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Damascus University
Faculty of Mechanical and Electrical Engineering
Mechanical Engineering of Textile Industries and Their Technology Department

Specification of subjects in the study plan
In Mechanical Engineering of Textile Industries and Their Technology Department

First Year			
Weekly Hours		**Semester**	**subject**
Practical	**Theoretical**		
2	4	1	**Mathematics (1)**
Linear algebra, algebra limits, radial space, matrixes, trapeziums, liner equations structures, special radial and values, quadratic forms.			
2	4	1	**Physics**
Light : light nature, light speed, light spread, reflection, refraction, Verma principle, Huggins principle, total reflection, light dispersion, light measurement principle and measurement unites. Geometric light: plane mirrors, spheral mirrors, spheral refractor, parallel sides sheets, prism, thin lenses, applications. Physical light :polarization, polarized light, polaroid and polarization by absorption, polarization by reflection, polarization by dispersion, polarization by double refraction, wave and quarter wave plates. Interlacement: phase difference, interrelation, Interference in thin plates, Youngs double slits, young theory, combination correspondent waves, Interlacement in case of equal divergence many points sources. Diffraction: diffraction at rectangle hole or thin wire, diffruction at circular operture or disc, interference of diffracted bundles at two slits, separation force, Inclination network. Optical fibers: mechanism, types, characteristics and uses. Heat and its characteristics: temperature, material status and status variables, zero law in thermodynamics, thermal ladders, thermal characteristics, thermal expansion, heat transfer, conductivity, loads, radiation. Static electricity: electrical field, conductors and insulators, colon law, ghaus law and field calculations, electrical potential, potential near charges groups, static electrical power, potential in case of continuous distribution of charges, distribution status, capacitors and insulators.			
2	4	1	**Descriptive Geometry**
Basic conceptions of the descriptive geometry, projection methods, central projection equilibrium projection, crossing projection, point representation, represent the point in orthogonal planes, point representation in three orthogonal levels sentence, projection on ancillary planes, represent the straight, straight piece projection, position of straight for projection planes, plane representation, plane trace, status (point, straight, even) for projection levels, positions between two planes or between straight and plane.			

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Representation of multisided shapes (prism..) position of straight and plane projection in space, isometric projection, geometrical position of straight and plane in the projection in space.

2	2	1	**Engineering Mechanics (Statics)**

Basic concepts of the geometrical mechanics, static, Newton and Olyer Group, basic stages of this science development, subsequent forces, non-equilibrium self-evidence points, combination of forces in different cases, forces equilibrium, even forces group, bodies equilibrium and arm, equilibrium of a group comprises of solid bodies, friction, equilibrium in case of friction types, graphical static and methods of to calculation the structures (ribbed strings, force polygon, cutting of structure, cutting of knots, Cremona, Maxwell), group of spatial forces in space group, spatial forces, forces moment, combine duals, equilibrium equation of body subjected to parallel set of space laws, transfer a set of forces as simple form as possible, forces centers, weight centers, centers of weights (volumes, weights, centers, centers of weights (volumes, weights, surfaces, lengths), methods of finding weights centers coordinates, applications.

_	4	1	**Foreign Language (1)**
_	4	1	**Arabic language**
_	2	1	**National Culture**
2	4	2	**Mathematics (2)**

Mathematical analysis: introduction to mathematical analysis, differentiation, absolute values with its characteristics, real fields, Dicart and polar coordinates, numerical progression, real function for one variable, numerical sequences, complex number, differential calculus for real function for one variable, higher curves, sequences and subordinate chains, complex numerical chains, correct forces chains. Indefinite integration: original function, characteristics of integration, methods of integration, fiction subordinates integration, triangle subordinates integration, integration of friction forces subordinates. Definite integration: relation between the definite and indefinite integrations, irregular integrations from the first and second type, geometric and physical applications of the definite integration, numerical methods for definite integration. Real function for many variables: definition of real function for two variables and more, function representation, point sets, methods for calculation conditional boundary limits, linear differential equations of high grades with constant coefficients and without second side or with second side, sets of linear differential equations with constant coefficients, approximate methods for solving normal differential equations.

2	4	2	**General Chemistry**

Atom structure, atoms studies development, dispersion quantum, quantum number, periodical classification, periodical law, Mandelf schedule, oxidization and recovery of the

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elements and inorganic compounds, electronic theory of the chemical group, theory of ionic bonds, ions relations, joint, supportive, hydrogenise , complex compound, typical and non-typical solutions, solution pressure, Inos theory for electrolytic dispersion, Raul law, Vant Hauf factors, pure water dispersion, water chemical and physical characteristics, colorants theory, pigments allowed and prohibited internationally, textile fiber and its relation with dyeing, ecological chemistry, ecological system components and integration, air pollution, noise pollution, radiological pollution, water pollution, pollution by pesticides, pollution by wastes, environment protection and types.

4	_	2	**Engineering Drawings**

Geometric Drawings: definition and introduction, drawings types and tools, principle of geometric drawings, curves lines and geometric lines, projection types, projection methods, prepare geometric drawings; drawing standard, projectors distribution, dimensions and data, deduce the third projection, geometric sectors, screws and galvanized holes, architectural and structural drawings, symbols and electrical drawings.

2	2	2	**Engineering Mechanics (kinematics)**

Movement: method to give matter point movement, velocity vector and acceleration, special cases of point movement, linear and rotational movement of a solid body, even movement of the solid body; compound movement of the matter point.

2	2	2	**Introduction to Computer and Programming**

Computer in use point of view , computer system components, inputs in computer, numbering systems, curves representations, correct inputs and floating inputs, an overview on computer structure, units surrounding the computer, computer interfaces, data transfer protocols, local computer networks (LAM), wide computer networks (WAN), clusters, an overview on the operation system, programming tools, widows system (practical), applied office programs (Word, Excel, Power point, Explorer, front page).

-	4	2	**Foreign Language (2)**

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Second Year				
Weekly Hours		**Semester**	**Subject**	
Practical	**Theoretical**			
2	4	1	**Mathematics (3)**	
Analytical geometry in space, surfaces and curves in space, Multiple integrals, Vector differentiation, Vector integrals, Probability and Statistics, and Numerical analysis.				
2	4	1	**Engineering Mechanics (Dynamics)**	
Basic Concepts, Newton's Laws, Gravitation Law. Kinetics of an Independent and a Dependent Particle. General Principles Of Particle Dynamics. Applications of the Principle of Work and Energy. Moment of Momentum and Principle of Moments of a Particle. Central Force Motion. Relative Motion of a Particle. The Differential Equations of Motion of a System. Motion of the Centre of Mass of a System. Conservation of Motion of the Mass Centre. Moment of Momentum and Conservation of Moment. Principle of Work and Kinetic Energy of a System. General Plane Motion Equations of rigid body. Motion of set of Rigid Bodies. Dynamic Equilibrium of a Particle and of a System.				
–	2	1	**Engineering Drawing by Computer Aid**	
Representation and drawing of the hole in the sectors. Drawing of the screw hole. Elements of assembly drawing. Linking (permanent and temporary). Engineering drawing of the screw. Drawing of the screw hole. Interference between the bolts and the screw holes. The drawing of square teeth screw. Diameter based dimensions of screw. Screw teeth and their types. Types of screws. Drawing aspects of screws, seals and washers. Drawing of seal geometrically, The design of screw. Assembly Drawing. Sectional drawing. Advantages of engineering Sectional drawing. Types of sections, Installation of mechanical parts. Detailed drawing, springs and its drawing. Pairing and operating marks. Tolerances and pairing. Operation marks. Final Drawing project.				
2	2	1	**Programming (1)**	
Introduction to programming languages and C++ programming language, C++ features, the program structure in C++, comments, preprocessor directives, main function, display statement, and escape sequences. Basic data types in C++, variables, input instruction, C++ symbols, mathematical logical and relational operators and their priorities. Increment (++) & decrement (--) operations, built-in assignment operations, Control structures, if statement, compound if statement, embedded if statement, switch (multiple decision), examples, Loops: for loop, while loop, Do-while loop, branching statements, embedded loops. Functions,				

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advantages of functions, in programming, function prototype, function definition, function call, math library functions, Functions without parameter lists, instantaneous functions, virtual parameters, passing by value and by address. Arrays: one dimensional array, two dimensional arrays, reading and displaying array elements, passing arrays to functions. Multidimensional arrays, reading and displaying array elements, Passing two dimensional arrays as a parameters for the functions.

2	2	1	**Materials Science and Their Properties**

Material structure and crystallization, metallic alloys theory. Building and analysing allotropic diagram, method of exploring the internal structure of the material and its effects , mechanical tests, non destructive tests of the material, materials used in modern industries including new materials, Crystalline Structure Defects ,Points Defects, Linear Defects ,Surface Defects. Material Crystallization. Crystallization, Crystallization Mechanism, Allotropic Transformations, Cast Metals Structures .Metallic Alloys. Binary Metallic Alloys Classification ,Alloys Systems Types, Composition of Alloys, Allotrope law, Gibbs Law, equilibrium diagram for binary Metallic Alloys, Lever Law, equilibrium Diagram Types, Phase Diagram for Allotropic Alloys. Material Structure Test. Macroscopic Test (visual),Microscopic Test ,Electronic Microscopic Test. X-Ray Structure Analysis , Physical Methods to Study Materials, Thermal Analysis Method , Extensibility Method, Electrical Resistance Method , Tracing Radioactive Isotopes Method. (discovering of material defects) Non-Destructive Tests of Material. Penetrates Liquid Method. Laser Light Method. X & Gamma Rays Method. Magnetic Field Method. Eddy Current Method. Ultrasonic Waves Method. Mechanical Tests of Material. Tensile Test /Compression Test/Bending Test /Twisting Test. Shear Test /Hardness Test/Impact Test /Fatigue Test. Bending Test /Draw Test/Creep Test. Corrosion of Material Corrosion, Corrosion Measures , Electrochemical Process in Corrosion ,Atmospheric Corrosion , Corrosion in Water, Corrosion in Soil .Iron and Steel .Iron-Carbon Phase Diagram, Heat treatments for Iron and Steel. Steel Classification non-Ferrous Metals. Aluminum, Aluminum Alloys. Copper, Copper Alloys, . Nickel and its Alloys, Titanium and its Alloys, Magnesium and its Alloys. Hard-to-Melt Metals. Composite Materials CMs. Composite Materials Classification. Reinforcing and filling Materials in CMs. Metallic CMs. Polymeric CMs. Carbon CMs. Tribological CMs. Ceramics Materials for Tools and Structure. Tools-Use of Ceramics Materials. Structural-Use of Ceramics Materials. High Ceramics Materials .Best Practice to Select Materials for Engineering Parts Manufacturing. Select Metallic Materials for Resistance. Select Metallic Materials for Heat Resistance. Select Metallic Materials for Fatigue Resistance. Select Metallic Materials for Strength.

_	4	1	**Foreign Language (3)**
2	2	1	**Organic Chemistry**

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The hydrocarbon compounds (alkanes) and unsaturated hydrocarbons (alkenes) and alkynes, aromatics compounds, alcohols, aldehydes, ketones and carboxylic acids, ethers and Esters. Mechanism of halogen addition reaction. Electrophilic addition mechanism. Replacement mechanism Nucleophilic Aliphatic. The Free-radical addition for alkenes and alleles rearrangement, Aromatic Electro-philic replacement. Fat, oils, soap and detergents. Laboratory security rules, Introduction to the practical part of Organic Chemistry and Organization of Laboratory Work Results. Qualitative analysis Of the basic elements of organic chemistry. Disclosure of organic functions. Determine some Chemical clues to fatty substances. Determination of melting point for organic matter. Determination of boiling point for organic material.

2	4	2	**Mathematics (4)**

The basic principles of mathematics, real and complex analysis. Complex expansion (Laurent expansion). Fourier expansion and its importance in engineering application. Laplace transform and its uses.

4	2	2	**Methods of Manufacturing and Specialized Workshops**

Metal casting using traditional methods (sand casting) and casting in modern methods, whether using metal Templates or casting by centrifugal force or casting with Corticosteroids Templates, low pressure casting, lost wax casting and casting using plaster mold or ceramic mold or full mold. Machining operations, learn about general concepts of metal machining, classification of operating machines, and identification of various operations: lathes, milling, and drilling, scraping and grinding operations. Welding: deals with Physical basics of welding, classifications of welding types , technology of most important types, the shapes of welding links and testing the quality of it, different formation operations for metal like Blacksmithing, rolling, extruding, deep pulling, bending, cutting, extending, rotations and other important industrial formations.

2	2	2	**Polymers Chemistry and their Technology**

Basic concepts in polymer chemistry, polymers manufacturing, multiple condensation, gradual polymerization, mass and flat polymers preparation, polymer physical states, theory of polymeric Solutions, chemical transformations of polymers, polymeric disintegration, homogeneous polymer chains , Mixed chains, nouflak preparation, preparation of Resin, properties study of prepared materials, preparation of methyl methacrylate and its properties, mechanical and physical properties of polymers, strain, stress and friction.

2	2	2	**Programming (2)**

Pointers in C++ programming language: memory addresses, static & dynamic allocation,

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pointers defining, the declaring about pointer, Passing pointers to functions (by value and by address), using the descriptor (const) with pointers, arrays & pointers, passing arrays as pointers to functions, dynamic allocation for memories. Character strings: entering character string, some of string.h library functions, some of ctypet.h library functions, ASCII table. Records or structures: definition of structure, accessing to the structure fields. Object oriented programming language OOP (classes): identification of class, The general structure of the class, the Determinants: private & public, How to Access to the class members, constructor function, and destructor function, examples, Default constructor, normal constructor, general constructor, set & get functions, Const objects & const functions, assigning objects, passing objects to functions, friend functions, (this) pointer, array of objects, using objects pointer, dynamic allocation for objects, Operator overloading: overloading operator fundamentals, binary as member & friend functions, overloading insertion and extraction operators, overloading for comparing operator, Overloading for relational operators, Overloading for unary operators as member & friend functions.

2	2	2	**Natural Textile Raw Materials**

Natural textile raw materials and their methods of verification, It includes the development of using raw materials, the required properties of the textile fibers and the division of it, the natural plant fibers, the seed fibers, the Phloem fibers, the leaf fibers, the animal fibers, and the mineral fibers.

2	4	2	**Principles and Electric Circuits**

Static electricity, static electric field (Atomic structure of the objects. - Electric current - Electric potential difference- Field quantities - Static electric field - Principle of accumulation in static electric field - Static electric induction - Flow of static electric field - Static electric potential - Storage capacity of power static electric field - Connect the electrical capacitors - electrical capacitors composed of several insulating layers). Mobile electricity, DC(Power sources and distribution of electric current- Practical sources of electric power - Electrical currents -DC (intensity – density) - Principles, relations and general theories of mobile electricity and DC–joule's law of energy conversion-electric capacity law - Applications of ohm law - theories of the collection of resistors and equivalent resistors - assembling the sources of electric power - Kirchoff's laws in DC circuits - the analysis of circuits using techniques (loop currents - the principle of accumulation –Thévenin's theory–norton's theory). Electrical magnetic(Definition of the magnetic field - the magnetic effects of the electric current - the law of Pierre-Simon Laplace - the calculation of magnetic fields according to the relationship of Pierre-Simon Lap lace - magnetic polarization - the calculation of magnetic fields according to the law of the integrated current–the principles used in magnetic circuits – calculation of magnetic circuit - the similarity between the magnetic circuits and electric circuits–Electromagnetic incitement - Self-Induction - Mutual Induction - Theory of Equivalent electromagnetic coils in Electromagnetic Circuits - Unstable state in Inductive

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Circuits - Stored Capacity in Inductive Circuit - Volumetric Density of capacity Stored in Induction Circuit - Electromagnetic Force).AC single-phase AC(AC definition - AC generation –sinus Currents and voltages, Average value of current and voltage - Effective value of current and voltage–vectorial representation for alternating voltages - Combining sinus currents and voltages - Single phase alternating currents circuits- AC capacity - AC circuits comprising several components connected in series).			
_	4	2	**Foreign Language (4)**

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Weekly Hours		Semester	Subject
Practical	**Theoretical**		
2	4	1	**Electrical Machines and Feeding Systems**

<table><tbody><tr><td colspan="4">Ability in the circuits of alternating current - Measuring Ability in mono phase and triple phase circuits - transformers and types - the principle of work and selection of transformers - triple transformer phase - connecting transformers in parallel - inductive Engine- the operation principle of triple phase inductive engine and its tests - the operation principle of mono phase inductive engine and its types. principle, structure and types of DC machines and its tests - DC engine types and speed regulation - feeding systems – cable types - cable laying - Distribution panel and its componentsand - electrical protection - industrial control panels and their contents.</td></tr></tbody></table>

2	4	1	**Theory of Machines**

Definitions and basic concepts –Degrees of freedom – Kinematic pairs – Kinematic chain – Linkage mechanisms – Kinematics of mechanisms – Mechanism velocity diagram – Mechanism acceleration diagram – Velocity determination by Instantaneous centers – Static forces analysis of mechanisms – Inertia forces analysis of mechanisms – Static and Inertia forces analysis in the slider-crank mechanism – turning moment diagram – Flywheel – Cams – Basic follower motion – Disc cam profile construction – Cams with specified contours -Effective forces in a disc cam .

2	2	1	**Synthetic and Man-Made Textile Raw Materials**

The importance of synthetic fibers and their types, cellulosic raw materials: types, production, properties and production development, ammonic silk: production and properties, man-made fibers, polyamide fibers and yarns: types, methods of production, polyester fibers and yarns, acrylic fiber and yarns production, another synthetic fibers and yarns and methods of production, glass fibers, metallic fibers, lygralic fibers, ceramic fibers: production, properties and uses, lyocel synthetic and aramid fibers, synthetic fibers: blends, properties and uses.

2	4	1	**Spinning Technology (1)**

Fiber properties that influence spinning process, Syrian cotton classification and cotton grades, Cotton ginning, Yarn count systems, Material preparation: opening and cleaning: Basic operations in the blow room (Opening, cleaning, dust removal, blending, even feed of

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material to the card), The grids, The machines comprising an installation, Accessories and associated equipments, Carding Process: The tasks of the card, The operation principle, The operating regions of the carding machine, Card clothing, Autoleveling equipment and The technological calculations related to carding machine, The Drawframe: Drafting theory, The tasks of the drawing process, The operation principle of the drawing machine, Monitoring and Autoleveling equipment, The technological calculations related to drawing machine. Combing Process: The tasks of the combing process, Preparation for combing, The comber, sequence of operations in a rectilinear comber, The technological calculations related to combing machine

2	4	1	**Strength of Materials**

Tensile and pressure - Stress in cross sections - Tensile scheme – statically indeterminate groups - Temperature stress - Installation stresses - Static properties of sections - Different inertia - torsion - Net shear - Stress and strain in case of twisting axes with circular cross section, designing circular axes in case of twist on strength and hardness, statically undeterminate problems, bending (turning) - supports and reactions - differential equation of elastic curve for the beam, permissible flex line - drawing of force diagrams and moment diagram - transitions in the general state of loading - Castigliao´s theory, Mohr´s integral- Stability - Euler issue - Longitudinal and transverse - Durability in the case of periodic change of stresses - The concept of fatigue -strength impact.

2	2	1	**Fluid Mechanics**

Specification of liquids (density - viscosity - surface tension - compressibility) Ideal gas characteristics - fluid balance - pressure - forces acting on fluid vessels - buoyancy - relative stability mode - flow fundamentals - flow line and pipeline line - flow types – Rhinold number, The circulation - One-dimensional circulation - Mechanism of retaining the properties of flow - Continuity equation - Energy conservation – conservation of momentum – flow of viscous fluid - velocity distribution in case of sheet flowand turbulent flow, the marginal layer.

2	4	2	**Textile preparations**

Raw materials for the textile sector, types of containers and methods of receipt, the most important trends in the textile industry and the stages of its development warp and weft yarns preparation, the in harmful forces acting on yarns on loom, stages of warp yarn preparation for weaving, warp yarns winding, the most important forces acting on the yarn, sizing, the importance and the role of sizing, sizing types, denting and drawing-in, calculation of reed count, reed types used in weaving, weft yarns preparation.

2	4	2	**Design of Machine Elements**

Metrology, science, measurement and technology development, industrial metrology science, measurement units, basic quantities and Derivative quantities, International System

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of Units, Design of cross and angular joints , welding links, Columns, Dowels, Border, variance, couple, , the international system for couples, surface finishing, operation marks, spiral springs, springs' steel types, torsion rod, spiral and conical springs, gears, studying design (Spur, Straight bevel, spiral bevel, worm) , studying of belt design (flat, V toothed belts) , design of chains, studying of bearing (sliding- ball bearings)

2	2	2	**Machinery Dynamic and Vibrations**

Dynamic mathematical model of the machine - Classification of forces affecting machines - Reduction of forces and blocks - Functions of machinery dynamic - the irregular movement of machines - balancing of machines - Analysis of forces in the mechanisms and forces moving to the base - the concept of vibration process - application of the theory of vibrations - free vibrations of systems of linear degree of fluency. obligatory vibrations of single-degree linear systems - Free vibrations of linear systems with two degrees of fluidity - Forced vibrations of linear systems of fluency - Self-tension and vibration forms of constrained and free systems (unrestricted)
twist vibrations in transmission systems.

2	4	2	**Spinning Technology (2)**

The roving process: The importance and the tasks of roving process, The operating principle of roving machine, Imparting twist and bobbin building on roving machine, The technological calculations related to roving machine, Monitoring devices on roving machine and quality control during the process, Ring spinning process: Systems used in spinning, The tasks of ring spinning machine, The operating regions of ring spinning machine, Imparting twist and cop building on ring spinning machine, The technological calculations related to ring spinning machine, Monitoring devices on ring spinning machine and New improvements. Winding process: The tasks of winding machine, The operation principle of winding machine and the basic winding actions. Open End Spinning Systems: Rotor spinning system, Development and operation principle of Rotor spinning system. Yarn formation and twist insertion on Rotor spinning machine, The technological calculations related to rotor spinning machine, Friction spinning system, air jet spinning system. Yarn folding: Definition of folded yarns, The objective of yarn folding, Folded yarns count. Fancy yarns

2	2	2	**Thermodynamics and Heat Transfer**

Physical values and units used in engineering thermodynamics - basic definitions - the first law of thermodynamics - Balance of energy- internal energy - formula . application of the first law in the case of flow - equation of state of ideal gases – basic changes of ideal gas - Law of thermodynamics II - water vapor, wet and roasted - basic transitions of steam -

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steam tables and striped - moist air and dry air - saturated wet air - basic processes of wet air. Heat transfer - thermal conductivity – thermal load - thermal radiation.			
2	2	2	**Principles of Electronic Engineering**
Semiconductors - transistor BJT (structure - properties) - JFET transistor (structure - properties) – (the silicon-driven GTO- transistor) - elements (photovoltaic resistance - photovoltaic - photovoltaic cell - photovoltaic transistor - photodiode) - definition of integrated circuits and the principle of their manufacture.			

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Weekly Hours		Semester	Subject
Practical	**Theoretical**		

<table>
<tr><td colspan="4" align="center">Fourth Year</td></tr>
</table>

Weekly Hours		Semester	Subject
Practical	**Theoretical**		
2	4	1	**Mechanics of Spinning Machinery**

The basic concepts of the materials used in the manufacture of textile machines, their types, properties and treatments, the most important elements of spinning machines and their calculations, the types of motions and their equations in spinning machines, the forces affecting the machines, their types and calculations. Calculation of torque and power, the importance of machines balancing in yarn production lines. Stages of the spinning process are detailed according to their order (opening and cleaning, the carding, drawing, combing, ring spinning, open-end spinning) and presenting the parts of the modern and traditional machines for each stage, their design and the attached equipment, the mechanical calculations and technical specifications for machines selecting. Faults of each stage and their causes and ways to solve, methods of maintenance of machines, machines developments for each stage. Additional processes and modern spinning systems in the spinning mill, and the most important mechanical and design calculations, additional topics in the mechanics of spinning machinery, the relationship between the quality of the product, the design of the machine, and machine parts.

2	4	1	**Dyeing and Printing Technology**

This course includes de-sizing boiling and bleaching - mercerization - the nature of colors - direct dyes for cotton - vat dyes for cotton - reactive dyes for cotton- sulfur dyes for cottons - acid dyes for wool -disperse dyes for polyester.

2	2	1	**Industrial Electronics**

The purpose of this subject is to provide a theory of industrial electronics and its applications. This subject is intended to teach students both the fundamentals in the context of exciting new applications and the practical design to meet the following objectives simultaneously, To develop skills for practical applications of industrial electronics, Teach design fundamentals so that students can be productive in industry from the very beginning. In this subject, the topics listed below are carefully sequenced to maintain student interest throughout the course and to maintain continuity as much as possible, Amplifiers, Electro-optical devices and applications, Transducers and applications, sensing elements, Boolean algebra and logic gate, Programmable logic control, D.C power supplies, electrical heating

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using high frequency currents, Electrical measurements.

2	4	1	**Weaving Technology**

The goal of course is to identify ways of woven fabrics and all manufacturing kinds of fabric and parts of machines and how they work, and include the following topics: Introduction, to the weaving technology, fabrics classification. General classification for weaving machinery. main parts of the weaving machine , basic processes in the weaving , longitudinal movement of the warp yarns, reciprocating movement of the slay, mechanism for take-up of woven. woven fabric winding mechanism, longitudinal movement of the warp yarns and tambourine reciprocating motion control devices, weft thread bet –up mechanism, warp yarns movement elements, Shed types and characteristics , shed cam formation , dobby shed formation , formation self-brokered Jacquard shed formation, General classification of ways of weft thread insertion, Conventional positive ways to weft insertion (mediated by the shuttle), Positive non-traditional ways for weft insertion (mediated by the shuttle), weft insertion of the weft thread system mediated by dobby, weft insertion through the pressure jet of air and water. Weft threads control devices. Weft thread change devices (switch), Temple for saving a woven fabric width, Multiphase weaving machines.

2	2	1	**Textile Structures (1)**

Subject includes the importance of weave structure, components and different parts of weaving design and how to read it. The course explains the construction and design of the woven fabric, how to prepare the textile design and the knowledge of its components as well as the basic textile designs. Plain - Twill - Satin - Sateen, In addition, the most important uses of these structures, how to prepare and manufacture it on the weaving machine, both for the main weave and the selvedge. Preparation for the manufacture of a fabric with specific specifications in terms of shape and construction, to drawing-in the threads in heald shafts, types and when to use each type of draw- in. Variants of basic structures. Plain derivatives - Twill derivatives - Satin derivatives - Sateen derivatives.
This course also includes how to develop and prepare designs systematically and independently to meet all of consumers requirements.

2	2	1	**Heating and Air Conditionings in Textile Organizations**

Heating: Define heating and the conditions to provide appropriate heating. Heat transfer factors of construction materials, thermal insulation and economical study of insulation. Study thermal loads of the building (thermal loses) , Study heating systems by using hot water, Devices used in heating and its calculation (thermal exchangers, heating network ,heating boilers, diesel burners , pumps, diesel tanks, expansion tanks, electrical)
Ventilation: Define ventilation and internal air specifications. Infiltration, calculate Infiltration rates. Ventilation ,calculate required air rates (as per human needs and the place

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and with the presence of thermal source and upon the emission of harmful substances), devices used in ventilation (fans ,air ducts , air filters, air holes ,cooling and heating coils , humidifier). Air conditioning engineering: Define air conditioning, temperature and relative humidity heat transfer from human body, lightning and different machines. Calculating the cooling load using CLTD method. Designing air handling unit (cooling and heating coils, humidifier, air ducts, air filters, fans), Designing an HVAC system of an industrial textile hall using all learned information.

2	4	2	**Mechanics of Textile Machinery**

Types and improvement of looms, loom parts and weaving basics, the principle of loom, mechanical study of the loom mechanisms, theoretical aspects of loom motions, calculation of acceleration and speeds, calculation of affecting forces, calculation of moment and momentum, kinetic and latent abilities of each mechanism of loom, loom maintenance, mechanical design of some parts, modern weaving machines and other additional devices.

2	2	2	**Mechanics of Preparation and Finishing Machinery**

Accessories attached with each machines – devices for drawing fabric –devices for receiving fabrics –washing machines – rope washing machines – opened width washing machines – dewatering machines mechanically – squeezing devices sucking devices –centrifugal – bleaching machines- rope bleaching machines- open width bleaching machines- impregnating machines- drying machines –cylindrical drying machines – stentering machines – hotflou –drying machines attached with printing machines – machines for thermo treating – steamers – thermo fixing machines – decatizing machines – mercerizing machines - mercerizing machines with clips - mercerizing machines without clips - mercerizing machines for yarns - dying machines – rope dying machine – open width dying machine – machines for yarns dying – printing machines – flat screens printing machines – cylindrical printing machines –rotary screen printing machines – machines for treating fabric surface – singing and sharing machines – rising machines – calendaring machines.

2	2	2	**Textile Structures (2)**

Description the basic weaving structures – derivatives of weaving design based on the basic weaving structures. Design the derived fabrics from the twill, such as the   reinforced twill and its uses, the Combination twill, the broken twill, the twill with the geometrical shape such as diamond – left hand twill - the Zigzag twill. Construction of derived weaving structures from Satin &Sateen structures - How to manufacture a fabric with specific specifications - Technical calculation for the fabrics. How to design fabrics: honey comb - Herringbone twill - Diaper and Diagonal fabrics - Crepe fabrics - huck a back weaves. Calculation of the maximum density of warp and weft threads - Manufacturing fancy fabrics.

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Affecting factors on the construction and specifications of the weave, Classification the fabrics with complex weaving- bag fabrics, One and half layer fabrics, Two layer fabrics and methods of bonding, Multi-width fabrics and manufacturing methods in weaving machine.

2	4	2	**Automatic Control**

Introduction to control systems and production automation, introduction to automatic control, types of control systems and control rings, logical control systems and applications including: programming, basic logical operations. control system characterization, box diagrams, differential equations writing for control systems, control system response, laplace conversion, pneumatic system control, advantages and disadvantages of pneumatic systems, basic principles of pneumatic systems, components, hydraulic control applications, pumps and hydraulic motors, cylinders and hydraulic control systems, intelligent control systems, industrial intelligence definition, Industrial Intelligence, Artificial Neural Networks, Design of Industrial Robots, General Concepts of Production Mechanization and automation, Flexible Industrial Systems, Flexible Manufacturing Cells, Control systems for industrial robots, Microelectromechanical systems.

2	2	2	**Operations Research**

Modeling in operation research, linear programming and formation of models, Graphical Solution of Linear Programming, Linear Program in Standard Form-Tableau Form, Simplex Method, Computational problems, Sensitivity Analysis in Linear, Programming-Goal Programming, Computer Solution of Linear Programming, Transportation Problems - Assignment Problems, Maximal -Flow Problems - Shortest-Route Problems, Project Management, Ghant and PERT diagrams, Inventory Models, Dynamic Programming, Simulation

2	2	2	**Programming and Design Spinning Mills**

Production and productivity concepts, production units and lines, production cycle, production time, factors affecting the production of the machine and the production line, the sequence of the production stages of the different spinning systems, the production study, determining the production capacity and create the production plan and its calculations, calculation of manufacturing wastes, calculation of productivity for each stage of spinning line, organizing the method of servicing its machines, determining the number of workers and machines, studying the establishment of a new plant or renovation of a section of the spinning line, the development of different spinning system lines, modern monitoring systems. The basic concepts in the spinning mills design, the main components of cotton spinning mills, feasibility study for the spinning mill project, the general principles in spinning mill design, the data and plans for the spinning mill project, design calculations for the spinning mill project, designing the production place, design of auxiliary sections for

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			spinning mill, industrial air conditioning design for cotton spinning mill.
2	2	2	**Productive Project**

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Weekly Hours		Semester	Subject
Practical	**Theoretical**		
		Fifth Year	
2	2	1	**Mechanics and Technology of Knitting**

Basic concepts in knitted fabrics industry, Physical and technical specifications for raw materials used in knitted fabrics industry, specifications and features knitted fabrics compared with textile fabrics and basic definitions in the knitting industry, the stages of the formation of knitting fabric (forming lunges), knitting machines, types and components main mechanisms of transmission in the knitting machines, the basic mechanisms working machines knitwear, the forces acting during manufacturing the main parts in the knitting machines,and its calculations. Circular knitting machines, flat knitting machines. Textile structures in knitted fabrics, Knitting machine productivity calculations, Maintenance and calibration of knitting machines.

2	2	1	**Automation Of Textile Operations**

The hallmarks of the control systems, the representation of control systems, the entrance to the automatic control, sensors and types of load cells, microprocessors, the principles of control systems, logic control systems programmed (PLC) device digital control NC, computer numerical control system (CNC), networks, handling technology, industrial robots, automation of products control operations, automate the handling of the pieces.

2	4	1	**Quality Control In The Textile Industry**

General terms, The stages of quality improvement, Modern quality system, Quality and Standards: Types and levels of standards, Standardization of testing, (ISO), ISO 9000. Statistical evaluation for test results. Quality improvement tools. The Quality of raw material: Uster Statistics related to cotton fibers, HVI900. Quality control in spinning technology: Uster Statistics related to yarns, The application of ISO 17025 in spinning laboratories. Quality control in: weaving technology, clothing technology, knitting technology, nonwoven, finishing processes. Measurements in textile industries. Yarn tests: Tensile properties, Yarn evenness, Hairiness test, Yarn imperfections. Fabric tests: Measuring of dimensional Stability, Seam Strength, Color fastness tests, Pilling resistance test.

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2	2	1	**Occupational Safety**

Concept, targets and principle of occupational health and safety in textile industry. Physical risks in the work environment. Chemical risks in the work environment. Techniques for control of chemical pollution. Air pollutant in textile industry. Liquid pollutant in textile industry. Effect of major pollutant on the work environment. Principle of safe use of steam boilers. Safe use of air compressors. Safe use of means of transport and cranes. prevention of electrical risks. Prevention of industrial fire. Environmental inventory and pollution prevention. International standard OHSAS 18001:1999, occupational health and safety management systems.

2	2	1	**Programming And Design Of Weaving Mills**

Identify the methods of design of textile factories. the following topics include general concepts in the design of textile factories, introduction and justification note, selection of the area of praise of the factory and the place of execution of the building of the factory, identification of woven fabrics, determining the technological method of the fabric, selection of machines for all stages of production , calculation of efficiency and machines productivity, calculation of wastes for each stage calculation of raw material amount, the number of machines required in each technological stage, determining the number of workers required for the plant, determining the laboratory's need for auxiliary raw materials and spare parts, slavery the technical plan of the textile lab, the protection systems and the networks used in the textile factories, the economic feasibility study of the textile factories, the marketing study of the textile factories.

2	2	2	**Mechanics And Technology Of Non-Woven Materials**

Introduction to the importance of non-woven fabrics industry and its role in the development of the textile industry in general in terms of the cost of the product and the material used in the modern industry with the cost of the very few compared with woven fabrics and knitwear, which included the most important methods used for non-woven fabric, a physical method - chemical, mechanical method, adhesive materials processing method, and various other method.

2	2	2	**Management Of Textile Organizations**

introduction in textile establishments managements included management concept and textile establishment , production management in textile establishment included material requirements planning and inventory management , production planning, maintenance management , financial management in textile establishments included cost concept, costs types, costs analysis , marketing management in textile establishments included marketing mix, swat analysis, human resources managements in textile establishments included hr

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			management functions
2	4	2	**Machinery And Technology Of Garments**
Textile faults, raw materials and auxiliary materials for the manufacture of garments, Barton and classification, the practical damage of cloth, working mechanism in the storytelling department, working mechanism in the technology department, production lines, types and its advantages, workstation and practical design of the product, productivity, and the most commonly problems during stitch, plot, and the types of stitching and systems of its presence in garments.			
2	2	2	**Industrial Economy**
Introduction to manufacturing economies, investment assets, accounts and analysis of the costs (labor, materials, expenses, operating), estimating operating costs, estimate the cost of the product, supply and demand concepts, pricing policies, the concept of interest, time value of money, measuring the value of the investment, analyze and compare alternatives investment, Inflation and taxes, depreciation of investment assets, Computer applications in engineering economy.			
4	-	2	**Bachelor Degree Project**

Head of Department of Textile Industries Mechanical Engineering and Their Techniques

Prof. Dr. Eng. Taher Rajab Kaddar