FIRAT UNIVERSITY FACULTY OF TECHNOLOGY DEPARTMENT OF MECHANICAL ENGINEERING COURSE CONTENTS

BHT101 SCIENTIFIC PREPARATION PROGRAMME 15 0 15 30

Mathematics: Numbers, Exponents and Rooted Numbers, Factorisation and Identities, Ratio Proportion, First Order Equations, Judgement Problems-I, Judgement Problems-II, Sets, Relation and Function, Operation and Modular Arithmetic, Polynomials, Second Order Equations, Second Order Inequalities, Parabola, Logarithm, Specially Defined Functions, Trigonometry-I, Trigonometry-II, Logic, Complex Numbers. Degree Inequalities, Parabola, Logarithm, Specially Defined Functions, Trigonometry-I, Trigonometry-II, Logic, Complex Numbers, Limit and Continuity, Derivative-I, Derivative-II, Integral-I, Integral-II, Integral-III, Matrices - Determinant, Systems of Linear Equations, Geometric Concepts and Angles, Triangles-I, Triangles-II, Triangles-III, Polygons and Quadrilaterals, Analytical Investigation of Line, Space Geometry and Solids

Physics: Matter and Properties, Force, Motion, Newton's Laws of Motion, Motion on Earth, Energy, Impulse and Momentum, Light, Electrostatic, Electric Current, Magnetism, Electromagnetic Induction, Motion of Charged Particles in Electric Field

Chemistry: Development of Chemistry, Compounds, Chemical Changes, Chemistry in Our Lives, Atomic Structure, Periodic System, Interactions between Chemical Species, States of Matter, Mixtures

I. SEMESTER

T A C ECTS

TRD 109 TURKISH LANGUAGE -I- 2 0 2 2

Definition of language and its place and importance in the life of a nation as a social institution; language-culture relationship, the place of Turkish language among the world languages, the development and historical periods of Turkish language, the current status and spread areas of Turkish language, sounds and classification in Turkish, sound features of Turkish and rules related to phonetics, syllable knowledge, spelling rules and application, punctuation marks and application

Textbook and Recommended Reading:

Turkish Language, Anadolu University Publications, No:786, Eskişehir, 2003.

Turkish Language Oral and Written Expression, Uğur, A., Ekspres Matbaası, Kütahya, 2002.

Oral and Written Expression, Anadolu University Publications, No: 1073. Eskişehir, 1998

Applied Turkish Information, Göker, O., Evos Basım Yayın, Ankara, 2001.

YDI 107 ENGLISH -I- **2 0 2 2**

Introduction. Tenses and verbs; present continuous, present simple, past simple, past continuous, present perfect simple, present perfect continuous, present perfect continuous, past perfect simple, past perfect continuous, future, present continuous for the future, present simple for the future, imperative and let's, be, there is, there are, have and have got, have for actions and etc. Modal verbs and related structures, ability, permission, obligation and necessity, obligation and advice, possibility, probability, deduction, requests, offers, suggestions, habits, refusals, promises and threats,

Textbook and Recommended Reading :

Interchange Intro, Richards, J.C., Third edition, Cambridge University Press, 2005

English-Turkish dictionary,

English Grammar in Use, Murphy, R., 1985

MAT 161 MATHEMATICS -I- **4 0 4 6**

Number sentences. Absolute value, inequalities involving the absolute value function, induction. Coordinates. Complex numbers. Functions. Compound function. Trigonometric functions. Limits of functions. Continuity. Properties of continuous functions. Derivative. Rate of change, mean value theorem and applications. Maximum and minimum finding and applications. Graph drawing, differential and applications. Integral, fundamental theorem. Functions defined by integration. Integral formulae, integration techniques. Area, volume and arc length calculations.

Textbook and Recommended Reading

General Mathematics, Küçük, Y., Üreyen, M., Orhun, N., Şenel, M., Özer, O., Azcan Hüseyin, Anadoulu University Publication No:1286, Eskişehir, 2001.

General Mathematics for Vocational Schools I, Şenel, M., Orhun, N.,, Tüzemen Şeref, Eskişehir, 2003.

Basic and General Mathematics, Hacısalihoğlu, H., Balcı, M., Gökdal, F., Ertem Matbaacılık, Ankara, 1986.

PHYS 111 PHYSICS-I **3 2 4 7**

Vectors, Motion in one dimension, Motion in two dimensions, Laws of motion, Circular motion and other applications of Newton's laws, Work and energy, Potential energy and conservation of energy, Linear momentum and collisions, Rotation of a solid body around an axis, Static equilibrium, Oscillatory motion, Universal gravitational force.

Textbook and Recommended Reading

Physics, Keller, F. J., Gettys, W. E., Skove, M. J. McGraw, 1993

Serway, R.A. and Beichner, R.J. Physics For Scientist and Engineers with Modern Physics, Sounders College Publishing, 2000.

CHEM 101 CHEMISTRY **2 2 3 4**

Basic concepts in chemistry: Matter, element, compound, mole, mixture and some chemical concepts. Important laws of chemistry: Conservation of mass, constant ratios, multiple ratios, etc. Atomic and molar mass. Symbols, formulae, equations and compounds. Simple formula, molecular formula determination. Valence concept, writing and naming of compound formulae. Chemical reactions and chemical equations, stoichiometry. Oxidation-reduction reactions (redox). Periodic table and some atomic properties: Electronegativity, ionisation energy, electron affinity, quantum numbers and electron orbitals. Gases: Simple gas laws, ideal gas equation, kinetic theory of gases, real gases. Thermochemistry: Heat, heat of reaction and calorimetry. Chemical bonding: Basic concepts: Covalent and ionic bonding. Liquids, solids and intermolecular forces. Solutions and physical properties. Chemical equilibrium. Acids, bases and aqueous solution equilibria. Thermodynamics: Some terms, laws of thermodynamics, Hess law, Gibbs free energy. Electrochemistry: Faraday's laws, electrolysis, battery potential, Nernst equation. Organic Chemistry: Classification of organic compounds. Hydrocarbons (alkanes, alkenes and alkynes), alcohols, phenols, ethers, aldehydes and ketones. Carboxylic acids and derivatives.

Textbook and Recommended Reading

General Chemistry, Uyar, T., Aksoy, S., Inam, R., Palme Publishing, Ankara, 2006 (Translation, Chang, R., 4(th). Edition, MC Graw Hill, New York)

Basic Chemistry-I,II, Kılıç, E., Köseoğlu, F., Yılmaz, H., Bilim Publishing Ankara, 1988. (Translation, P. Atkıns, L., Jones, Chemistry, 3th. Edition, W.H. Freeman and Company, New York)

MMT 101 TECHNICAL DRAWING **2 2 3 5**

The importance of technical drawing, drawing tools and materials, lines, writings, geometric drawings, projections, dimensioning, scales, sectional views, isometric perspective, sketch. Auxiliary views, surface roughness, tolerance and exercises, openings, screws, bolts and nuts, wedges, pins, welded joints, gear wheels, bearings, couplings, construction drawings, assembly drawings.

Textbook and Recommended Reading

Technical Drawing, Bağcı, M, Birsen Publishing House, Ankara, 2000

Technical Drawing Textbook, Şen, İ.Z., İzçilingir, N., DE-HA Publications, Istanbul 2006.

MMT 103 INTRODUCTION TO MECHANICAL ENGINEERING 2 2 3 4

Introduction, Brief history of engineering, Definition of engineering and engineering, Classification of engineering, Relationship between engineering and science, mathematics and business environment, Engineering activities, Definition of mechanical engineering, activity and application areas, education, Mechanical engineering functions, Mechanical engineering education plan, Departments, introduction of laboratory facilities, Factory technical visits, Basic concepts in mechanical engineering, design awareness and process

Textbook and Recommended Reading

An Introduction to Mechanical Engineering, Jonothan Wickert, 2nd Ed., Thomson.

Engineering Ethics, Assoc. Prof. Dr. Seyhan Uygur Onbaşıoğlu, Doğa Publishing House Akademi Kitabevi, Istanbul, 1985.

II. SEMESTER

TRD 110 TURKISH LANGUAGE -II- 2 0 2 2

Turkish construction suffixes and application, general information about composition, plan and application to be used in writing composition, noun and verb conjugations in Turkish, forms of expression in composition and application, usage of adverbs and prepositions in Turkish.

Textbook and Recommended Reading:

Turkish Language, Anadolu University Publications, No:786, Eskişehir, 2003.

Turkish Language Oral and Written Expression, Uğur, A., Ekspres Matbaası, Kütahya, 2002.

Oral and Written Expression, Anadolu University Publications, No: 1073. Eskişehir, 1998

Turkish Handbook, Gülensoy, T., Bizim Gençlik Yayınları, Kayseri, 1994.

Applied Turkish Information, Göker, O., Evos Basım Yayın, Ankara, 2001.

YDİ 108 ENGLISH -II- 2 0 2 2

The passive and have something done. If sentences, conditionals, reported speech, ing form and infinitive, nouns, articles and quantity, pronouns, adjectives, adverbs, comparison: adverbs, negatives, questions and answers, relative clauses, linking words, time, contrast, reason and result, purpose. Prepositions, place, place and movement, time, means of transport, Phrasal verbs, types of phrasal verbs. Pronunciation and spelling of endings, contractions, irregular verbs.

Textbook and Recommended Reading :

Interchange Intro, Richards, J.C., Third edition, Cambridge University Press, 2005.

English-Turkish dictionary,

English Grammar in Use, Murphy, R., 1985.

MAT 162 MATHEMATICS -II- **4 0 4 6**

Sequences, series, power series. Polar coordinates, vectors, curves, lines and planes in R3. Limit and continuity of functions of several variables, partial derivative, gradient vector, tangent plane, directional derivative, unconstrained and constrained maximum and minimum, Lagrange multipliers. Multiple integrals, line integrals and path independence, surface integrals.

Textbook and Recommended Reading

General Mathematics, Küçük, Y., Üreyen, M., Orhun, N., Şenel, M., Özer, O., Azcan Hüseyin, Anadoulu University Publication No:1286, Eskişehir, 2001.

General Mathematics for Vocational Schools I, Şenel, M., Orhun, N.,, Tüzemen Şeref, Eskişehir, 2003.

Basic and General Mathematics, Hacısalihoğlu, H., Balcı, M., Gökdal, F., Ertem Matbaacılık, Ankara

PHYS 112 PHYSICS-II **3 2 4 7**

Electric fields, Gauss Law, Electric potential, Capacitance and dielectrics, Current and resistance, direct current circuits, magnetic fields, magnetic field sources, Faraday's Law, Inductance, Alternating current circuits, electromagnetic waves.

Textbook and Recommended Reading

PHYSICS, For Scientists and Engineers with Modern Physics, R.Serway, Saunders College Publishing, 1990.

Modern University Physics Volume 2 Electricity Problems, Nasuhoğlu-Yalçıner, Çağlayan, Istanbul, 1989

Modern University Physics Volume 2 (Electricity), , , İst,1989

MMT 102 COMPUTER AIDED TECHNICAL DRAWING **2 2 3 5**

Introduction to computer aided technical drawing. Geometric drawings. Principles of vertical projection, extraction of basic views from three-dimensional models. Solution techniques for basic manufacturing processes and standard specifications. Removing the third view from two basic views, freehand drawing techniques. Three dimensional drawing techniques; simple shapes, oblique surfaces, contrary surfaces. Principles of dimensioning.

Principles of sectioning; full, half sections, traditional applications. Screws, screw elements, construction and lapping tolerances, surface quality, shape and position tolerances. Wedges, springs and locking elements, riveted and welded joints. Gear wheels. Cams.Construction and assembly drawings.Auxiliary views and visibility.Drilling Points.Interfaces of planes and the angle between two planes.Parallelism, perpendicularity and the angle between a line and an inclined plane.Interfaces of bodies with planes.Interfaces of bodies with bodies. Expansions and pipe networks

Textbook and Recommended Reading

, ISBN:9752976778

AutoCAD for Engineering Graphics,.Bertoline,Gary R., Macmillan Publishing Company, New York: 1994.

Technical Drawing, Giesecke,E.Frederick et. al., Upper Saddle River,New Jerse:Prentice Hall, 2000.

MMT104 STATICS **3 0 3 4**

Statics of a material point: planar and spatial forces, equilibrium. Moment, moment of force pair. Equivalent force systems in rigid bodies. Equilibrium of two dimensional systems. Equilibrium of three dimensional systems. Distributed loads: centroids and centres of gravity. Analysis of structures: truss systems, frames and machines. Internal forces in beams and cables. Friction. Area and mass moments of inertia. Virtual work method.

Textbook and Recommended Reading

Mechanical Statics for Engineers, Prof Dr Keskinel, Özbek, Üçer Matbaacılık Istanbul, 1977,

Engineering Mechanics Static Problem Solutions, Prof. Dr Yaşar PALA - Murat Reis, Nobel Publication, ISBN : 975591711X

Engineering Mechanics, Statics and Dynamics, I.H. Shames Prentice Hall College Div; 3 edition (June 1980), ISBN-13: 978-0132791588

MMT 106 MATERIAL INFORMATION **3 1 3 4**

Scope and development of materials science and its place in engineering, classification of materials. Atomic structure and interatomic attraction forces, amorphous and crystalline systems, crystallisation mechanism, short and long distance arrangement, unit cells, points, directions and planes in unit cells, allotropic transformations, crystal defects, dislocations, atom diffusion, Fick's law and its applications, diffusion types, elastic and plastic deformation mechanisms, fracture, structure of alloys, solid melts, hardening and strengthening of materials, precipitation, dispersion and deformation hardening, ageing. Materials testing methods: tensile, compression, bending, creep, torsion, fatigue, fatigue, impact and hardness measurement tests, phase diagrams, solid state transformations, iron carbon alloy system, iron and steel production, steel norms,

iron-cementite phase diagrams and structures, heat treatment, annealing, tempering, surface hardening and modification methods, isothermal transformation and continuous cooling diagrams, alloy steels

Textbook and Recommended Reading :

D.R. Askeland, The Science and Engineering of Materials, PWS-Kent Publishing Co., Third Edition, 1995.

W.D. Callister, Materials Science and Engineering: An Introduction, John Wiley and Sons, Fifth Edition, 2000, ISBN 0-471-32013-7

S. Sarıtaş, Engineering Metallurgy and Materials, Gazi University, 1995.

III. SEMESTER

ATATURK'S PRINCIPLES AND HISTORY OF REVOLUTION -I- 2 0 2 2

The aim of reading Turkish Revolution History and Kemalism course and the concept of revolution, the collapse of the Ottoman Empire and the reasons that prepared the Turkish Revolution, the disintegration of the Ottoman Empire, the Mondros armistice treaty and the subsequent events, the situation of the country in the face of the occupations and the reaction of M. Kemal Pasha, M. Kemal Pasha's exit to Samsun and the opening of the last Ottoman parliament, the opening of the Turkish Grand National Assembly and the management of the war of liberation

Textbook and Recommended Reading:

Atatürk's Principles and History of Revolution, Turan, R., 2004

MAT213 LINEAR ALGEBRA 2 0 2 3

Proof Methods, Sentence Theory, Relations, Functions and Operations, Group, Ring, Field, Vector Spaces, Matrix and Matrix Spaces

Linear Algebra (Hilmi HACISALİHOĞLU)

Linear Algebra with Solutions (H Hilmi HACISALİHOĞLU)

MMT 201 INDUSTRIAL MEASUREMENT TECHNIQUE **2 1 3 5**

Basic principles of measurement and control. Measurement methods. Measurement and control instruments: Callipers, micrometers, callipers, callipers, comparators, pasameters, indicators. Gauges. Coordinate measuring machine. The importance of experiment in engineering, experimental methods, basic concepts and definitions, measurement and dynamic response. Statistical analysis of experimental data, error types and error analysis, uncertainty, probability, Chi-square test, least squares method, correlation coefficient. Measurement of basic electrical quantities, pressure, flow, temperature, force, torque, strain, velocity, acceleration, displacement. Data collection and evaluation. Report writing and presentation techniques.

Textbook and Recommended Reading :

Experimental Methods for Engineers, J. P. Holman, 7th Ed., Mc-Graw Hill, 2001

Quality Control, Mustafa AKKURT, Birsen Publishing House, 2002.

MMT 203 DYNAMICS **3 0 3 4**

Kinematics of a material point: uniform linear, curvilinear motion: Kinetics of the material point. Linear and angular momentum. Newton's law of motion. Work-energy theorem. Dynamic equilibrium. Thrust-momentum theorem of a material point. Collision. Collision kinematics of rigid bodies: planar and spatial. Linear and angular momentum of rigid bodies. Kinetics of a rigid body. Euler equation of motion. Work-energy and thrust-momentum theorems for a rigid body. Virtual work principle

Textbook and Recommended Reading :

Engineering Mechanics, Statics and Dynamics, R:C. Hibbeler.

Dynamics, J.L. Meriam.

Engineering Mechanics, Statics and Dynamics, I.H. Shames

MMT205 STRENGTH-I **3 0 3 4**

Geometrical classification of bodies, Principles on which strength is based, Stress, Cross-sectional effects, finding cross-sectional effects by various methods. Relationship between spring load, shear force and bending moment, cross-sectional effects for frame and skew-axis bars, Cross-sectional effects in non-planar systems, Axial forces state, Deformation (Hook's Law), Statically indeterminate problems (Hyperstatic problems), thin-walled rings and tubes, stress analysis, uniaxial stress state, biaxial stress state, principal stresses, triaxial stress state, mohr circle, strain, stress-strain relations, volumetric elasticity model, strain energy and finding.

Textbook and Recommended Reading :

Mechanics of Materials, R. C. Hibbeler, Prentice-Hall Inc., USA

Mechanics of Materials, F. P. Beer and E. R. Johnston, Mc-Graw Hill Comp., England.

Engineering Mechanics of Solids, E. P. Popov, Prentice-Hall Inc., USA

MMT 207 THERMODYNAMICS-I **2 0 2 3**

Thermodynamics and energy, dimension and units, system and control volume, properties of the system, state and equilibrium, state changes and cycles, temperature and the zeroth law of thermodynamics, pressure, technique of solving thermodynamic problems, energy transformations, internal energy, heat energy, work and energy transfer, mechanical forms of work, first law of thermodynamics, energy conversion efficiencies, pure matter and pressure-specific volume-temperature diagrams, property tables, ideal gases, closed and open system analysis, enthalpy and specific heats, second law of thermodynamics, heat machines, refrigeration machines, heat pumps, reversible and irreversible state changes, Carnot cycle, entropy, exergy, second law efficiency.

Textbook and Recommended Reading

Thermodynamics with Engineering Approach, Y.A. Çengel, M.A. Boles, McGraw-Hill, 6 ed., 2007

Thermodynamics, A.R. Büyüktür, Birsen Publishing House, 2000

MMT 209 MANUFACTURING PROCESSES **3 1 3 6**

Classification of manufacturing methods. Introduction to casting, principles of melting, pouring and solidification, sand mould casting, investment casting, plaster mould casting, ceramic mould casting, pressure casting, centrifugal casting, permanent mould casting, hollow moulds, shell moulds, air hardening moulds, melting furnaces, surface treatment and repair, casting defects and quality control, casting part design and casting materials. Principles of plastic forming technology, fundamentals of elasticity and plasticity, mechanical principles, metallurgical principles, mass formability. Analysis of plastic forming processes, forging, rolling, extrusion, extrusion, drawing, sheet metal working methods. Introduction to powder metallurgy, metal powder production methods, characterisation of powders, moulding and compaction methods, sintering, bond formation mechanisms, application areas of the method. Definition and classification of welding, gas fusion welding, electric arc welding, welding electrodes, electric resistance welding, submerged arc and gas welding methods, solid state welding methods, other welding methods, soldering methods, evaluation of welding capabilities of materials, welding defects, work safety in welding.

Textbook and Recommended Reading :

Mechanics of Materials, R. C. Hibbeler, Prentice-Hall Inc., USA

Mechanics of Materials, F. P. Beer and E. R. Johnston, Mc-Graw Hill Comp., England.

Engineering Mechanics of Solids, E. P. Popov, Prentice-Hall Inc., USA

IV. SEMESTER

ATATÜRK PRINCIPLES AND HISTORY OF REVOLUTION 210 -II- 2 0 2 2

Abolition of the Caliphate, Terakkiperver Republican Party and Takrir-i Sükun period, education reform, cultural reform, alphabet reform, Turkish history reform, Turkish language reform, Izmir economic congress, transition to multi-party life, reform in the field of women's rights, hat, disguise Revolution, Foreign policy of the Republic of Turkey, Atatürk's principles, political events, relations between the Government of the Grand National Assembly of Turkey and the Government of Istanbul, military developments, the Treaty of Kars, the Ankara Treaty of Alliance, the Great War, Mudanya Armistice, the abolition of the Ottoman Sultanate, Lausanne Peace Treaty.

Textbook and Recommended Reading

Atatürk's Principles and History of Revolution, Turan, R., 2004.

ELK 214 ELECTRICAL-ELECTRONICS 2 0 2 3

Electrical definitions and units. Basic laws. Circuit analysis methods. Resistance circuits. Inductance and capacitor. Dynamic response. Alternating current circuits. Electrical measurement and measuring instruments. Chemical effect. Transformers, generators and motors. Semiconductor electronics: working principles of diodes and transistors and simple applications. Functional amplifiers and applications. Logic gates and applications

Textbook and Recommended Reading

Rizzoni, G., Principles and Applications of Electrical Engineering, Mc Graw Hill

Aydemir, M.T., Nakiboglu, C., Electric Circuits, (Translation), Schaum Series

MAT 214 ENGINEERING MATHEMATICS 3 0 3 5

Vector spaces. Matrices and determinants. Algebraic eigenvalue problems. Coordinate transformations. Quadratic forms. Matrix functions. Analysis of vector functions. Gradient. Divergence. Blind. Differential vector identities. Vector integral theorems. Green. Gauss. Divergence and Stokes integral theorems. Analytical functions, Euler's Theorem in Homogeneous Functions, Implicit Functions. Line Integral and its applications Conversions in Multiple Integrals, Spherical and Cylindrical Coordinates Applications of Double and Triple

IntegralsArea Heasbı, Volume CalculationMoment and Centre of Mass, Moment of Inertia, Guldin Theorem, Fourier Series, Gamma Function

Textbook and Recommended Reading

G.Nikos and D.Joyner, Linear Algebra with Applications.Brooks/Cole Co.1998.

O.Bretscher,Linear Algebra with Applications,Prentice Hall,1997.

P.V.O'Neil, Advanced Engineering Mathematics.

E.Kreyszig, Advanced Engineering Math.

MMT 204 COMPUTER PROGRAMMING 2 2 3 5

Problem solving. Input-Operation-Output process. Algorithm design and flow diagrams. Constants, variables and expressions. Arithmetic, relational and logical operators. Input-Output statements. Condition and repeat statements, loops. Vector and matrix representations. Character information operations. Sub-function and function creation. Writing a programme in a structured programming language (C, C++). Applications in C programming language.

Textbook and Recommended Reading:

C programming Language, Fatih Başçiftçi, Nobel Publishing, Istanbul, 2009.

C How to Programme, H.M.Deitel and P.J. Deitel, Prentice Hall, 2004.

The C++ Programming Language, Bjarne Stroustrup, Addison-Wesley, 2000.

C programming: A Modern Approach, K.N. King, W.W. Norton & Company, 2008

MMT 206 MACHINE ELEMENTS-I- 3 0 3 3

Stresses, Stresses under static and dynamic loads, safety stresses. Shafts and axles, shaft-hub connections, fasteners; solvable fasteners, bolt connections, pins, rivets, non-solvable fasteners; welding, soldering, gluing and rivet connections. Springs and loading conditions in springs.

Textbook and Recommended Reading :

Applied Machine Elements Handbook, E. Çiftçi, Birsen Publishing House.

Machine Elements Solved Problems, Gürcül, İ., Birsen Publishing House.

MMT 208 STRENGTH-II- 3 0 3 4

Strength hypotheses, comparison of hypotheses, torsion, principal stresses in torsion, strain energy, sizing, torsion of ring sections, thin walled tubes of arbitrary shape, sections other than circles, torsion of open profile sections, moments of inertia, radii of inertia, parallel displacement of axes, Rotation of axes, simple bending, simple bending of symmetrical sections, Bernoulli Hypotheses, stress-moment relationship, moment and deformation order in deformation, oblique bending, shear bending, comparison of shear and normal stresses in shear bending, normal strong bending-dimensioning, eccentric force condition, torsional bending.

Textbook and Recommended Reading :

Mechanics of Materials, R. C. Hibbeler, Prentice-Hall Inc., USA

Mechanics of Materials, F. P. Beer and E. R. Johnston, Mc-Graw Hill Comp., England.

Engineering Mechanics of Solids, E. P. Popov, Prentice-Hall Inc., USA

MMT 210 THERMODYNAMICS-II- 2 0 2 3

Second law analysis of engineering solutions, Irreversibility, Gas-fuelled power cycles. Comparison of gas-fuelled power cycles. Theoretical steam power cycles. Calculations and applications of steam power cycles. Cooling machine cycles. Gas mixtures. Combustion thermodynamics.

Textbook and Recommended Reading

Thermodynamics with Engineering Approach, Y.A. Çengel, M.A. Boles, McGraw-Hill, 6 ed., 2007

Thermodynamics, A.R. Büyüktür, Birsen Publishing House, 2000

MMT 212 PRODUCTION TECHNOLOGY-I- 3 2 4 5

Introduction of drill, vargel, lathe machine tools used in machining; use of cutters and apparatus. Drilling, marking, filing, cutting operations. Operation types, cutters used in these machines. Sharpening of drills and lathe pens. Part processing, shaping using hand tools. Screwing and reaming by hand and machine with die and guide. Chip removal on the Vargel machine. Use of measuring and control instruments. Simple joining methods. Soft and hard soldering. Production of tools and instruments. Safety rules and the way the lathe is operated. Introducing the parts of the lathe, the types of tools used in the lathe, the types of tools used in the lathe, the places of use and the ways of using them and the connection to the lathe. Cutting tools used in the lathe (lathe, tailstock drill, etc.) and bringing them to the ready position for cutting. Applications of turning operations: cylindrical turning, conical turning, eccentric turning, screw drawing, hole drilling and enlarging, sphere turning, knurling, spring winding and special turning operations.

Textbook and recommended resources:

Sawing Vocational Technology I, N., Şahin, Kozan Ofset, Ankara, 1999

Levelling Vocational Technology II, N., Şahin, Kozan Ofset, Ankara, 1999

Chip Removal Principles 2, Y. Şahin, Nobel Publishing Distribution, Ankara, 2001.

V. SEMESTER

IST 301 PROBABILITY AND STATISTICS **2 0 2 2**

Introduction and basic concepts, Organisation of data, Measures of central tendency, Measures of central dispersion, Simple probability concepts, Binomial distribution, Normal distribution, Hypothesis testing, Regression and correlation

Textbook and Recommended Reading

Statistics for Management and Economics, 7th Edition, by Mendenhall/Reinmuth/Beaver, Duxbury Press, 1993

Business Statistics by Example, 5th Edition, by Terry Sincich, Prentice-Hall Inc. (International Students Edition), 1996.

Business Statistics, 6th Edition, by Daniel/Terrell, Hougton Mifflin (International Students Edition), 1996.

MMT 303 NUMERICAL ANALYSIS **3 0 3 4**

Numbers, Errors, Taylor series, Lagrange, Newton interpolation, Roots of nonlinear equations, Newton Raphson method, Direct and iterative solutions of systems of linear equations, Curve fitting to experimental data (least squares method), Numerical integration (Simpson method), Some methods for numerical solution of ordinary differential equations. Classification of partial differential equations. Finite difference method for the solution of parabolic and elliptic equations.

Textbook and Recommended Reading :

Numerical Analysis and Engineering Applications, İrfan Karagöz, Nobel Publications, 2000

MMT305 HEAT TRANSFER-I- **2 0 2 3**

Definitions and concepts in heat transfer, Heat transfer mechanisms; Conduction, convection, radiation, The place of heat transfer in practice and sample applications, Introduction to heat conduction in continuous regime; Boundary and initial conditions, Conduction equation, Expressions of heat conduction equation in Cartesian, cylindrical and spherical coordinates, Conduction heat transfer in planar wall, mixed wall and radial systems, Thermal contact resistance and critical insulation radius on cylindrical surfaces, Heat transfer on finned surfaces, Heat transfer through the fin at different boundary conditions, Fin effectiveness and efficiency, Time-

dependent heat conduction; bulk and diffuse systems, Analytical solution of time dependent heat conduction equations; Biot and Fourier Numbers, Graphical solution of time dependent heat conduction equations.

Textbook and Recommended Reading :

Fundamentals of Heat and Mass Transfer, Frank P. Incropera, David P. Dewitt, Translators: Taner Derbentli, Osman Genceli, Ali Güngör, Arif Hepbaşlı, Zafer İlken, Necdet Özbalta, Feridun Özgüç, Cem Parmaksızoğlu, Yalçın Uralcan, Literatür Yayıncılık, 2003.

Heat Transfer Heat Transfer with Examples, F. Halıcı, Birsen Publishing House.

MMT 307 MACHINE ELEMENTS-II-II- 3 0 3 3

Oils and lubrication theory, plain and rolling bearings. Design of gear wheels; spur, helical and bevel gear wheels, spiral and worm mechanisms. Design of couplings, clutches and brakes. Design of belt-pulley mechanisms and chain-gear mechanisms. Friction wheels.

Textbook and Recommended Reading :

Machine Elements. M.Akkurt, Fastening Elements. M.Gediktaş, Mechanical Eng.Design, J.E. Shigley,

Machine Elements and Construction Examples, F. C. Babalık, Machine Design, R. L.

MMT 309 FLUID MECHANICS-I- 2 0 2 2

Properties and introduction of fluids, Gas kinetic explanation of internal friction and viscosity, Surface tension and capillarity, Liquid fluid pressure, Pressure force on the sides of the tank, Pressure force on the inclined surface, Hydrostatic buoyancy, Hydrodynamics, jet forces, Flow from a tank and applications of Bernolli equation, Introduction of flow types, Laminar and turbulent flow, Calculation of friction loss in pipes and ducts, calculation of equivalent diameter and flow in bends, Euler equations of motion, Viscosity, surface tension, Capillarity, Jet forces, Lifting force.

Textbook and Recommended Reading :

Fluid Mechanics, F. M. White, translation into Turkish, Kadir Kırkköprü and Erkan Ayder, Literatür Publishing, (1034 pages), 2004.

Fluid Mechanics and Hydraulics with Theory and Problems, Güven YAyıncılık San. And Tic. A.Ş., 1977.

MMT 311 INDUSTRIAL HYDRAULIC AND PNEUMATIC SYSTEMS 2 2 3 5

Industrial use of hydraulics, Hydrostatics and Hydrodynamics, Basic rules, Standard symbols, Working principles and types of direction, pressure and flow control valves. Hydraulic pumps and types, working principles, calculations related to pumps and motors. Sealing elements, Hydraulic cylinders, piston speed, calculation of push and pull forces. Design and drawing of hydraulic circuits, basic principles, path-step diagrams, industrial circuit diagrams. Possible malfunctions in hydraulic system and their elimination. Introduction of pneumatic systems, place and application areas in industry. Production and distribution of compressed air. Symbols used in pneumatics, direction, pressure and flow control valves, cylinders taken in pneumatics, maintenance units, path-step diagrams and drawing of pneumatic circuits, basic principles and examples from applications in industry. Maintenance and troubleshooting of pneumatic systems. Introduction of electrohydraulic and electropneumatic systems.

Textbook and Recommended Reading :

Pneumatic Transmission Basics, Arun, N., Akkoç, H., Mak. Müh. Chamber Publication

Pneumatic circuit elements and application techniques, Mak. Müh. Chamber Publication

MMT 313 ENGINES 3 1 3 5

Thermodynamic cycles, analysis of ideal cycles in combustion engines, deviations from ideal processes, fuels, knock. Air fuel mixture formation, fuel injection, manifold and mixture distribution, valves and valve mechanisms, ignition systems, combustion media. Engine performance, piston and engine mechanisms, balancing.

Textbook and Recommended Reading

Engineering Fundamentals of the Internal Combustion Engine, W. W. Pulkrabek, Prentice Hall, 1997.

Internal Combustion Engine Fundamentals, J. P. Heywood, McGraw Hill Book Company, New York, 1988.

Internal Combustion Engines, B. Safgönül, M. Ergeneman, H. E. Arslan and C. Soruşbay, Birsen Publishing House, 1995.

MMT 315 PRODUCTION TECHNOLOGY-II- 3 2 4 6

Use and operation of milling machine tools and tools. Machine tool cutters, features, usage patterns. Milling techniques. Applications of plane surface, channel, step, pocket and hole operations in milling. Partition operations. Gear wheel manufacturing applications and opening of helical grooves. Surface quality in milling. Special gear opening machines and applications. Introduction and use of grinding and tool grinding machines and auxiliary apparatus, working principles, adjustment. Connection, disassembly, balancing, sharpening of workpieces and stones, selection of suitable stones. Cylindrical, conical, hole grinding, spot grinding operations

and points to be considered. Safety precautions. Sharpening of single and multi-bladed straight, helical, cross, profile and other milling cutters, making the necessary adjustments and calculations. Sharpening of drill and lathe pens, practical demonstration of the basic rules of sharpening, errors that may occur during sharpening and their elimination.

Textbook and Recommended Reading :

Frezecilik, N., İpekçioğlu, M.E.B. Publications, Ankara, 1988.

Chip Removal Methods and Machine Tools, M.Akkurt, Birsen Publishing House, Istanbul, 1992.

Machine Tools theory and calculations, F., Mendi, Gazi Kitabevi, Ankara, 1999.

Grinding and Tool Sharpening, M. Bağcı, Yakup Erişkin, M.E.B Publications, Ankara, 1989

VI. SEMESTER

MMT 302 HEAT TRANSFER -II- 2 1 3 4

Introduction to convection heat transfer; Natural and forced convection, Boundary layer concept, Continuity, Momentum and Energy equations, Dimensionless numbers used in heat transfer, Laminar flow and heat transfer through the plate, Flow and heat transfer through the cylinder, sphere and tube bundle, Flow and heat transfer in pipes and ducts, Flow and heat transfer in pipes and channels, Friction and heat transfer coefficient in fully developed flow, Natural convection; boundary layer concept, heat transfer by natural convection through horizontal and vertical plate, heat transfer by natural convection through horizontal and vertical cylinder and sphere, boiling and condensation; natural convection, bubble and film boiling, Heat exchangers; definition and classification, determination of total heat transfer coefficient, Thermal analysis of heat exchangers; Logarithmic mean temperature difference (LOSF) method, Thermal analysis of heat exchangers; -NTU Event method, Radiative heat transfer; radiative heat transfer between two black surfaces, Radiative heat transfer; relations between shape factors

Textbook and Recommended Reading :

Fundamentals of Heat and Mass Transfer, Frank P. Incropera, David P. Dewitt, Translators: Taner Derbentli, Osman Genceli, Ali Güngör, Arif Hepbaşlı, Zafer İlken, Necdet Özbalta, Feridun Özgüç, Cem Parmaksızoğlu, Yalçın Uralcan, Literatür Yayıncılık, 2003.

MMT 304 MECHANICS TECHNIQUE 2 0 2 3

Introduction to mechanisms; examples of mechanisms, basic definitions, degree of freedom, kinematic constraints on the motion of elements, classification of mechanisms. Kinematic analysis of rod mechanisms; position velocity and acceleration analysis by graphical and analytical methods. Linear mechanical systems; simple gear systems, gear trains. Cam mechanisms

Textbook and Recommended Reading :

Mechanisms, E. Söylemez, METU Publication No:64 1999 Ankara

Mechanism Design, A.G Erdman, G.N. Sandor, Prentice Hall 1997

Theory of machines and Mechanism, J.E. Shigley and J.J. Uicker, Mc-Graw Hill Comp., U.K.

MMT 306 FLUID MECHANICS-II- 2 1 3 3

Dimensional analysis, Introduction to gas dynamics and fundamentals of fluid mechanics, Fundamentals of thermodynamics and derivation of thermodynamic relations used in gas dynamics, Definition of compressible fluids, Speed of sound and Mach number concepts, Pressure distribution of compressible fluids, Introduction to isentropic flow, Isentropic flow conditions in nozzles and diffusers, Working table for isentropic flow and sample problem solutions, Viscous flows, turbulent flow, flow around moving and stationary bodies, Introduction to hydraulic machines, Action and reaction turbines, Axial and axial pumps, ventilators.

Textbook and Recommended Reading :

Janna, W.,S., Introduction to Fluid Mechanics, 3rd edition, PWS-KENT pub. Comp.1993

Soğukoğlu M, Fluid Mechanics, Birsen Publishing House.

MMT 310 CNC MACHINE TOOLS 2 2 3 5

Coordinate systems in numerically controlled machine tools, machine movements and motion control, drive and slide systems. Machine-computer hardware interface in numerically controlled machines. DNC, CNC and AC technologies in numerical control. Part programming techniques in numerically controlled machine tools; manual programming, computer aided programming; APT, part programming applications.

Textbook and Recommended Reading :

M P Groover, Automation, Production Systems and Computer Integrated Manufacturing, Prentice-Hall International, ISBN: 0-13-054610-0.

M. Akkurt, Computer Controlled Machine Tools (CNC) and Systems, Birsen Yayinevi, Istanbul, 1991.

A. Esin, Numerically Controlled Machine Tools, Volume 1, TMMOB Makina Müh. Odasi, Publication No: 140, 1992.

E. Aslan, BSD (CNC) Programming Principles and Applications, 72TDFO Ltd. Şti. Publications, 1995, ISBN: 975-95038-0-8.

VI. SEMESTER ELECTIVE BRANCH COURSES

MMT 312 CAM-I- **2 2 3 4**

Basic concepts; product phases in production, manufacturing systems, automation, computer aided design (CAD), computer aided manufacturing (CAM), computer integrated manufacturing (CIM). Manufacturing and process planning in manufacturing systems, techniques related to production capacity calculation, determination of the number/location of machine tools. Numerical control principles and numerical control machine tools. Group technology, part family, flexible manufacturing cells and systems, programmable controllers. Quality control and quality control diagrams.

Textbook and Recommended Reading :

Mikell P. Groover, 'Automation, Production Systems, and Computer Integrated Manufacturing', Prentice-Hall, Inc, Englewood Cliffs, New Jersey, 1991, ISBN: 0-13-054652-6.

Tien-Chien Chang, Richard A. Wysk and Hsui-Pin Wang,'Computer Aided Manufacturing', Prentice-Hall, Inc.,Upper Saddle River, New Jersey, 1998, ISBN: 0-13-754524-X.

MMT 314 MOULDING TECHNIQUE -I- **2 2 3 4**

Moulding techniques and basic concepts. Presses used in moulding. Design and production of cutting, punching, bending and drawing moulds. Selection of mould parts and materials. Propping, pushing and advancing elements in moulds. Design, construction and use of moulds. Design and manufacture of plastic injection and volume moulds. Design and manufacture of work and clamping moulds.

Textbook and Recommended Reading :

F.W. Wilson, Fundamentals of Tool Design, SME, Prentice Hall, U.S.A.

Turan Güneş, Press Works Technique, Chamber of Mechanical Engineers, Ankara

MMT 316 MODERN MANUFACTURING METHODS **2 2 3 4**

Chip removal methods, mechanical methods, chemical methods, ECM, electrochemical methods, thermal methods, hybrid electrochemical methods, hybrid thermal methods, surface treatment methods, Ultrasonic machining (USM), rotational ultrasonic machining (RUSM), Abrasive jet machining (AJM), water jet cutting (WJM), Electrochemical energy: Electrochemical machining (ECM), electrochemical grinding (ECG), electrochemical honing (ECH), electrochemical deburring (ECD). c. Chemical energy: Chemical machining (CHM). d. Thermal energy: Electro-erosion machining (EDM), wire electro-erosion (WEDM), laser machining (LBM), electron beam machining (EBM), plasma cutting (PAC).

Textbook and recommended resources:

G.F. Benedict, Nontraditional Manufacturing Processes, Marcel Dekker, Inc., New York, 1987, ISBN: 0-8247-7352-7.

P.C. Pandey and H.S. Shan, Modern Machining Processes, Tata-McGraw Hill Comp., New Delhi, 1988, ISBN: 0-07-096553-6.

Hassan Abdel, Gawad El-Hofy, Advanced machining process, Mc Graw Hill, 2005

Metals Handbook 9th Edition, 16 volume, 1989

Cemal Çakır, Modern machining methods, Nobel Publishing, 2006.

MMT318 PLASTIC FORMING TECHNOLOGY 2 2 3 4

Stress-strain relations in plastic deformation, basic principles of plastic deformation, factors affecting plastic deformation, mechanical principles, stress and stress state, indices, signs, triaxial stress state and principal stresses, special stress states, deviator tensor, stress-strain relations in elastic field, mechanics of plastic deformation, yield criteria, maximum shear stress, distortion energy, effective stress-effective strain, volume constancy in plastic deformation, stress-strain relations in plastic field, tensile, compression and torsion tests, plastic deformation work, adiabatic heating, analysis of plastic forming methods, metallurgical principles, cold, hot and warm forming, directional dependence, residual stresses, furnaces used in plastic forming processes, forging, rolling, extrusion, wire drawing, such as plastic forming methods and sample problem solutions.

Textbook and Recommended Reading :

Levon Çapan, Plastic forming of metals, Çağlayan Kitapevi 2003

E. Sabri Kayalı, H. Çimenoğlu, Plastic forming principles and applications, Bilim Teknik Yayınları 1995

MMT 320 MECHANICAL SYSTEM DESIGN 2 2 3 4

Three dimensional stress analysis, static design criteria for ductile and brittle materials, fatigue design, dynamic effects in design; dynamic force analysis, natural frequency control, sudden impact effect, optimisation methods; simple derivative, lagrange multipliers and linear programming. In addition to these topics, a mechanical design project is carried out during the semester.

Textbook and Recommended Reading :

Mechanical Engineering Design, J.P. Shigley and C.R. Mischke Mc Graw - Hill Book Company

MMT 322 NATURAL GAS AND LPG SYSTEMS 2 2 3 4

Natural gas and its properties, comparison with other fuels. Use of natural gas in residential buildings; determination of natural gas requirement, time factor, natural gas installation calculation, natural gas safety systems. The use of natural gas in industry; natural gas installation calculation and safety precautions in industrial use. Natural gas burners. Conversion to natural gas in residential and industrial use.

Textbook and Recommended Reading :

Natural gas and LPG installation, Isısan publications, Küçükçalı, R., 1998.

Introduction to natural gas installation,

In-Building Natural Gas Installation Project Preparation Principles with Schemes, Mak. Müh. Chamber Publications

MMT324 AIR CONDITIONING AND VENTILATION TECHNIQUE 2 2 3 4

Dry air and atmospheric air, specific humidity and relative humidity of air, dew point temperature, adiabatic saturation and wet bulb temperatures, psychrometric diagram, human comfort and air conditioning, air conditioning processes, sensible heating and cooling, heating with humidification, dehumidification with cooling, evaporative cooling, adiabatic mixing of air flows, wet cooling towers, calculation of cooling load, air cleaning methods, fresh air requirement and calculation of spaces, heat increases, space dimensions and coefficients of variation, aspirator, ventilator calculation, finding the number and amount of air exchange, air ducts, duct materials, clamps, joining and separating elements, flow, pressure, speed measurements, grilles, chimneys, hoods, ventilation systems and introduction, air distribution and duct design methods, automatic control systems used in air conditioning systems, air conditioning project design, installation and operation of systems, aspirator, ventilator types, designs and constructions, air cleaning methods.

Textbook and Recommended Reading :

Ventilation and Air Conditioning Principles, Doğan, H.Seçkin Kitapevi

Air Conditioning Installation, Mak. Müh. Chamber Publication

Psychometry, Thermodynamics of moist air, Mak. Müh. Chamber Publication

MMT 326 SOLAR ENERGY AND APPLICATIONS 2 2 3 4

Basic concepts of solar energy, solar radiation, solar angles, calculation of solar radiation to horizontal and inclined plane, flat collectors, parabolic collectors, collector thermal efficiencies, optimum collector inclination, shading length calculation, obtaining hot water with the help of solar energy and project design, active and passive heating with solar energy and project design, use of solar energy in heat pumps and combined heating

systems, cooling and drying with solar energy, solar cells, design, project design, manufacturing and installation of solar energy systems.

Textbook and Recommended Reading :

Solar Energy, Öztürk, A., Kılıç, A.

Solar Energy Installation, Küçükçalı, R., Isısan publications, 2003.

Solar Energy Applications, Doğan, İ., Bileşim Publishing House,

MMT 328 REFRIGERATION TECHNOLOGY 2 2 3 4

Basic concepts and thermodynamic information about refrigeration, inverse Carnot cycle, theoretical and real refrigeration cycles and refrigeration circuits, mechanical vapour compression refrigeration system elements (compressor, condenser, expansion valve or capillary tube, evaporator), calculation of refrigeration performance coefficients, refrigerants, design of refrigeration circuits, absorption and adsorption refrigeration circuits, cascade refrigeration, gas-fluid refrigeration cycles, thermoelectric refrigeration cycles and applications, control elements of refrigeration systems, design and design of cold storages, calculation of cooling load and sample projects, vapour compression and absorption heat pumps and applications.

Textbook and Recommended Reading :

Applied Refrigeration Technique, Ozkol, N., Mak. Müh. Chamber Publication

Refrigeration Technique and Applications, R. Yamankaradeniz, Nobel Publication Distribution

Refrigeration Installation, Mak. Müh. Chamber Publication

MMT 330 APPLIED HEATING TECHNIQUE 2 2 3 4

Local, central and district heating, hot water heating systems, floor heating systems, boilers, boilers, combi boilers, heaters (radiators), heating installation project preparation principles, building components and heat transfer, heat loss calculations, insulation and vapour transfer calculations, heater selection and placement, column diagram and pipe diameters calculation, boiler selection and boiler room layout, chimney section calculation, expansion tank and safety pipes, circulation pump calculation, annual fuel quantity and fuel tank calculation, maintenance and repair of boiler and pump, sound and vibration in installation, automatic control, underfloor heating.

Textbook and Recommended Reading :

Heating and Ventilation Technique, Volume 1 and 2, Translated by Mak. Y. Engineer. Uğur KÖKTÜRK, Arı bookstore

Heating Installation, Mechanical Engineer. Chamber Publication

VII. SEMESTER

MMT 401 WORKPLACE TRAINING **5 15 13 20**

In the seventh semester, students will receive workplace training in the relevant sector.

MMT 403 INTERNSHIP - I **0 2 1 5**

Reports of completed internships will be evaluated.

MMT 405 INTERNSHIP - II **0 2 1 5**

Reports of completed internships will be evaluated.

VIII. SEMESTER

MMT 402 MACHINE DYNAMICS **2 0 2 3**

Static and dynamic force analysis in mechanisms: graphical and analytical methods. Friction models and frictional force analysis. Unbalance analysis and balancing, flywheel selection. Introduction to mechanical vibration analysis: basic concepts, equations of motion for single degree of freedom systems, natural frequencies, forced vibration, resonance. Critical speeds of shafts.

Textbook and Recommended Reading :

Theory of Machines and Mechanisms, J. E Shigley and J. J. Uicker, McGraw-Hill, Second Edition, 1995.

Mechanism Design: Analysis and Synthesis, A. G. Erdman and G. N. Sandor, Prentice Hall, Third Edition, V.1, 1997.

Kinematics and Dynamics of Machines, G. E. Martin, McGraw-Hill.

Notes on Dynamics of Machinery, E. Söylemez and Others, METU.

Engineering Mechanics: Static and Dynamics, R. C. Hibbeler, Prentice- Hall.

MMT 406 TRIBOLOGY **2 0 2 3**

Introduction. Physical properties and components of lubricants, hydrodynamic lubrication, hydrodynamic, hydrostatic lubrication, elastohydrodynamic lubrication, boundary and overpressure lubrication, solid lubricants and surface treatments, principles of contact between solids, abrasive, cavitation, erosive wear,

adhesion and adhesive wear, corrosion and wear, fatigue wear, wear mechanisms, wear of metallic and non-metallic materials.

Textbook and Recommended Reading :

Gwidon W. Stachowiak, Engineering tribology, Butterworth

Frank Philip Bowden, Friction: An introduction to tribology

H. Prashad, Integral Approaches to Tribo-testing in Mechanical Engineering Norton

MMT 424 TRANSPORT TECHNIQUE **2 1 3 4**

General principles of transmission systems; classification, elements of lifting and handling machines; elements related to load, drive elements, reducers between motors and load. Reels and pulley systems, drums, steel ropes, hooks. Stopping and load holding brakes. Cranes, wheels and rails. Feeders and belt, chain, vibratory, worm screw conveyors. Pneumatic conveying systems. Continuous conveyors. Vibration conveying systems; pneumatic conveying systems, belt conveyors, rubber belt conveyors, steel belt conveyors, wire belt conveyors, limbed belt conveyors. Calculation and construction of band transmitters. Brakes; band brakes, shoe brakes, disc brakes, conical brakes, locking mechanisms, brake selection in transport machines. Drive types; manual drive, power drive, hydraulic drive, pneumatic drive, steam drive, internal combustion engine drive, electric drive, selection of engine size. Electrovinches. Freight and human lifts.

Textbook and recommended resources:

Ali Rıza Tarakcılar, Transport Technique Lecture Notes, 2002.

Ergün Aşık, Belt Conveyors Calculation and Construction Principles, TMMOB Chamber of Mechanical Engineers, Ankara 1998

MMT 410 COMPLETION PROJECT **0 2 1 3**

Determination of the subject of graduation thesis. Literature review and information gathering on the subject. Determining and writing the thesis content. Presentation, preparation and submission of the graduation thesis.

VIII. SEMESTER ELECTIVE BRANCH COURSES

MMT 412 CAM-II- **2 2 3 5**

Product phases in manufacturing, manufacturing systems, automation, computer aided design (CAD), computer aided manufacturing (CAM), computer integrated manufacturing (CIM). Manufacturing and process planning in manufacturing systems, techniques related to production capacity calculation, determination of the number/location of machine tools. Numerical control principles and numerical control machine tools. Group technology, part family, flexible manufacturing cells and systems, programmable controllers. Quality control and quality control diagrams.

Textbook and Recommended Reading :

Mikell P. Groover, 'Automation, Production Systems, and Computer Integrated Manufacturing', Prentice-Hall, Inc, Englewood Cliffs, New Jersey, 1991, ISBN: 0-13-054652-6.

-Tien-Chien Chang, Richard A. Wysk and Hsui-Pin Wang,'Computer Aided Manufacturing', Prentice-Hall, Inc.,Upper Saddle River, New Jersey, 1998, ISBN: 0-13-754524-X.

MMT 414 MACHINE CONSTRUCTION AND MATERIAL SELECTION **2 2 3 5**

Fundamentals of material selection, material selection in terms of mechanical and physical properties, material selection diagrams, material selection and design, material selection in terms of application, sample material selection applications, the relationship between material selection and process, other diagrams used in material selection. Physical properties of materials, standards and norms of materials. Steels, ceramics, composite and plastic materials used in industry and their properties

Textbook and Recommended Reading :

F. Fındık, Material selection and applications, Sakarya Publishing 2008

Michael F. Ashby, Materials Selection in Mechanical Design, Second Edition

MMT 416 DAMAGE ANALYSIS **2 2 3 5**

Definition and classification of damage and the way to determine a damage. Mechanical behaviour of materials: fracture under overload in tension, torsion, bending and fatigue. stress distribution, triaxial stress and strain. Plane stress - plane strain, stress concentration, crack propagation, ductile and brittle fracture. Determination of fracture initiation, effect of temperature and loading rate, thermal expansion and thermal stresses. Technological faults: Causes of damage. Material defects, faulty manufacturing, construction and assembly. Welding defects, faulty heat treatment, residual stresses, hot and cold cracking. Abrasion,

overloading, abnormal temperature, severe vibration, impact, collision, thermal shock, etc. Micro-fracture mechanisms: slip, cleavage, twin formation, mixed fracture, tearing, intergranular fracture, fatigue fracture. Effect of environment on fracture, comparison of fracture surfaces, micro and macro fracture relations. Wear mechanisms and types of wear, analysis of wear damage. Corrosion and oxidation. Damage analysis studies

Textbook and Recommended Reading :

Eryürek, I.B., "Damage Analysis", 1st edition, ITU Mechanical Faculty, Birsen Publishing House, Istanbul, (1993).

Gürleyik, M.Y., "Damage Information", KTÜ Publication no:3, Trabzon, (1976).

Charlie, R.B., Choudhury, A., "Failure Analysis of Engineering Materials", McGraw-Hill, New York, (2002).

MMT 418 VEHICLE TECHNOLOGY 2 2 3 5

Mechanics of Motor Vehicles, New Technologies in Automotive, Alternative Engines and Fuels, System Analysis and Design, Quality Assurance and Standards, Auto Air Conditioning Systems, Body Paint Technology, Motion Control Systems, Powertrain Systems

Textbook and Recommended Reading :

B. Raj, Edition, 2007

F.U. Library resources

MMT 420 OPTIMISATION TECHNIQUES 2 2 3 5

Introduction and basic concepts/ Unconstrained optimisation/ Analytical solution, numerical methods and algorithms in unconstrained optimisation/ Constrained optimisation: Optimisation under equality constraints, Optimisation under equality and inequality constraints, Optimisation under special constraints/ Application of algorithms to real life problems and computer solution

Textbook and Recommended Reading :

M.A. Bhatti, Practical Optimisation Methods, with Mathematica Applications, Springer-Verlag New York, Inc., 2000.

R. Fletcher, Practical Methods of Optimisation, Second Edition, John-Wiley and Sons Ltd., Chichester, New York, 1987

MMT 422 INDUSTRIAL AUTOMATION SYSTEMS 2 2 3 5

Introduction to industrial automation systems. Control systems; control system structure, programmable controllers (PLC), programming of programmable controllers, sequential controllers, expert systems, numerical control (NC) and computerised numerical control (CNC). Material handling systems; robots, robot technology principles, servomotor and servosystem design, stepping motor and control system, linear and planar motors, solid state variable speed drives. Machine vision. Mechanical, hydraulic and pneumatic systems used in industrial automation.

Textbook and Recommended Reading :

S. Kurtulan, Industrial automation with PLC, Birsen Publications, 2008

MMT424 MOULDING TECHNIQUE -II- 2 2 3 5

Advanced topics in moulding techniques. Modern hair styling moulding. Modern plastic moulding. Special problems and solutions in moulding techniques. Optimisation in moulding methods. Mould design project.

MMT 426 BOILERS AND CALCULATIONS 2 2 3 5

Flame tube, smoke tube, water tube and radiation boilers, cast slab boilers, steel boilers, gas, liquid and solid fuel boilers, hot water, boiling water, low pressure steam and high pressure steam boilers, semi-cylindrical, horizontal or vertical cylindrical and prismatic package boilers, natural circulation boilers, forced circulation boilers, low, medium and high pressure boilers, Structure of boilers, economisers, drams and combustion chambers, superheaters, boiler selection and layout, capacity calculation of boilers, heating surface calculation of boilers, thermal efficiency calculation of boilers, furnace sizing, determination of furnace temperature, circulation of gases and load losses, calculation of combustion end products, strength calculations of boilers, design of various boilers and boiler standards.

Textbook and Recommended Reading :

Küçükşahin, F., Steam Boilers, Birsen Publishing House, 2008.

Boiler and Chimney, Mak. Eng. Chamber Publication.

Thermal calculations of steam boilers, Birsen Publishing House.

MMT 428 ALTERNATIVE ENERGY SOURCES 2 2 3 5

Introduction of alternative energy sources such as solar, wind, wave, geothermal, geothermal, biomass, nuclear and hydrogen energy, the effects of alternative and conventional energy sources on the environment, examination of the usability of alternative energy sources for Turkey conditions (according to regions) and project design principles.

Textbook and Recommended Reading :

Alternative Energy Sources, Mustafa ACAROĞLU, Atlas Publications, Istanbul, 2003

MMT 430 CURRENT MACHINES **2 2 3 5**

Principles of pumps, classification of pumps, rotodynamic pumps, industrial pump applications, performance rules, adjustment of rotodynamic pumps, positive displacement pumps, series-parallel connection of positive displacement pumps, liquid ring pumps, side channel pumps, regenerative pumps, cavitation and its effect, material selection for pumps, valve systems and pipelines, pump tests, classification of ventilators and compressors, parts and operation of ventilators, flow pressure at a point, atmospheric pressure, absolute pressure and vacuum pressure, pressure diagrams, total pressure and surface curves, practical applications of flow and pressure, equations of motion and energy in ventilators, radial flow, boundary layer theory, dimensional analysis, losses and efficiencies, impeller design, operation and main parts of compressors, various applications of compressors.

Textbook and Recommended Reading :

Hydraulic Machines and Applications, Y. Pancar, H., Ergür, Birsen publishing house,

Pumps, A.T. Gokelim, Birsen Publishing House.

MMT 432 HEAT EXCHANGERS **2 2 3 5**

Classification of heat exchangers, construction of heat exchangers, flow arrangements in heat exchangers, thermal calculations of heat exchangers, pressure drop in heat exchangers, material selection and strength calculations in heat exchangers, sample calculations of heat exchangers.

Textbook and Recommended Reading :

Heat exchangers, O.F. Genceli, Birsen Publishing House.

S. Kakac and H. Liu, Heat Exchangers, Selection, Rating and Thermal Design, CRC Press LLC, 1998.

MMT 434 THERMAL ENERGY STORAGE **2 2 3 5**

Energy storage, energy storage systems, thermal energy, thermal energy storage methods, latent heat storage, sensible heat storage, cold storage, thermal energy storage systems, solar energy storage, heat and cold storage materials, phase change materials, phase change material capsules, thermal energy storage and environment, energy saving with thermal energy storage, modelling of thermal energy storage systems, thermoeconomic optimisation of thermal energy storage systems, energy and exergy analysis in thermal energy storage systems.

Textbook and Recommended Reading :

Passive annual heat storage, John N. Hait, 1998

MMT 436 GAS TURBINES **2 2 3 5**

Types of gas turbines, operating principles and system elements. Simple Brayton cycle, gas turbine cycles with intercooler, gas turbine cycles with intercooler, gas turbine cycles with intercooler, gas turbine cycles with recuperator, pressure loss in gas turbine combustion chambers, various application areas of gas turbines, gas turbine cycles used in aircraft, energy loss and irreversibility in gas turbine cycles. Thermodynamic calculations related to gas turbine cycles.

Textbook and Recommended Reading :

Gas Turbines, Selim ÇETİNKAYA, Nobel Publication Distribution, Ankara, 1999

H. Saravanamutto, G.F.C. Rogers and H. Cohen, Gas Turbine Theory, Prentice Hall, Fifth Edition.

MMT 438 SANITARY INSTALLATION TECHNIQUE **2 2 3 5**

Building clean water and waste water installation, rainwater installation, hydrophore installation, fire installation, ventilation installation, solar hot water installation, tools, equipment and materials used in sanitary installations, diameter, capacity and power calculations of sanitary installations, design of plumbing systems, layout in wet areas, volume / detail diagrams of wet areas, project cost, project report.

Textbook and Recommended Reading

Sanitary Installation, Sıdal, C., Birsen Publishing House, Istanbul, 2007.

III. SEMESTER ELECTIVE SOCIAL COURSES

IKT 215 ENGINEERING ECONOMICS **2 0 2 3**

Basic concepts of engineering economics; basic economic concepts, cost concept, interest concept and interest formulae, money-time formulae. Microeconomics: Markets, demand and supply concepts, elasticity, market equilibrium, cost analysis, break-even analysis, Macroeconomics: Gross national product, national income, economic growth, inflation, unemployment, money and money supply. Applications of engineering economics; application of money-time formulae, comparison of alternative solutions, forecasting money flows, inflation and price changes, replacement investments. Additional topics in engineering economics; decision making under risk, decision tree applications, influence diagrams, decision making with expected value method, decision making under uncertainty, strategic evaluation techniques.

Textbook and recommended resources:

W.G. Sullivan, J.A. Bontadelli, E.M. Wicks,Engineering Economy, Prentice Hall, Eleventh Edition, 2000.

M.İ. ABC of Economics, Ezki Kitabevi, 2000.

L. Blank, A. Tarquin, Engineering Economy, McGraw Hill, Fifth Edition, 2002.

İŞL 217 INDUSTRIAL SOCIOLOGY 2 0 2 3

Definition, Subject, History of Industrial Sociology; Basic Concepts: Technical and social division of labour, Types of technology, Specialisation, Production, Industrial relations, Unionisation; Industrialisation Strategies: Import substitution industrialisation, Export substitution industrialisation, Mixed economic system, Free market economy; Fordism, Post-fordism and Flexible Specialisation; Organisational Structure and Management Strategies of Industrial Enterprises: Taylorism, Human resource school, Flexible business model, Total quality management, Quality circles, Team work, Lean production, Change engineering, Just in time production, Turkey's industrial development.

İŞL 451 ENTREPRENEURSHIP-I 2 0 2 3

Examination and evaluation of the economic, legal, financial, behavioural, psychological, social, cultural aspects of entrepreneurship depending on the different types of entrepreneurship in the dimensions of intrapreneurship or small business-family business (entrepreneurship); Consideration of leadership as an individual and social process in the dimensions of being-becoming-doing (leadership theories, motivation, communication, team building, creativity); Defining the relationship between entrepreneur-leadership and factors affecting entrepreneurship; Evaluation of entrepreneurship in the historical process with international and Turkish examples.

VI. SEMESTER ELECTIVE SOCIAL COURSES

İŞL 314 FACTORY ORGANISATION AND MANAGEMENT 2 0 2 3

System, production system and factory concepts. Selection of the establishment location of the factory; region selection, location and location selection, factors affecting the selection of the establishment location and methods used in selection. Workplace layout and material flow; objectives of workplace layout planning, factory building, workflow types, workplace layout types, arrangement by work, arrangement by flow, cellular arrangement, arrangement by fixed positions, material flow systems: AGVS, conveyors, robots, material storage and warehousing systems: AS/RS, warehouses. Factors and methods used to choose between alternative solutions in factory organisation; factors affecting the choice, characteristics and quantities of products produced in the factory, technological and product strategies applied in the factory, production systems, cost calculations, machine selection, workplace layout selection, programmed workplace layout algorithms, material flow, stocking and storage system selection.

Textbook and recommended resources:

Facilities Planning, J. A. Tompkins, J. A. White, Y. A. Bozer, Facilities Planning, (Second Edition), John Wiley & Sons, Inc., Second Edition, 1996.

The Design of the Factory with a Future, J. T. Black, McGraw-Hill, Inc., 1992.

Manufacturing Facilities Design and Material Handling, F. E. Meyers, M. P. Stephens, Prentice Hall, Inc. Second Edition, 2000.

İŞL 312 TOTAL QUALITY MANAGEMENT 2 0 2 3

Competition and quality concepts, historical development of quality and quality gurus, Total Quality Management Philosophy and Principles, Quality culture in organisations and quality responsibilities in activities, continuous improvement (Kaizen), quality costs, Suppliers in Total Quality Management, EFQM Excellence Model, Quality Management Systems, ISO 9000, ISO 14000.

VIII. SEMESTER ELECTIVE SOCIAL COURSES

KAM 402 LABOUR LAW 2 0 2 2

The subject, qualifications and development of labour law. Concepts of employee, employer, employer representative and intermediary. Individual labour law: Contract of service, organisation of work, working hours, wages, annual paid leaves, severance pay and other compensations. Collective labour law: Trade unions and collective labour agreement. Labour disputes and remedies: Mediation, special arbitrator, high arbitrator and labour court. Strike and lockout.

Textbook and recommended resources:

E. Akyiğit, Labour Law: Prepared According to the New Legislation, Seçkin Publishing, Istanbul, 2005.

E. Güven, Bireysel İş Hukuku, Nisan Kitapevi Yayınları, Istanbul, 2004.

T. Centel and M. Demircioğlu, Labour Law, Beta Publications, Istanbul.

İŞL 404 SOCIOLOGY OF MANAGEMENT 2 0 2 2

Management process, universal and environmental elements of management, and theoretical approaches to management. Processes, structures, functions and problems of formal and natural organisations. Defining and explaining the concepts of organisation and organisation. Bureaucracy as one of the many manifestations of

formal organisations. Bureaucratic behaviour, main bureaucratic theories, Turkish Public Administration in Ottoman and Republic of Turkey periods. Main characteristics of bureaucracy. Centralisation of authority and the appearance of authority in public administration (Adem-Merkaziyetism).

İŞL 402 ENTREPRENEURSHIP-II **2 0 2 2**

Examination and evaluation of the economic, legal, financial, behavioural, psychological, social, cultural aspects of entrepreneurship depending on the different types of entrepreneurship in the dimensions of intrapreneurship or small business-family business (entrepreneurship); Consideration of leadership as an individual and social process in the dimensions of being-becoming-doing (leadership theories, motivation, communication, team building, creativity); Defining the relationship between entrepreneur-leadership and factors affecting entrepreneurship; Evaluation of entrepreneurship in the historical process with international and Turkish examples.