinite integrals (antiderivatives). Logarithmic, exponential, trigonometric and inverse trigonometric functions and their derivatives. L'Hospital's rule. Techniques of integration. Applications of the definite integral, improper integrals

English I (course type: required; course code: ENG 101)

Course objective: This course aims at enabling students to understand their lessons and to express themselves in English Language.

Course content: Within a thematic approach, reading, writing, speaking, and listening skills will be developed, with a language component in order to build onto the foundation established at the Department of English. In speaking and writing, students will be encouraged to use language forms that they learn through reading and listening. Under broad themes (or threads), the students will be exposed to extensive reading both in and outside the classroom. They'll be encouraged to read a variety of texts such as short stories, academic articles, research reports, reviews and journalistic texts as well as chapters from textbooks

Technical Drawing I (course type: required; course code: ECC 103)

Course objective: The aim of this course is to provide students with the basics of AutoCAD, be able to transform data into graphical drawings and also draw orthographic projections and sections, learn basic engineering drawing formats.

Course content: Introduction to CAD. Principles of engineering drawing (1st and 3rd angle orthotropic projections), drawing methodology stages, line work and lettering, isometric and oblique projections, drawing layouts (working drawings and assembly drawings), machine drawing features, sections and sectional views, geometrical constructions and dimensioning principles.

Introduction to Materials Science and Nanotechnology Engineering course type: required; course code: MSN 101)

Course objectives: Make students gain basic knowledge on engineering, material science and nanotechnology engineering. Teach students how to use basic software for curve plotting, regression engineering calculations.

Course content: Introduction to Materials Science and Engineering. Classification of engineering materials and scaling. the interdisciplinary occur in materials science and engineering within the introduction of nanomaterials and nnanotechnology engineering. Engineering applications of nanomaterials, production methods, examples of the impact of social and ethical issues. The introduction of the nanomaterials properties analysis and research equipment.

General Physics II (course type: required; course code: PHY 102)

Course objectives: General Physics II is the second part of General Physics I. The aim of this course is to help students apply knowledge of physics everyday life activities and through problem solving exercises in the fileds of Electrical and Electromagnetics point of view.

Course content: Electrical charges. Coulomb's law. Electrical fields. Gauss's law. Electrical potential. Capacitance and dielectrics. Current and resistance. Direct current circuits. Magnetic fields. Sources of the magnetic field. Faraday's law of induction. Inductance and inductors.

General Chemistry II (course type: required; course code: CHM 112)

Course objective:Students who successfully complete this course will be able to: Develop fundamental principles of theoretical and applied chemistry, develop scientific inquiry, complexity, critical thinking, mathematical and quantitative reasoning, explain phenomena observed in the natural world and develop basic laboratory skills.

Course content: Intermolecular forces and liquids and solids, chemical kinetics, chemical equilibrium, acids and bases, acid-base equilibria thermodynamics, redox reactions and electrochemistry.

Calculus II (course type: required; course code: MTH 102)

Course objectives: This course aims at helping students further develop their problem solving and critical reasoning skills and to prepare them further study in mathematics, the physical sciences, or engineering.

Course content: Plane and polar co-ordinates, area in polar co-ordinates, arc length of curves. Limit, continuity and differentiability of function of several variables, extreme values, method of Lagrange multipliers. Double integral, triple integral with applications. Line integrals, Green's theorem. Sequences, infinite series, power series, Taylor's series. Complex numbers.

English II (course type: required; course code: ENG 102)

Course objective: This course aims to take students to intermediate advanced level of English.

Course content: This course will be a continuation of ENG 101, with greater emphasis on student autonomy, research skills and synthesizing ability. All the activities and tasks in ENG 101 will continue within a thematic approach. In Eng-102, the ability to evaluate, analyze and synthesize information in written discourse will be highlighted. Documentation in writing will be introduced at the beginning of the course, in order to solidly establish the skill by the end. Students will learn the discourse patterns and structures to be used in different essay types.Students will write two essays in ENG-102. 1. An academic essay with proper documentation. 2. A project report to be prepared throughout the course, including a literature review (displaying analysis/synthesis skills, and documentation), a definition/elaboration of a problem (using definition, description, cause/effect and

comparison/contrast patterns) and suggestions for solution (including personal views and argumentation). Local and regional topics, personalizing the research and viewpoints will be recommended to prevent plagiarism. Instructors will have to keep in close contact with the students to guide them throughout the process

Introduction to Computers and Programming (course type: required; course code: ECC 101)

Course objectives: The goal of this course is to help students know program language evolution and classification and basic computer architecture. Students will be able to solve basic numerical computation in binary, design and implement simple assembly language programs at the end of the course.

Course content: An introduction to fundamental concepts. Algorithms and flowcharts as tools of program design process. Basic program structure. Input/output statements. Control structures: Selection and repetition statements and arrays. Concept of modular programming: Procedures and Functions.

ORGANIC CHEMISTRY (course type: required; course code: CHM 122)

Course objectives: This course is designed as a one-semester course for materials science and nanotechnology engineering, bioengineering, food engineering and molecular biology and genetics students. CHM 122 is a central link between physical and biological sciences and introduces a fundamental basis in nanotechnology, food processing, genetics and tissue engineering.

Course content: This course provides a broad perspective about carbon compounds, chemical bonds, molecular structure, intermolecular interactions, organic reactions and mechanisms, acids and bases, alkanes and cycloalkanes, conformational analysis, stereochemistry: chiral molecules, substitution and elimination reactions of alkyl halides, alkenes and alkynes (addition reactions), alcohols and ethers, aromatic compounds and reactions, aldehydes and ketones, carboxylic acids and amines.

Career Planning (course type: required; course code: CAR100)

Course objectives: To help students to plan a career in line with their future goals by making them aware of their interests, personal characteristics and values. Learning career planning and career development models. Having knowledge about current labor market conditions. To have knowledge about interview techniques. Learning how to make an impressive job interview. To have knowledge about CV preparation methods and cover letters. Preparing a CV to use in job applications.

Course Content: Career Concept and Career Stages. Expectations of the Business World from New Graduates. Career Management and Career Management Models in Organizations. Individual Career Planning and Goal Setting. Job Search Techniques. Individual Career Planning and Applications: Cover Letter and CV Writing. Basic Communication Skills. Individual Career Planning Practices: Preparing for the Interview. Interview Techniques. Orientation and Introduction to Working Life. Lifelong Learning.

YEAR 2

Material Sciences I (course type: required; course code: MSN 201)

Course objectives: The aim of this course is to evaluate the fundamentals of Materials Science and Engineering and to examine the application fields.

Course content: Classification of engineering materials, sub-groups. Microstructure of Engineering Materials Applications feature does not. CWR cycle. Mechanical and physical properties of the presentation. Atomic structure and bonds. Nanostructures. Crystal structure and set up. Crystal defects and material effect on the properties. Diffusion in solids. Phase diagrams and applications. Fe-C phase diagram. Steels and cast irons.

Foundations of Nanotechnology (course type: required; course code:MSN 203)

Course objectives: The objective of this course is to provide students with a fundamental knowledge of structure and bonding at the molecular level that can be applied towards a wide range of nanomaterials systems give students more details about the biological molecules and systems and to make them understand molecular interactions give more in-depth understanding of synthetic techniques and the nanomaterials systems.

Course content: Introduction to Miniaturization; Atomic, molecular, and extended structures; structure and function of biomolecules and their roles in molecular interactions; Quantum dots; Carbon-based materials; Nanoparticle synthesis; Self-assembly; Special topics in nanosynthesis and nanofabrication.

Inorganic Chemistry (course type: required; course code: CHM 201)

Course objectives: The objective of this course is to develop an understanding of the range and chemistry of elements in the periodic table and their inorganic compounds give detailed information and laboratory practices on the non-metals and metals, their inorganic compounds give more in-depth understanding of resources, synthetic techniques and applications areas of the inorganic materials

Course content: Inorganic nomenclature. Descriptive inorganic chemistry of non-metal and metals. Important industrial processes including availability of raw material and environmental aspects. Properties of solid substances.

Physical Chemistry and Thermodynamics (course type: required; course code: MSN 205)

Course objective:Thermodynamics is the field of science describing the principles that govern and determine the equilibrium properties of macroscopic systems. The objective of this course is to provide students with a quantitative understanding of those principles and their application to chemical phenomena.

Course content: The following topics will be covered: (1) properties of gases, (2) internal energy, enthalpy & the First Law, (3) entropy, free energy & the Second and Third Laws, (4) phase equilibrium, (5) simple mixtures, (6) chemical equilibrium.

English Communication Skills (course type: required; course code: ENG 201)

Course objectives: The main aim of this course is to help students improve their spoken English and also improve their communication skills.

Course content: The main goal of ENG 201 is to enhance the students' competence and willingness to express themselves in an organized manner in academic and professional contexts, and to interact with others confidently. It is important that students learn to conduct independent research and think critically on issues raised in the course. ENG 201 will use an integrated, thematic approach with emphasis on advanced oral communication and academic presentation skills, with language components such as grammar, vocabulary and pronunciation. ENG 201 will be inter-active; students will be encouraged to listen actively, respond to presentations, and participate in discussions. Speaking activities and academic presentations will ensue from reading and listening activities. Each theme will lead to the production of an oral and/or written activity. Input on oral presentation skills will enable the students to distinguish between oral and written discourse, and emphasize the requirements of oral discourse (such as direct sentences, transitional words and signposts). Skills (such as good body language, effective eye contact and voice control) related to the delivery of an oral presentation will be discussed and demonstrated.Active listening will be integrated into the course, with various tasks such as note-taking and peer evaluation

Differential Equations (course type: required; course code: MTH 201)

Course objectives: To introduce the concept of first, second and higher order differential equations, and the methods of solving these equations

To emphasize the importance of Differential equations and its application in Engineering. To understand the concept of Laplace transform and its applications in solving differential equations and other engineering applications

Course content: The nature of differential equations, definition, ordinary and partial differential equations, order and degree, linear and nonlinear equations, Separable equations and Homogeneous equations, Exact equations, and integrating factors, Linear equations, and Bernoull's equation, and initial value problems.

Applications: simple electric circuits and free falling problems, parachute problem, radium decoposition and tank of water problem, Reduction of order and knowing one solution to find another solution and the general solution of second order linear differential equation, Introduction, the general solution of the homogeneous equation, and the general solution of nonhomogeneous differential equation, The homogeneous equation with constant coefficients and the solution of Euler's equidimensional equation.

The method of undetermined coefficients for finding the particular solution, The method of variation of parameters for finding the particular solution and initial value problems, Laplace transform of continuous functions, Laplace transform of discrete functions. Introduction to solution by series.

Turkish for Foreign Students I (course type: required; course code: YIT101)

Course objective: To teach reading, writing, speaking, listening and comprehension skills in Turkish. Explaining / explaining the determined concept(s). Develop selected / determined skills. Examine selected topics in depth / detail. To improve the existing knowledge of students about the concepts / theories / topics.

Course content: Basic rules of Turkish, phonology (sounds, alphabet reading rules), vocabulary (Recognition of words as words, relations between words), sentence information (sentence organizations, general structure and sentence types), reading-writing (reading rules and writing techniques, spelling rules, comprehension of speaking and writing language, spelling rules. learning on the techniques of speaking, learning of specific forms of emphasis, intonation etc. Applying on appropriate texts, A1 has been started according to international language level.

Turkish Language I(course type: required; course code: TUR101)

Course objective: Explaining / explaining the determined concept(s). Developing and developing awareness about the related concept(s). Develop selected / determined skills. Students' knowledge of the concepts / theories / topics develop. Students learn about existing concepts / theories / topics renew.Developing critical thinking

Course content: Definition and importance of language; the relationship between language and culture; writing language and features,external structure and rules in written expression, spelling rules and punctuationsigns; plan, theme, point of view, helpful ideas, paragraphwriting; composition concept, composition writing rules andplans; composition, composition, paragraphreview, essay correction studies, general narrationexpressing disorders, thinking and thinking; various writingtypes, (memoirs, jokes, stories, criticism, novels etc.)(resume, petition, report, announcement, bibliography, official papers, scientific)introduction, development and conclusion sections of articles, articles, etc.)will be worked on.

Material Sciences II (course type: required; course code: MSN 202)

Course objective:The aims of the course is to give fundamental knowledge about type of materials, their usage, properties and characteristics, which are important in engineering design. It is also aimed to give a theoretical background about the analysis of behavior of engineering materials by emphasizing important relationships between internal structure and properties. It attempts to present ways of modifying and control the material microstructures and especially mechanical properties (toughness, strength, fatigue and creep resistance) by suitable heat treatment operation.

Course content: The mechanical properties of engineering materials and mechanical tests . Strengthening operations. Proses↔ Microstructure ↔Performans relationship. electrical and magnetic properties of engineering materials. Other physical properties. Nanomaterials and engineering applications. Metallic and non-metallic materials in engineering applications. CWR used engineering materials and mechanisms. Non-destructive testing methods

Mechanic of Nanomaterials (course type: required; course code: MSN204)

Course objective: Aim of the course is to discuss the mechanical properties and features of nanomaterials (nanoparticles and nanocomposites) and to introduce the concept of the structural mechanics of materials. It covers macromechanics, micromechanics, and nanomechanics distinguished by the dimensions of isolated components in material structure. Moreover, some main trends and approaches in the mechanics of nanomaterials (nanomechanics) will be discussed.

Course content: Fundamentals of mechanics of materials, elastic and plastic properties, dislocations and strengthening mechanism, failure of materials, nanostructures and nanomaterials: characterization and properties, defect structures and mechanical behaviour of nanomaterials

Materials for Biological and Medical Applications (course type: required; course code: MSN 206)

Course Description: This class provides an introduction to the interactions between cells and the surfaces of biomaterials. The course covers: surface chemistry and physics of selected metals, polymers, and ceramics; surface characterization methodology; modification of biomaterials surfaces; quantitative assays of cell behavior in culture; biosensors and microarrays; bulk properties of implants; and acute and chronic response to implanted biomaterials. General topics include biosensors, drug delivery, and tissue engineering.

Nanomaterials (course type: required; course code: MSN 208)

Course objective: Learning objectives for this course will focus on developing a fundamental understanding of thefollowing topics as they relate to nanomaterials.

- Motivation/Vision: Feynman's vision, why use/explore new nanomaterials. - Synthesis and Fabrication: Top down vs. bottom up techniques, nucleation theory, surface energy and stabilization. Characterization: Composition, structure, porosity, crystallinity, single vs. ensemble measurements. Examples: General classification (zero – two dimensional and assembled nanostructures), materialscomposition/function (metals, metal oxides, semiconductors, carbon, biological). Size Dependent Chemical and Physical Properties: Electrical, optical, catalytic, magnetic, thermodynamic, why purification is needed. Applications: Electrical, optical, catalytic, magnetic, thermodynamic, purification, sensing, biology,medicine, solar cells, etc. (literature). Implications: Environment, health, and safety as well as impacts on policy, society, and education.

Course content: The course should give a basic introduction to chemical and physical principles in the synthesis of inorganic nanostructured materials. In addition, basic principles of finite size effects will be covered. The course will also cover different methods for synthesis and characterization of different nanostructures and nanostructured bulk materials. Prerequisites include general knowledge in chemistry, physics and material science.

Introduction to Quantum Physics (course type: required; course code: PHY201)

Course content: Black body radiation, Photoelectric effect, The Comptom effect, Wave packets and uncertainty relations, The Schrödinger equation, free particle equation, Eigenfunctions and eigenvalues, the energy eigenvalue equation, particle in a box, one dimensional potentials

Summer Practice I (course type: required; course code: MSN 200)

Course objective: The goal of this course is to familiarize students with the daily work of Materials Science and Nanotechnology Engineering
Course content: Summer training

Turkish for Foreign Students II (course type: required; course code: YIT102)

Course objectives: To teach reading, writing, speaking, listening and comprehension skills in Turkish. Explaining / explaining the determined concept(s). Develop selected / determined skills. Examine selected topics in depth / detail. To improve the existing knowledge of students about the concepts / theories / topics.

Course content: Vocabulary of Turkish (Recognition of words as a structure, relations between words), sentence information (sentence organizations, general structure and sentence types), reading-writing (reading rules and writing techniques, spelling rules, comprehension of speech and writing language, spelling rules) , reading (reading comprehension techniques, practices on the texts), listening (listening comprehension, listening to the necessary comments by taking note of the necessary comments on the students' own profession) applications, speaking (learning speech techniques, specific emphasis, learning shapes such as toning appropriate texts applications on the A1 level according to the international level.

Turkish Language II (course type: required; course code: TUR102)

Course objectives: Explaining / explaining the determined concept(s). Developing and developing awareness about the related concept(s). To discuss the validity of the determined concept(s).

Course content: In the lecture, the importance of speech, speech disorders, collective discussion types, body language and the successful use of speech are given to the students.

YEAR 3

Synthesis and Fabrication of Nanoengineering (course type: required; course code: MSN 301)

Course Description: Introduction to methods for fabricating materials and devices in NanoEngineering. Nano-particle, -vesicle, -tube, and -wire synthesis. Top-down methods including chemical vapor deposition, conventional and advanced lithography, doping,

and etching. Bottom-up methods including self-assembly. Integration of heterogeneous structures into functioning devices.

Introduction to Solid State Physics (course type: required; course code: MSN 303)

Course Description: Introduction to Solid State Chemistry is a first-year single-semester college course on the principles of chemistry. This unique and popular course satisfies MIT's general chemistry degree requirement, with an emphasis on solid-state materials and their application to engineering systems.

MATERIALS SELECTION in ENGINEERING DESIGN (course type: required; course code: MSN 302)

Course objective: Students who successfully complete this course will be able to:

Obtain basic knowledge of Materials Science and Engineering. Explore the relationships between structure, properties and applications and how this can be used in materials and process selection and design. Introduce a systematic procedure for selecting materials that will most likely perform best in a given engineering application. Enable students to become proficient in the derivation of material indices starting from the relevant equations describing the application, and to successfully carry out a simple mechanical design involving the determination of the relevant material properties, selection of suitable candidates and the building and testing of a working model.

Course content: Design concept, thesteps of design, designtools, designed to damage , CaseStudies , production method sand material selection in design, choice of materials and design in affordability ,availability, material and environment (recycling, ecologicalcriteria , environ mental damage of the material) ,Case Studies Production methods and defectsarising from materialselection , materialselection , material property chartscase study, hybrid materials case study design , materialsselection , and ethical decision-making , teamwork .

Introduction to Solid State Chemistry (course type: required; course code: MSN 303)

Course Description: Introduction to Solid State Chemistry is a first-year single-semester college course on the principles of chemistry. This unique and popular course satisfies MIT's general chemistry degree requirement, with an emphasis on solid-state materials and their application to engineering systems.

Nanoengineering System Design (course type: required; course code: MSN 304)

Course objective: The main objective of the course is to train and prepare Clarkson graduate and upper-level undergraduate students in the areas of micro-/nano-systems' design and analysis as well as manufacture. It is assumed that students are either conducting or planning to obtain research or engineering positions in micro/nano-technology or a related area

Course content: Principles of product design and the design process. Application and integration of technologies in the design and production of nanoscale components. Engineering economics

Phase Transformations and Kinetics (course type: required; course code: MSN 305)

Course objective: The overall goals of the course are to: 1) develop an understanding of why materials and microstructures undergo changes by reinforcing and significantly extending concepts introduced in chemical thermodynamics courses, 2) provide an understanding of how diffusion enables changes in the chemical distribution and microstructure of materials by discussing mechanisms and rates of diffusion and the role of driving force on diffusional processes, and 3) to formulate and discuss a variety of phase transformations and the effects of temperature and driving force on the nature of the transformation and its impact on the resulting microstructure. In summary, the tools required to understand how and why phase transformations occur, and how and why microstructures can be controlled are developed

Course content: This course introduces theory of design in an introductory to intermediate level.; 1. Diffusion being a mechanism of atomic and molecular change is solids will be covered in greater details following the basics taught in year one2.Phase transformations and the kinetics of these transformations 3.Interfacial Studies 4.Heat Transfer

Instrumental Methods for Materials Science and Nanoengineering (course type: required; course code: MSN 306)

Course description: At the heart of materials science and engineering is the understanding and control of the microstructure of solids. Microstructure is used broadly in reference to electronic and atomic structure of solids—and defects within them—at size scales ranging from atomic bond lengths to airplane wings. The structure of solids over this wide range dictates their structural, electrical, biological, and chemical properties. The phenomenological and mechanistic relationships between microstructure and the macroscopic properties of solids are, in essence, what materials science is all about.

Course content: Materials engineering builds on the foundation of materials science and is concerned with the design, fabrication, and optimal selection of engineering materials that must simultaneously fulfill dimensional, property, quality control, and economic requirements.

Crystallography of Materials (course type: required; course code: MSN 307)

Course objective: Define concepts such as lattice, point and space groups. Be familiar with Bragg's Law and explain its the relation to crystal structure. Identify and describe different diffraction methods. Interpret and assign X-ray and electron diffraction patterns

Course content: The different degrees of structural order in matter are presented and how one can define the subject of Crystallography. Next, revisions on what wave-particle duality is, the electronic configuration of elements and what constitutes a bond are made. The unit cell, crystallographic planes, Bravais lattice, atomic packing factor and dislocations in crystals will be amongst the notions used to latter define how physical properties may be influenced by variations in the crystal structure of materials. Symmetry and elements pertaining to symmetry operations will help establish the different point, plane and space groups that lattices can be classified into. Following this, the crystal structure will be studied looking at how real and reciprocal lattices relate. Here, concepts such as Wigner-Seitz cells and the first Brillouin zone will be approached. The principles of diffraction and how these correlated to different types of electromagnetic waves and particles, from light to X-rays, electrons and neutrons will be addressed. Bragg's law, the Ewald sphere and structure factor are amongst the topics to study. Finally, several case studies such as the assignment of electron diffraction patterns will be used to illustrate the capabilities of each diffraction technique.

Composite Materials(course type: required; course code: MSN 308)

Course objective: Introduce to advanced composite materials and their applications. Develop fundamental relationships for predicting the mechanical and hygrothermal response of multi layered materials and structures. Develop micromechanical and macromechanical relationships for lamina and laminated materials with emphasis on continuous filament. Introduce material, structural, and strength optimization to design laminated composite materials using user-friendly software.

Course content: Introduction to composite materials along with its basic requirements and classification; Various models analyzing the design and performance of composite materials; Understanding the composite modulus, strength and fracture behaviour for structural applications; Composites including nano-composites for electrical, süper conducting and deviceapplications; Fabrication and processing of metal matrix (MM), polymer Matrix (PM) andceramic matrix (CM) composites and their characterization; Fabrication of nano-composites; Secondaryprocessingandjoining of various composite materials for structural applications and their fracture behaviour and safety.

Research Skills in Science (course type: required; course code: MSN 309)

Course objective: After successfully completing this unit, you should be able to:
independently find the necessary background knowledge (e.g. literature) required to support a research project, articulate a research question and the required research methodology for that question, judge whether or not to use qualitative or quantitative research methodologies, demonstrate experience in working as part of a group, including a reflective summary, distinguish between a research question and a research topic, design an appropriate control and blank for a chemical, biological or environmental science research experiment, recognise flaws in experimental design and develop strategies for minimising those flaws, apply tools of preparation required before undertaking a research project, for example; literature searching, scientific referencing, ethics application, time and resource management, experimental design, critically analyse the research methodology and experimental design in selected research articles, critically analyse experimental design.

Course Description: This course will introduce you to the real world of working in a laboratory. You will learn about the operation of a laboratory from the perspectives of occupational health & safety, research skills, quality processes, analysing data, teamwork and appropriate communication. The skills you gain in this course will be used in a range of other courses.

Summer Practice II (course type: required; course code: MSN 300)

Course objective: The goal of this course is to familiarize students with the daily work of Materials Science and Nanotechnology Engineering

Course content: Summer training

Principles of Atatürk and the History of Turkish Revolotion I (course type: required; course code: AIT 101)

Course objective: Explaining / explaining the determined concept (s). Developing and developing awareness about the related concept (s). To discuss the validity of the determined concept (s). Develop selected / determined skills. Examine selected topics in depth / detail. To improve the existing knowledge of students about the concepts / theories / topics To improve students' ideas / knowledge / insights in the context of selected concepts Renewing existing knowledge with students about the concepts / theories / topics identified To promote critical thinking. To solve the political, economic, cultural and socio-psychological problems that arise as a result of the encounter between other Western cultures and Turkish culture;demolished reform movements and the transition from the Empire to the national state. As result of the national struggle, Mustafa Kemal Atatürk's leadership dealt with the political events of the founding of the Republic of Turkey.

Course content: Definition of Revolution and Turkish Revolution III. by starting the reform movement began with Selia Mustafa Kemal Pasha, October 29, 1923, the Republic of Turkey to the penny emerging political, social and economic events are examined.

Principles of Atatürk and the History of Turkish Revolotion II (course type: required; course code: AIT 102)

Course objective: Explaining / explaining the determined concept (s). Developing and developing awareness about the related concept (s). To discuss the validity of the determined concept (s). Develop selected / determined skills.Examine selected topics in depth / detail. Students' knowledge of the concepts / theories / topics develop. To improve students' ideas / knowledge / insights in the context of selected concepts. Renewing existing knowledge with students about the concepts / theories / topics identified. Promoting innovation. Developing critical thinking. In parallel with the Republic of Turkey on the organization of contemporary Turkish society the principles of Atatürk and As a result of the restructuring of the state and society within the framework of their revolution.political, social, economic and cultural development in our society and changes in domestic and foreign political events encountered in today's problems evaluation.

Course content: Mustafa Kemal Pasha penny from the Republic of Turkey on October 29, 1923 until his death policies and reforms carried out are assessed

Principles of Atatürk and the History of Turkish Revolotion I (course type: required; course code: AIT 103)

Course Content: A Concise Political History of Ottoman Empire 1300-1914 Decline and the Ottoman Modernization Ottoman State and Society in Classical Period The organization of National Resistance Movement: The Circular of Amasya The Congresses of Erzurum and Sivas Invasions, Mustafa Kemal and National Resistance Movement Ottoman Empire in the

First World War I Armistice of Mudros The Treaty of Sevres and the National Liberation War against the Armenians and Greeks I The Armistice of Mudanya and the Peace Treaty of Lausanne

Principles of Atatürk and the History of Turkish Revolotion II (course type: required; course code: AIT 104)

Course Content: Discussion on "revolution", "Evolution" and the great revolutions in history. Transformation in the Political system: From a Sultanate to Republic Transformation in education and cultural life Transformation in Social and economical life. Unsuccessful attempts for multi-party system and consolidation of the Single Party Regime. Atatürkçülük/Kemalizm and the 6 principles of Ataturk, Nationalism, Secularism-Laicism, Populism. Sheikh Said Rebellion: Kurdish Nationalism or A Reaction to Secular policies of the new regime Turkey During the Second World War. Turkey and the League of Nations Turkey in the Regional Organizations. Turkish Foreign Policy and the Foreign Policy Issues Statism, Republicanism, Revolutionism.

YEAR 4

Characterızatıon Of Nanoengıneerıng Systems(course type: required; course code: MSN 401)

Course objective:Students who successfully complete this course will be able to: Obtain basic knowledge of Materials Science and Engineering, Define, formulate and solve engineering problems related to materials characterization and specification Develop his/her knowledge in using different techniques and modern equipment for engineering applications Find out new methods to improve his/her knowledge.

Course content: Common nanoscale characterization instrument theory, operation and maintenance. An instrument provider in the marketplace promotion, development of tender conditions, technical evaluation of tenders, plans for appropriate infrastructure works, the current oral and written evidence. Common nanoscale characterization instrument theory, operation and maintenance. An instrument provider in the marketplace promotion, development of tender conditions, technical evaluation of tenders, plans for appropriate infrastructure works, the current oral and written evidence.

Experimental Methods in Materıal Science (course type: required; course code: MSN 403)

Course objective:The student, upon successful completion of this course, will be able to: Demonstrate understanding of the important thermodynamic and kinetic factors involved in different materials processing techniques. Apply different materials characterization techniques with demonstrated understanding of the advantages and limitations of each technique. Demonstrate the ability to apply computer-based analytical methods to experimental data sets to obtain information about the parameters of interest and experimental errors. Demonstrate effective written and oral communication techniques for the purpose of disseminating technical information. Synthesize all of the course material and experimental results into a cohesive research paper. (For graduate students only)Students who successfully complete this course will be able to: Design and conduct experiments, as well as analyze and interpret data related to materials design and specification, Develop his/herknowledge in using different techniques and modern equipment for engineering applications, Develop an awareness of continuous learning in relation with modern technology, Find out new methods to improve his/her knowledge.

Course content: Mechanical and physical testing of engineering materials. Preparation and examination of microstructure samples. Macro-, micro- and nano-hardness tests. Atomic force microscope (AFM). Scanning electron microscope (SEM). Clean rooms. Nano-fabrication methods.

Graduation Project (course type: required; course code: MSN 400)

Course objective: The course is intended to evaluate students ability to complete a project without a given detailed structure usually found in undergraduate courses

Course content: Design or research projects are assigned including application and synthesis. The projects including prototype production are especially encouraged. Students may work

alone or as a team. Supervisors and jury members grades the projects by considering the studies during the semester, project report and presentation.

ELECTIVE COURSES

POLYMERIC ENGINEERING MATERIALS (course type: elective; course code: MSN452)

Course Description: This course aims to extend the knowledge the polymerization techniques and the physical properties of the created polymers by giving detailed knowledge of the structure, properties and applications of polymeric materials. This will enable educated assessments on the choice of polymeric materials for a given application and the effect of the chemical structure on the polymer properties. Foundations of polymeric materials. Topics: structure of polymers; mechanisms of polymer synthesis; characterization methods using calorimetric, mechanical, rheological, and X-ray-based techniques; and electronic,

mechanical, and thermodynamic properties. Special classes of polymers: engineering plastics, semiconducting polymers, photoresists, and polymers for medicine. The course is intended to evaluate student's ability to complete a project without a given detailed structure usually found in undergraduate courses

INTRODUCTION TO BIOMATERIALS (course type: elective; course code: MSN 453)

Course objective: To learn the properties of advanced materials and to be able to select materials correctly in advanced engineering applications.

Course content: Micro and nanosensor of, actuators, modules (micro-electromechanical systems, nanoelectromechanical systems and micro and nano fluid channel) for the development of construction techniques. Micro and nano example of the integration of instruments and chemical analysis. Current Micro and nano airports in perspective.

FUNDAMENTALS OF SOLAR CELLS (course type: elective; course code: MSN455)

Course objective: The objective of this course is to provide an insight into the fundamentals of solar cells and describe the manufacturing processes of different types of photovoltaics (PV). Throughout the course, students will learn physical principles of solar irradiation and solar cell operation. Emerging concepts of polymer, hybrid and quantum-dot-based solar cells will be described including device physics, manufacturing and technological development.

Course content: It is expected that all students attend to all the lectures. There might be shifts in the time of the lecture hours due to committments. These will be discussed previously in the lectures.

Surface science (course type: elective; course code: MSN 451)

Course content:PHYSICAL STRUCTURE of surfaces and materials: Crystal structure Basic introduction on surface systems: crystalline surface structure, reconstructions. Bottom-up nanofabrication techniques. Growth of nanostructures from vapor phase deposition. Different growth models. Surface structure determination: LEED, EXAFS and other fine-structure techniques; SPM, AFM, SEM, TEM, etc. ELECTRONIC STRUCTURE of solids: Band theory, Fermi surfaces and metals; semiconductors and insulators, superconductivity. SURFACE REACTIONS: particles-surface interactions, radiation-surface interactions, kinetics studies, TDS, LITD and other radiation induced desorption techniques

MATERIALS SCIENCE OF ENERGY TECHNOLOGIES (course type: elective; course code: MSN454)

Course content: Materials for solar cells: semi-conductors. Battery materials: Li-batteries, metal-hydrid-batteries. Materials for hydrogen technology: production (electrolysis), storage (hydrids), fuel cells. Materials used in connection with gas power (catalysts, microporous materials, membranes).

Materials Science of Thin Films (course type: elective; course code: MSN456)

Course Description: Deposition, processing, and characterization of thin films and their technological applications. Physical and chemical vapor deposition methods. Thin-film nucleation and growth. Thermal and ion processing. Microstructural development in epitaxial, polycrystalline, and amorphous films. Thin-film characterization techniques. Applications in information storage, integrated circuits, and optoelectronic devices. Laboratory demonstrations.

Micro and Nano Structural Materials and Devices (course type: elective; course code: MSN457

Course objective: The main objective is to create a base of knowledge in the field of sensors and actuators. This base includesuitable physical properties of materials used in sensor manufacturing, basic technologies of materialsengineering, specific technologies for circuit devices manufacturing. The knowledge is extended topossibilities to translate sensor and actuators categories to micro- and nanoscale. After course, students areable to design, prepare and testing a sensor structure.

Course content: The course covers fundamental theory of phase transformations, fundamental thermodynamics of phase diagrams and application of binary and ternary phase diagrams, formation of micro- and nanostructures through nucleation and growth, crystalline and amorphous solidification, transformations in solid phases, relaxation phenomena, equilibrium and transformations in metallic and ceramic materials.

Material Engineering (course type: elective; course code: ME 453)

Course objective: The aims are to give the student a sound background in the science of engineering materials diagram selections.

Course content: Engineering materials and their properties. Material selection and material development. Heat treatments and examples. Advanced materials. Brittle materials and designs. Weibull analysis. Material selection diagrams

Heat Treatment (course type: elective; course code: ME 454)

Course objective: The aims are to make students aware of the fact that desirable mechanical and other material properties in engineering materials can be achieved by a proper heat treatment design and practice.

Course content: The relation between material structure ↔ production technique ↔ material properties in engineering materials. Heat Treating of Steel - quenching, tempering and annealing, continuous annealing, quantitative methods to predict hardenability. Heat treating information for the most widely-used nonferrous alloys, cast iron, ceramics and glass.

Mechatronics (course type: elective; course code: EE 435)

Course objective: The aims are to give students necessary knowledge in using sensors, and actuators, electrical equipment and microprocessors for designing and building intelligent mechatronic systems

Course content: Introduction to Mechatronics and measurement systems. Sensors and transducers: Sensors and transducers, Performance terminology, Examples of sensors, Selection of sensors. Signal conditioning: Signal conditioning, The operational amplifiers for analog signal processing, Protection, Filtering, Digital circuits and systems. Measurement systems: Designing measurement systems, Data presentation systems,Measurement systems, Testing and calibration. Mechanical actuation systems: Mechanical systems, Kinematic chains, Cams, Gear trains, Ratchet mechanisms, Belt and chain drives. Electrical actuation

systems: Electrical systems, Switches, Solenoids, Motors, Stepping motors. Basic system models: Mathematical models, Mechanical system building blocks, Electrical system building blocks, Fluid system building blocks, Thermal system building blocks. Simulation of simple mechanical systems by electrical elements (circuits). Design and mechatronics: Designing, Mechanisms, Examples of designs.

Image Processing(course type: elective; course code: EE 463)

Course content: Introduction to Image Processing, Digital Signal Processing. D- T and C- T signals and systems. Digital System features. Linearity and S -I. get the picture. Image Processing Techniques; Image Compression, Image Enhancement, Image Restoration and Image Identification.Corner Detection Techniques; Differential approach and identify the model.Mathematical Model of the image. Image Sampling and Quantumrenovation . Fold and Digital Image Correlation . Matlab is used in laboratory studies.

Advanced Technology Materials (course type: elective; course code: MSN458)

Course Description: You will investigate how new process of making foster the innovation of advanced materials and technologies for apparel. This course will provide you with the opportunity to acquire knowledge and skills in research and development for the use of these new processes. Analytical thinking and problem solving will be critically applied to develop and understand the use and application of 2D and 3D technologies relevant to textile and apparel innovation and entrepreneurship.

Electrical, Dielectric, and Magnetic Properies of Engineering Materials (course type: elective; course code: MSN459)

Course Description: Introduction to the physical principles underlying the dielectric and magnetic properties of solids. Processing-microstructure-property relationships of dielectric materials, including piezoelectric, pyroelectric, and ferroelectric oxides, and of magnetic materials, including hard- and soft ferromagnets, ferrites and magneto-optic and -resistive materials, and includes descriptions of magnetic disc data storage principles and methods. The course also covers the properties of grain boundary devices (including varistors) as well as ion-conducting and mixed conducting materials for applications in various devices such as chemical sensors, fuel cells, and electric batteries.