course description

Fly to Italy

این فایل به منظور کمک به متقاضیان تحصیل در کشور ایتالیا توسط گروه فلای تو ایتالی به صورت رایگان تهیه شده است لطفا از خرید این فایل خودداری فرمایید.

اسفاده از این فایل در صفحات مجازی و وبسایت ها **با ذکر نام تهییه کننده** بلا مانع است.

معرفی فلای تو ایتالی

سلام ...!
تیم فلای تو ایتالی متشکل از چند دانشجو که فعالیت خودمون را از ماه بهمن سال **1401** آغاز کردیم و هدف تیم ما این است که به شما کمک کنیم تا بتوانید به صورت مستقل و بدون نیاز به مشاوران مهاجرتی برای دانشگاه های ایتالیا اپلای کنید و پذیرش بگیرید . با توجه به اینکه بسیاری از موسسه های مهاجرتی هزینه های بالایی را برای اخذ پذیرش از دانشگاه های ایتالیا از دانشجو دریافت میکنند ، ما تصمیم گرفتیم با تلاش و تجربه خود به دانشجو ها کمک کنیم که بدون هزینه اضافه کار های مهاجرتی خودشون را انجام بدهند .
در این راستا در طی سال های گذشته ویدئو های مختلفی را برای نحوه اپلای کردن دانشگاه های ایتالیا ضبط و منتشر کردیم تا به دانشجویان کمکی کرده باشیم تا بتوانند در این مسیر با کمترین هزینه از دانشگاه های ایتالیا پذیرش بگیرند .

پس اگر سوال یا نیاز به راهنمایی در زمینه مهاجرت تحصیلی به کشور ایتالیا داشتید ، با ما همراه باشید و سوالات خودتون را از ما بپرسید . ما در کنار شما خواهیم بود و شما را همراهی خواهیم کرد .

مدیریت **fly to italy**

طریق استفاده از فایل

برای استفاده از این فایل ، صفحات بعد را کپی گرفته و به دانشگاه مبدا ببرید و تاییدات لازم را بگیرید

SUMMARY OF COURSE DESCRIPTIONS

BACHELOR OF MECHANICAL ENGEENIRING-FLUID AND HEAT

1st Semester 2010-11

1. **Title of the Course: General Physics I**

Number of Credits: 3 (51 Hours),

Type of the Course: Theoretical

Pre-requisite: None

Syllabus:

Vectors: Equilibrium of a particle: introduction, Newton's First Law, neutral equilibrium (stable and unstable), Newton's Third Law, particle equilibrium, rigid body equilibrium friction: moment of force, second condition of equilibrium, center of gravity, couple.

Motion on one dimension: motion, average and instantaneous velocity, mean and instantaneous acceleration, acceleration integral average velocity, motion on a uniform acceleration, free fall, motion with variable acceleration, relative velocity, gravity tension of two substances.

Motion on two dimensions (plane): motion on the plane, average and instantaneous velocity, average and instantaneous acceleration, components of acceleration, circular motion, centripetal force, circular motion perpendicular on the horizon, satellite motion, the effect of earth rotation on acceleration and gravity.

Work and energy: introduction, work, kinetic energy, gravity potential energy, elastic potential energy, gravity potential, elastic potential energy, conservative and losing ranges, internal work, internal potential energy, power and velocity.

Impulse: impulse, linear momentum conservation law, rubber and non-rubber percussions, return, principles of rocket motion, relative changes of mass and velocity, mass and energy, relative conversion of force, mass in length and width.

Rotation: introduction, angular velocity, angular acceleration, rotation with variable angular acceleration, rotation with fixed angular acceleration, relation between linear and angular accelerations and velocities, angular acceleration moment (moment of inertia), computation of moment of inertia, kinetic energy of work and power, angular momentum, rotation around moving axes (gyroscope).

Harmonic motions: elastic forces, equation of simple harmonic motion, motion of suspended matter, simple pendulum, angular harmonic motion, physical pendulum (compound), and center of oscillation.

Temperature: thermal equilibrium, measurement of heat and different scales, ideal gas temperature scale, zero principle.

Heat: quantity of heat, specific heat and heat energy, heat conduction, mechanical equivalent of heat and gas, first law of thermodynamics, application of first law.

Kinetic theory of gases: ideal gas, computation of pressure, kinetic change of heat, specific heat, ideal gas, equal distribution of heat energy, mead free-path, distribution of molecular velocity, thermodynamic change and transformations, van der Waals state equation.

Entropy: reversible and unidirectional process, Carnot's cycle, second law of thermodynamics, thermal engines return, reversible and unidirectional entropy.

Physical change of state of substances: different phases of change of state under effect of heat, Clapeyron equation, properties of change of state, triple point of melting, freezing and evaporation, fluidity and sublimation

Heat transfer: conduction, convection, radiation and the relevant laws.

2. **Title of the Course: General Chemistry**

Number of Credits: 3 (51 Hours),

Type of the Course: Theoretical

Pre-requisite: None

Syllabus:

Introduction to the fundamental properties of matter, applications to industrial and environmental chemistry and biochemistry stoichiometry; the properties of solids liquids and gases; thermo-chemistry; and the electronic structure of atoms and molecules

3. **Title of the Course: Industrial Drawing I**

Number of Credits: 2 (34 Hours),

Type of the Course: Theoretical

Pre-requisite: None

Syllabus:

Content: an introduction to origin of industrial drafting and its application; definition of projection; drawing of projection, point, line, plane; substance on a projection plane; introduction of main pages of projection; three projections drawing principles; geometrical relation between different projections; drafting tools and their application; standard dimensions of drafting papers; different types of lines and their application; table of map specifications; geometrical drawings; different methods and introduction of 1^{st} and 3^{rd} order of dihedron; method of drawing three images of a substance in 3^{rd} order of dihedron; method of drawing six images of a substance in 1^{st} order of dihedron; dihedron transform; image drawing from simple models; measure writing and application of letters and figures; drawing image of a substance through its determined images using method of identification of surfaces and volumes; definition of shear and contracts thereto related; simple shear (symmetric & asymmetric); broken shear; slant and radial broken shear; simple semi-shear; broken semi-shear; local shear; circulation and transformed shears; exceptional in shear; definition of concrete projection and its application; classification of

concrete projections; normal concrete projection (isometric, diametric, trimetric); slant concrete projection including isometric slant (cavalier) and diametric slant (cabinet); bolt and nut junctions; rivet, welding and method of drawing of their different types; method of drawing of modulated maps in brief.

4. Title of the Course: Mathematics I

Number of Credits: 3 (51 Hours),

Type of the Course: Theoretical

Pre-requisite: None

Syllabus:

Cartesian coordinates; polar coordinates; complex numbers; addition, product, root & geometrical representation of complex numbers; polar representation of complex numbers; function; functions algebra; limit and relevant theorems; infinite limit and limit in infinite; left-hand and right-hand limit; connectivity; derivative; derivation formula; inverse function and its derivative; trigonometric functions derivative and their inverse functions. Rolle's theorem; mean theorem; Taylor expansion; geometrical and physical applications of derivative; curves and acceleration in polar coordinates; application of derivative in approximation of equations roots; definition of integral of continuous functions and piecewise continuous; basic theorems of differential & integral arithmetic; primitive function; approximate methods of integral estimate; application of integral in computation of area, volume, length of curve, moment, center of gravity and labor (in Cartesian and polar coordinates); logarithm and exponential function and their derivative; hyperbolic functions; integration methods such as change of variable, component and decomposition of fractions; transform of special variables of sequence and numerical series and relevant theorems; power series and Taylor theorem with remainder.

5. Title of the Course: General English

Number of Credits: 3 (51 Hours),

Type of the Course: Theoretical

Pre-requisite: None

6. Title of the Course: Pre-University Mathematics

Number of Credits: 3 (51 Hours),

Type of the Course: Theoretical

Pre-requisite: None

7. Title of the Course: Islamic Thought I

Number of Credits: 2 (51 Hours),

Type of the Course: Theoretical

Pre-requisite: None

2nd Semester 2010-11

8. Title of the Course: Differential Equations

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Mathematics II

Syllabus:

Nature of differential equations and their solution, family of graphs and vertical routes, physical patterns, separable equation, first order linear differential equation, homogeneous equation, 2nd order linear equation, homogenous equation with fixed constants, method of indefinite constants, method of changing parameters, application of 2nd order equations in physics and mechanics, solution of differential equation with series, Bessel and Gamma functions, Legendre polynomial, an introduction to differential equations set, Laplace transform and its application in solving differential equations

9. Title of the Course: General Physics II

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: General Physics I and Mathematics II or simultaneous

Syllabus:

Load and material: electric load, conductors, insulators, and Cullen's Law

Electric field: force lines, focal load, and bipolarity in electric field

Gauss's Law: Gauss's Law and its relation with Cullen's Law, intensity of electric field, some applications of Gauss's Law

Electrical potential: electric potential, focal load potential, bipolar potential, energy of electrical potential, calculating difference of potential

Capacitors: Properties and capacity of capacitors, connecting capacitors, calculating their energy, dielectric and primitive constants

Power Current and electric resistance: electric current, resistance, resistance and special conductance, Ohm's Law, energy conveyance in electric circuit

Electrical motor force: Electrical motor force and calculating current intensity, potential difference, multi-cyclic circuits, measuring current and potential difference, RL circuits, connecting resistance and Kirchhoff's Laws, basis of the work of voltmeter and ampere-meter, potentiometer and Whetstone Bridge

Magnetic Field: Magnetic induction, magnetic flow, magnetic force on current, Hull's effect, rotating load

Ampere's Law: Ampere's Law, magnetic field in the vicinity of long wire, magnetic field lines

Faraday's Law and Induction: Faraday's experiment, Lens Law, induction in variable magnetic fields

Electromagnetism: Analysis of the movement of simple pendulum, quantity of electromagnetic vibrations, change of the electromagnetic current

Alternative currents: Alternative current, monocycle circuit, power in alternate current circuits, rectifiers and filters, transformers

10. Title of the Course: Statics

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: None

Reference:

Engineering Mechanics- Statics by J. L. Meriam

Syllabus:

Vector Algebra, Newton's laws, equilibrium laws, free body diagram, moment of a force around a point and a line, inner and outer product of vectors, Structures like trusts, frames, and machine elements, distributed forces, geometrical center and mass center, beams (internal forces shear force and bending moment diagrams, the relation between shear force and bending moments and distributed forces), Cables under different loading conditions, moment of inertia, friction, virtual work and energy method.

11. Title of the Course: Thermodynamics I

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: General Physics I and Differential Equations

Reference:

Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen

Syllabus:

Fundamental concepts; pure substance; work and heat; control volume; Ideal and real gases, first and second laws of thermodynamics, Entropy.

12. Title of the Course: Mathematics II

Number of Credits: 3 (51 Hours),

Type of the Course: Theoretical

Pre-requisite: Mathematics I

Syllabus:

Parametric equations; space coordinates; vector and space; numerical product; matrix 3x3 of three-indeterminate linear equations system; operation on lines; matrix reverse; solving equations system; linear independence; base in R^2; R^3 linear transform and its matrix; determinate 3x3 and characteristic value and vector; vector product; second order line and plane equations; two vector functions and its derivative; speed and acceleration; bending; normal vector to a curve; multivariable function; directional and partial derivative; tangent plane and normal line to a curve; multivariable function; directional and partial derivative; tangent plane and projecting line of gradient; chain of rule for partial derivative; exact differential; second kind and third kind integrals and their application in geometrical and physical problems; transform of integration arrangement (without accurate affirmation); cylindrical and spherical coordinates; vector field; curvilinear integral; surface integral; divergence; curl; Laplacian; potential of green space and divergence and stochastic.

13. Title of the Course: General Persian

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: None

14. Title of the Course: Islamic Ethics (Fundamental and concepts)

Number of credits: 2 (34 hours)

Type of the Course: Theoretical

Pre-requisite: None

1st Semester 2011-12

15. Title of the Course: Dynamics

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Differential Equations and Statics

References:

Engineering Mechanics (Dynamics) by Irving H. Shames

Engineering Mechanics (Dynamics) by J. L. Meriam and L. G. Kraige

Syllabus:

Kinematics of a Particle – Simple Relative Motion: Differentiation of a Vector With Respect to Time, Rectangular Components, Velocity and Acceleration in Terms of Path Variables, Cylindrical Coordinates, Simple Relative Motion, Motion of a Particle Relative to a Pair of Translating Axes.

Particle Dynamics: Newton's Law for Rectangular Coordinates, Rectilinear Translation, Newton's Law for Cylindrical Coordinates, Central Force Motion, Gravitational Central Force Motion, Newton's Law for Path Variables, The General Motion of a System of Particles.

Energy Methods for Particles: Analysis for a Single Particle (Power Considerations, Conservative Force Field, Conservation of Mechanical Energy, Alternative Form of Work-Energy Equation), Systems of Particles (Work-Energy Equations, Kinetic Energy Expression Based on Center of Mass, Work-Kinetic Energy Expressions).

Methods of Momentum for Particles: Impulse and Momentum Relations for a Particle, Linear-Momentum Considerations for a System of Particles, Impulsive Forces, Impact, Collision of a Particle with a Massive Rigid Body, Moment of Momentum Equation for a Single Particle, Moment of Momentum Equation for a System of Particles.

Kinematics if Rigid Bodies – Relative Motion: Translation and Rotation of Rigid Bodies, Chasles' Theorem, Derivative of a Vector Fixed in a Moving Reference, General Relationship between Time Derivatives of a Vector for Different References, The Relationship Between Velocities of a Particle for Different References, Acceleration of a Particle for Different References, The Coriolis Force.

Kinetics of Plane Motion of Rigid Bodies: Moment of Momentum Equations, Pure Rotation of a Body of Revolution about its Axis of Revolution, Pure Rotation of a Body with Two Orthogonal Planes of Symmetry, Pure Rotation of Slablike Bodies, Rolling Slablike Bodies, General Plane Motion of a Slablike Body, Pure Rotation of an Arbitrary Rigid Body, Balancing.

Energy and Impulse-Momentum Methods for Rigid Bodies: Kinetic Energy of a Rigid Body, Work-Energy Relations, Angular Momentum of a Rigid Body About Any Point in the Body, Impulse- Momentum Equations, Impulsive Forces and Torque (Eccentric Impact).

Dynamics of General Rigid Body Motion: Euler's Equations of Motion, Application of Euler's Equations, Necessary and Sufficient Conditions for Equilibrium of a Rigid Body, Three Dimensional Motion About a Fixed Point, Euler Angles, Equations of Motion Using Euler Angles, Torque-Free Motion.

Analytical Dynamics: Generalized Coordinates and Degrees of Freedom, The Principle of Virtual Work, The Generalized Principle of D'Alembert's Principle, Proof of Lagrange's Equations, The Dissipation Function, Kinetic Energy, Conservation Laws, Hamilton's Equations, Rotating Frame of References and Velocity-Dependent Potentials, Moving Coordinates, Non-Holonomic Systems, Lagrange's Equations for Impulsive Forces.

16. Title of the Course: Special English in Mechanics

Number of credits: 2 (34 hours)

Type of the Course: Theoretical

Pre-requisite: None

17. Title of the Course: Strength of Materials I

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Static

Syllabus:

Static equilibrium in structures, rules for static determinacy of frames.

General conditions for solution: equilibrium of forces and compatibility of strains, stress-strain relationships, examples from thin shells.

Elastic stress-strain relationships in three-dimensions, elastic constants, elastic strain energy, statically indeterminate stress systems.

Bending stresses in beams: moment, stress, curvature relationship, deflections, Macauleyí's method, and statically indeterminate beams.

Torsion: torque, stress and rotations of circular sections and thin-walled tubular closed sections; introduction to torsion of non-circular sections.

18. Title of the Course: Computer Programming

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Mathematics I

Syllabus:

Introducing organization and main parts of computer, machine language and assembly, numeric and non-numeric data representation, algorithms and sub-algorithms and flowchart, basic concepts such as frequency, selection, repetition and branching, familiarity with a structured language and programming including: constants and variables, computational and logical phrases, different types of instructions, different types of conditional operations loops, vectors and matrices, subprograms, input and output instructions, common algorithms such as methods of search and arrangement, practical examples of programming, Correct programming, programs documentation, structured programming, modular programming, familiarity with Matlab programming language and its comparison with the first language, troubleshooting and programs

testing, assurance of programs accuracy, non-numeric algorithms including: fields processing and etc., return programming, program efficiency, elementary familiarity with compilers and other translator programs, effective use of system software facilities, implementation of large programming projects in group form.

19. Title of the Course: Engineering Mathematics

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Differential Equations and Mathematics II

Syllabus:

Fourier series for periodic functions - the Euler formulae, full range and half-range series for functions defined in a finite interval. Fourier Transforms, Laplace Transforms, use for solutions of ODE's, types of partial differential equations; linear equations, superposition of solutions, boundary conditions. First-order equations solution using transformation of variables, Second-order equations: wave, diffusion, Laplace equations; travelling waves, d'Alembert solution. Separation of variables (Cartesian coordinates): solution by superposition. Complex Numbers, the Complex Plane, Polar Form, Complex Functions, the Complex Exponential. Trigonometric and Hyperbolic Functions, Logarithms and Powers, Sequences and Series of Complex Numbers. Sequences and Series of Functions. Power Series. Taylor Series. Laurent Series. Zeros and Poles. Harmonic Functions and Fourier Series, Cauchy's Residue Theorem. Definite Integrals of Trigonometric Functions. Improper Integrals Involving Rational and Exponential Functions. Improper Integrals of Products of Rational and Trigonometric Functions. Advanced Integrals by Residues. Summing Series by Residues. The Counting Theorem and Rouche's Theorem, Basic Properties. Linear Fractional Transformations. Solving Dirichlet Problems with Conformal Mappings. The Schwarz-Christoffel Transformation. Green's Functions. Poisson's Equation and Neumann Problems.

20. Title of the Course: Population and Family Planning

Number of credits: 2 (34 hours)

Type of the Course: Theoretical

Pre-requisite: None

21. Title of the Course: Islamic Thoughts II

Number of Credits: 2 (34 Hours)

Type of Course: Theoretical

Pre-requisite: Islamic Thoughts I

2nd Semester 2011-12

22. Title of the Course: General Physics Lab II

Number of Credits: 1 (34 Hours)

Type of the Course: Practical

Pre-requisite: General Physics II

Syllabus:

Test 1: Methods of measuring electric resistance (by use of ohmmeter, Whetstone Bridge, Ohm's law) and measurement of series and parallel resistances.

Test 2: Research on relation of R=P-I/S and study of resistance changes.

Test 3: Research on Ohm's Law and Kirchhoff's Laws in electric circuits and measuring inner resistance of measurement instruments.

Test 4: Study of accumulator and popular cell (battery) and drawing charge and discharge curves and measuring motor force of cells.

Test 5: Study of capacitors and drawing charge and discharge curves and measuring capacity of capacitor and study of series and parallel laws.

Test 6: Observation of natural and electrical magnetic field lines and study and measurement of inductive motor force

Test 7: observation of magnetic hysteresis curve of iron.

Test 8: Study of transformers (measuring initial and secondary ohm resistance, determining conversion coefficient, computation of equivalent apparent resistance.

Test 9: Study of R-R and R-C circuits, measurement of input and output voltages and phase difference between them, study of the effect of capacitors in low and high frequency circuits.

Test 10: Study of R-L and R-L circuits, measurement of input and output voltages and measurement of apparent resistance and phase difference, study of the effect of coil in low and high frequency circuits and study of resonance phenomenon

Test 11: Introduction to oscilloscope and its application (observation of sinusoidal quadrate waves and composition of waves and measurement of frequency by use of lissajous curves and measurement of phase difference.

Test 12: Electromagnetic waves: observation of electromagnetic waves generator systems (microwave, x-ray and ultraviolet radiation), study of diffusion and interference of waves with microwave.

Test 13: star and triangle joints in three-phase currents.

Test 14: Measurement of power in three-phase currents with two star and triangle joints.

Test 15: Study of alternate current meter (single phase and 3-phase) and the relevant measurements.

Test 16: Study of generators and electromotor and the relevant measurements.

Some tests concerning electrostatic such as drawing electric fields lines in different forms, observations and measurements related to static load.

Note: Selected by the department, some of the above tests are carried out into a minimum of 11 laboratory sessions of 3-hour. In all circumstances, the number of the tests carried out by the student should not be less than 12.

23. Title of the course: Mechanical Vibration

Number of Credits: 3

Type of the Course: Theoretical

Pre-requisite: Engineering Mathematics and Dynamics I

References:

Mechanical Viberation by Signiresu S. Rao

Theory of Viberation with Applications by William T.Thomson and Marie D. Dahleh

Syllabus:

Fundamentals of Vibration: Basic Concepts of Vibration, Classification of Vibration (Free and Forced Vibration, Undamped and Damped Vibration, Linear and Non-Linear Vibration, Deterministic and Random Vibration), Spring Elements, Mass or Inertia Elements, Damping Elements, Harmonic Motion (Vectorial Representation of Harmonic Motion, Complex Number Representation of Harmonic Motion, Complex Algebra, Operation on Harmonic Functions), Harmonic Analysis (Fourier Series Expansion, Complex Fourier Series, Frequency Spectrum, Time and Frequency Domain Representations, Even and Odd Functions, Half Range Expansions, Numerical Computation of Coefficients).

Free Vibration of Single Degree of Freedom Systems: Free Vibration of an Undamped Translational Systems (Equation of Motion Using Newton's Second Law of Motion, Equation of Motion Using Other Methods, Equation of Motion of a Spring-Mass Systems in Vertical Position, Harmonic Motion), Free Vibration of an Undamped Torsional System, Stability Conditions, Rayleigh's Energy Method, Free Vibration with Viscous Damping (Logarithmic Decrement, Energy Dissipated in Viscous Damping, Torsional Systems with Viscous Damping), Free Vibration with Coulomb Damping, Free Vibration with Hysteretic Damping.

Harmonically Excited Vibration: Introduction, Equation of Motion, Response of an Undamped System under Harmonic Force (Total Response, Quality Factor and Bandwidth), Response of a Damped System under $F(t) = F_0 e^{i\omega t}$, Response of a Damped System under the Harmonic Motion on the Base (Force Transmitted, Relative Motion), Response of a Damped System under Rotating Unbalance, Forced Vibration with Coulomb Damping, Forced Vibration with Hysteresis Damping, Self-Excitation and Stability Analysis (Dynamic Stability Analysis, Dynamic Instability Caused by Fluid Flow).

Vibrating Under General Forcing Conditions: Introduction, Response under a General Periodic Force, Response under a Periodic Force of Irregular Form, Response under a Non-Periodic Force, Convolution Integral (Response to an Impulse,

Response to General Forcing Condition, Response to Base Excitation), Response Spectrum (Response Spectrum for Base Excitation, Earthquake Response Spectra, Design under Shock Environment), Laplace Transformation, Response to Irregular Forcing Conditions Using Numerical Methods.

Two Degree of Freedom Systems: Introduction, Equation of Motion for Forced Vibration, Free Vibration Analysis of an Un-damped System, Tensional System, Coordinate Coupling and Principal Coordinates, Forced Vibration Analysis, Semi-Definite Systems, Self-Excitation and Stability Analysis.

Multi Degree of Freedom Systems: Introduction, Modeling of Continuous Systems as Multi-Degree of Freedom Systems, Using Newton's Law to Derive Equations of Motion, Influence Coefficients (Stiffness Influence Coefficients, Flexibility Influence Coefficients, Inertial Influence Coefficients), Potential and Kinetic Energy Expressions in Matrix Form, Generalized Coordinates ad Generalized Forces, Using Lagrange's Equations to Derive Equations of Motion, Equations of Motion of Un-damped Systems in Matrix Form, Eigenvalue Problem, Solution of the Eigenvalue Problem (Solution of the Characteristic Equation, Orthogonality of Normal Modes, Repeated Eigenvalues), Expansion Theorem, Unrestrained Systems, Free Vibration on Undamped Systems, Forced Vibration of Undamped Systems, Forced Vibration of Viscously Damped Systems, Self-Excitation and Stability Analysis, Computer Programming.

24. Title of the Course: Fundamental of Electrical Engineering I

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: General Physics II and Differential Equations

Syllabus:

Lumped circuits and Kirchhoff's Laws, introducing circuit parts and their relation, simple circuits (making series and parallel the resistances, capacitors), RC, RL and RLC circuits (impulse response, stair response, zero input response, zero and perfect state), Basic concepts of Logic circuits.

25. Title of the Course: Strength of Materials II

Number of Credits: 2 (34 Hours)

Type of the Course: Theoretical

Pre-requisite: Strength of Materials I

Syllabus:

Beam deflections, use of tabulated solutions; column buckling; Castigliano's theorem, statically indeterminate beams, bending of beams with asymmetric cross-sections, shear centre; principal stresses and stress invariants in three dimensions, Stress and strain analysis in two dimensions: principal values, maximum shear stresses, Mohr's circle for stress and strain, Yield criteria and the concept of equivalent uniaxial stress, Displacement relationships and compatibility, The analysis of strain gauge results

Hooke's law for three dimensions and the elastic constants, Plane stress variation in Cartesian coordinates, shear stresses in beams, Stress and strain in cylindrical polar coordinates (three dimensions with axial symmetry), The elastic limit and plastic flow effects. Plastic collapse. Buckling of struts and instability, Applications in elasticity: shafts in bending and torsion, I-section beams, high-pressure cylinders. Applications in elasto-plasticity: beams in bending, limit loads.

26. Title of the Course: Fluid Mechanics I

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Dynamics I

Reference:

Fluid Mechanics: Fundamentals and Applications by Yunus A. Cengel and John M. Cimbala

Syllabus:

Fundamental concepts; hydrostatics; integral and differential equations of fluid flows; conservation of mass, momentum and energy; dimensional analysis.

27. Title of the Course: Dynamics of Machinery

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Dynamic I

References:

Kinematics and Dynamics of Machines by George H. Martin

Kinematics and Dynamics of Machinery by Robert L. Norton

Syllabus:

Fundamental Concepts, Properties of Motion, Relative Motion, Methods of Motion Transmission, Linkages, Instant Centers, Velocities by Instant Centers and by Components, Velocities in Mechanisms by Method of Relative Velocities, Acceleration in Mechanisms, Velocity and Acceleration Graphs and Graphical Differentiation, Mathematical Analysis, Cams, Rolling Contact, Gears, Gear Trains, Translation Screws, Mechanical Advantage, Synthesis of Mechanism, Analog Computing Mechanisms, Static Forces in Machines, Inertia Forces in Machines, Flywheels, Balancing Rotating Masses, Balancing Reciprocating Masses, Gyroscopic Effects, Critical Whirling Speeds and Tensional Vibrations of Shafts.

28. Title of the Course: Physical Education I

Number of Credits: 1 (34 Hours)

Type of the Course: Practical

Pre-requisite: None

29. Title of the Course: Thematic interpretation of Holy Quarn

Number of Credits: 2 (34 Hours)

Type of the Course: Theoretical

Pre-requisite: None

1st Semester 2012-13

30. Title of the Course: Numerical Calculations

Number of Credits: 2 (34 Hours)

Type of the Course: Theoretical

Pre-requisite: Differential Equations and Introduction to C Programming

Syllabus:

Approximations and errors, instability in numerical computations and methods of their prevention;

Equations root: bisecting method, improper method, hypotenuse method, simple iterated method, iterated method-Refson, determining polynomial roots;

Linear equations systems: direct methods including elimination method, Gauss elimination method, linear methods b reversed matrix;

Finite differences including: interpolation, method of Newton, Lagrange and Atkins.

Curve fitting, method of least squares;

Numerical integration;

Numerical integration, trapezoidal method, Simpson's rule, quadrature, Gauss's integration formula;

Numerical solving of differential equations, Wrong method, Quota method, poly-stage methods, Adams Gaze;

In this course, use of computer for solving problems should be considered as the main and part and particle of the cours each part of course subjects, special issues related to computer application together with its mathematical aspects sh presented.

31. Title of the Course: Strength of Materials Lab

Number of Credits: 1 (34 Hours)

Type of the Course: Practical

Pre-requisite: Strength of Materials II

Syllabus:

Principles of mechanical properties of metals and polymers, including strength under combined loads, fatigue, and fracture mechanics. Laboratory includes study of strengthening mechanisms, and principles of experimental stress analysis.

32. Title of the Course: Fluid Mechanics II

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Fluid Mechanics I

Reference:

Fluid Mechanics: Fluid Mechanics, Streeter, Wylie, Bedford, Nine Editions

Syllabus:

Laminar and turbulent flow. Pipe flow including friction factor. Boundary layers, separation, drag, and lift.Compressible flow including shock waves.

33. Title of the Course: Fluid Mechanics Laboratory

Number of Credits: 1 (34 Hours)

Type of the Course: Theoretical

Pre-requisite: Fluid Mechanics II

Syllabus:

This lab introduces students to fluid properties under different practical conditions. This includes practical experiments on sickness. Students also learn types of flow, its measurement, speed curves, drop of pressure, and flow of fluids vulnerable to pressure. This is in addition to the study of some equipment, namely pumps and turbines.

34. Title of the Course: Thermodynamics II

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Thermodynamics I and Fluid Mechanics I

Reference:

Fundamentals of Engineering Thermodynamics by Michael J. Moran & Howard N. Shapiro

Syllabus:

Principles of thermodynamics for general systems, cycle analysis, thermodynamics relations, thermodynamics of non-reacting and reacting mixtures. Includes design activity.

35. Title of the Course: Thermodynamics Laboratory

Number of Credits: 1 (34 Hours)

Type of the Course: Theoretical

Pre-requisite: Thermodynamics II

Syllabus:

This lab aims at showing students the practical using of vapor turbines, compressors, cooling towers, and boilers.

36. Title of the Course: Elements Design I

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Strength of Materials II and Science of Materials

Syllabus:

Introduction to manufacturing operations, Design for manufacturing and assembly, Design and selection of shafts, bearings, springs, seals and packing, and couplings, Design of bolted joints and power screws, Design and selection of gears, gear trains, brakes and clutches. Material selection in design, Static failure theories, Fatigue failure, Design of Shafts for static and dynamic loads, Selection of Ball bearings, Lubrication and Journal Bearings, Gear geometry and forces, Power transmission by belts and/or chains, Power screws, Bolted Joints, Welded joints. Design of helical compression springs. Introduction to clutches, brakes, and couplings.

37. Title of the Course: Imam's Will

Number of credits: 2 (34 hours)

Type of the Course: Theoretical

Pre-requisite: None

38. Title of the Course: History of Imamate

Number of Credits: 2 (34 Hours)

Type of the Course: Practical

Pre-requisite: None

39. Title of the Course: Physical Education II

Number of Credits: 1 (34 Hours)

Type of the Course: Practical

Pre-requisite: Physical Education I

40. Title of the Course: Instruction to Holy Quran Reading

Number of credits: 2 (34 hours)

Type of the Course: Theoretical

Pre-requisite: None

2nd Semester 2012-13

41. Title of the Course: Fundamental of Electrical Engineering II

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Basic Electrical Engineering I

Syllabus:

Magnetic circuits, Transformers, DC Machines, Synchronized machines, Asynchronized machines, Introduction to power systems.

42. Title of the Course: Science of Materials

Number of Credits: 3 (51 Hours)

Type of the Course: Practical

Pre-requisite: General Chemistry

Syllabus:

Introduction to materials and composites used in engineering applications, Topics include: structure of metals, metals and alloy systems, material forms and designation, non-metals, polymers, ceramics, composite materials, deformation mechanisms and material failure analysis, importance of microstructure in behavior, fundamental properties of ceramic and glass materials which are utilized in electronic, electro-optic, thermal, and mechanical systems. An introduction to the manufacturing processes specific to ceramics with an emphasis on their interaction with the design process.

43. Title of the Course: Heat Transfer I

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Thermodynamics I and Fluid Mechanics II

Reference:

Introduction to Heat Transfer by Frank P. Incropera& David P. De Witt

Syllabus:

Energy balance in thermal systems, One-dimensional steady and transient conduction, Introduction to numerical solution techniques, Analogy of momentum, heat, and mass transfer: order of magnitude analysis, Forced convective heat transfer in internal and external flows, Heat exchangers.

44. Title of the Course: Element Design II

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: None

Syllabus:

Introduction to design of machine components; application of analytical methods in the design of complex machines, Design of common machine elements such as threaded fasteners, springs, flexible drive components, gears, and friction devices, Introduction to stress and deflection analysis using finite element software. Design and analysis of machinery for load bearing and power transmission, Consideration of material failure modes, including yielding, fracture, fatigue, and creep. Design and selection of machine elements: bolts, springs, rolling-element bearings, fluid-film lubrication, and power transmissions, including gears and friction drives.

45. Title of the Course: Turbomachinery

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Thermodynamics II and Fluid Mechanics II

Reference: Turbo machines, N. Montazerin

Syllabus:

Introduction to turbomachinery, the essentials of turbomachinery performance, the essentials of turbomachinery durability, Centrifugal compressor and pump performance, Axial compressors and pumps, Axial turbines, Radial turbines, Modeling turbomachinery flows, Stability and range limitations, The design process, Experimental techniques for machinery development.

Summer 2012-2013

46. Title of the Course: Internship

Number of Credits: 1 (280 Hours)

Type of the Course: Practical

Pre-requisite: None

1st Semester 2013-14

47. Title of the Course: General Physics Lab I

Number of Credits: 1 (34 Hours)

Type of the Course: Practical

Pre-requisite: General Physics I

Syllabus:

Determination of specific heat of liquids in cooling method; determination of volume expansion coefficient of liquids; determination of latent heat of fusion; determination of latent heat of vaporization; determination of linear expansion of solids; gas thermometer; determination of surface tension of liquids (tensiometer), determination of heat conductivity of solids; research of Boyle Mariotte law; Gay-Lussac's law; determination of surface tension of liquids (capillary tubes); viscosity; densitometer through Hilke dropper (determination of surface tension of liquids); identification of measurement instruments and computation of errors (total sessions of laboratory in this course is nine sessions of 2-hour).

48. Title of the Course: Machine Tools and Tool making workshop

Number of Credits: 1 (34 Hours)

Type of the Course: Practical

Pre-requisite: None

Syllabus:

Machining techniques, manufacturing some parts.

49. Title of the Course: Auto mechanic Workshop

Number of Credits: 2 (34 Hours)

Type of the Course: Practical

Pre-requisite: None

Syllabus:

Practical training on auto motors in different cars including testing of fuel engines, inspection and testing and overhauling of different engines and systems.

50. Title of the Course: Dynamics and Vibration Laboratory

Number of Credits: 1 (34 Hours)

Type of the Course: Practical

Pre-requisite: Dynamics of Machinery and Mechanical Vibration

Syllabus:

Dynamics of Machinery: Simple Mechanical Experiments including: Simple Gear, Parallel Helical Gears, Crossed Helical Gears, Worm Gears, Bevel Gears, Hypoid Gears, Gear Trains and Translation Screws and Measuring Acceleration, Balancing Rotating Masses, Experiments on Governors, Gyroscope, Balancing Reciprocating Masses, Cams with different type of Profile and Follower, Measuring Velocity and Acceleration, Clutches.

Mechanical Vibration: Experiments on Free and Forced Vibration of One Degree of Freedom Systems with and Without Damper, Free and Forced Vibration of Beams Modeled as Two Degree of Freedom Systems, Vibration of Width of Beams and Determining the Natural Frequencies and Mode Shapes, Dynamical Absorbent of Vibrating Systems, Critical Speed of Rotating Axles.

51. Title of the Course: Central Heat and Air Conditioning I

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Heat Transfer I and Fluid Mechanics II

Reference: Heating, Ventilation and Air Conditioning, ASHRAE

Syllabus:

Topics covered in class include technical knowledge of safety practices, the basic refrigeration cycle, electrical schematic reading, brazing, soldering, sizing and installation of duct systems, and preventive maintenance procedures.

52. Title of the Course: Heat Transfer II

Number of Credits: 2 (34 Hours)

Type of the Course: Theoretical

Pre-requisite: Basic Electrical Engineering I

Reference: Introduction to Heat Transfer by Frank P. Incropera & David P. De Witt

Syllabus:

Forced Convection - External Flow, Forced Convection - Internal Flow, Free Convection, Heat Exchangers, Radiation: Processes and Properties, Radiation Exchange between Surfaces.

53. Title of the Course: Automatic Control

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Mechanical Vibration

References:

Modern Control Engineering by Katsuhiko Ogata

Modern Control Systems by Richard C. Dorf and Robert H. Bishop

Syllabus:

The Laplace Transform: Review of Complex Variables and Complex Functions, Laplace Transformation, Laplace Transform Theorems, Inverse Laplace Transformation, Partial-Fraction Expansion with MATLAB, Solving Linear, Time-Invariant Differential Equations.

Mathematical Modeling of Dynamic Systems: Transfer Function and Impulse-Response Function, Automatic Control Systems, Modeling in State Space, State-Space Representation of Dynamic Systems, Transformation of Mathematical Models with MATLAB, Mechanical Systems, Electrical and Electronic Systems, Signal Flow Graphs, Linearization of Non-Linear Mathematical Models.

Mathematical Modeling of Fluid Systems and Thermal Systems: Liquid Level Systems, Pneumatic Systems, Hydraulic Systems, Thermal Systems.

Transient and Steady-State Response Analyses: First Order Systems, Second Order Systems, Higher Order Systems, Transient Response Analysis with MATLAB, Routh's Stability Criterion, Effects on Integral and Derivative Control Action on System Performance, Steady-State Errors in Uni-Feedback Control Systems

Root-Locus Analysis: Root-Lucas Plots, Root-Lucas Plots with MATLAB, Positive-Feedback Systems, Conditionally Stable Systems, Root Loci for Systems with Transport Lag.

Control Systems Design by Root-Locus Method: Preliminary Design Considerations, Lead Compensation, Lag Compensation, Lag-Lead Compensation, Parallel Compensation.

Frequency Response Analysis: Bode Diagrams, Plotting Bode Diagrams with MATLAB, Polar Plots, Drawing Nyquist Plots with MATLAB, Log-Magnitude versus Phase Plots, Nyquist Stability Criterion, Stability Analysis, Relative Stability, Closed Loop Frequency Response of Unity Feedback Systems, Experimental Determination of Transfer Functions.

Control Systems Design by Frequency Response: Lead Compensation, Lag Compensation, Lag-Lead Compensation.

PID Controls and Two Degree of Freedom Control Systems: Tuning Rules for PID Controllers, Computational Approach to Obtain Optimal Set of Parameter Values, Modifications of PID Control Schemes, Two Degree of Freedom Control, Zero Placement Approach to Improve Response Characteristics.

54. Title of the Course: Heat Exchanger Design

Number of credits: 2 (34 hours)

Type of the Course: Theoretical

Pre-requisite: Heat transfer I

Syllabus:

category, basic methods at Heat Exchanger Design, Forced convection heat transfer in single-phase flow, pressure drop and pumping power in heat exchanger, fouling, double and multiple pipe heat exchanger, shell & tube Heat exchanger, Vibration, Compact Heat exchanger, Gasketed- plate Heat exchanger, Air cooled Heat exchanger.

55. Title of the Course: Welding and Sheet Working Workshop

Number of Credits: 1 (34 Hours)

Type of the Course: Practical

Pre-requisite: None

Syllabus:

The workshop training includes spot welding, shielded metal arc welding, TIG, MIG, pipe fabrication, oxyacetylene welding, brazing, pipe profilers, auto-manual flame cutting, plasma cutting, ssafety concept and practices, etc.

56. Title of the Course: Fundamental of Electrical Engineering Lab

Number of Credits: 1 (34 Hours)

Type of the Course: Practical

Pre-requisite: Basic Electrical Engineering II

Syllabus:

Laboratory should be presented according to the course Basic Electrical Engineering I & II

57. Title of course: Islamic Revolution if Iran

Number of Credits: 2 (34 Hours)

Type of Course: Theoretical

Pre-requisite: None

2nd Semester 2013-2014

58. Title of the Course: Fuels and Combustion

Number of Credits: 2 (34 Hours)

Type of the Course: Theoretical

Pre-requisite: Heat Transfer I and Thermodynamics II

Reference:

An Introduction to Combustion: Concepts and Applications w/Software, Stephen Turns

Senjel Thermodynamics

Syllabus:

The objective of this third module is to present the characteristics of different types of fuel, and look at the factors governing efficient combustion. Various types of burner equipment are demonstrated for burning coal, oil, natural gas, wood, and low-grade fuels such as municipal waste.

59. Title of the Course: Water Supply Systems

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Fluid Mechanics II

Reference:

Steam its Generation and Use, Babcook and Wilcox Company, 1992

Syllabus:

The Water Supply and Sanitation course provides students with engineering principles and tools for designing and operating water and sanitation systems in developing country contexts. Key topics include water quality parameters; groundwater and surface water treatment; water treatment process technologies; nutrient removal; key principles of Ecological Sanitation; simplified sewerage; decentralized water and sanitation systems; bio-solids management; and operation and maintenance of water supply and sanitation infrastructure.

60. Title of the Course: Entrepreneurship

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: None

61. Title of the Course: Power Plant Engineering

Number of Credits: 3 (51 Hours)

Type of the Course: Theoretical

Pre-requisite: Heat Transfer II, Thermodynamics II, and Fluid Mechanics II

Reference:

Power Station Engineering and Economics

Power Plant

Steam Power Plant, Alvakil

Syllabus:

Introduction of power plants, Thermodynamics of the power plant, Main parts of the Power plant, Design of the Main parts of the Power plant.

62. Title of the Course: Bachelor of Science Project

Number of Credits: 3 (300 Hours)

Type of the Course: Research

Pre-requisite: Pass 100 Credits