B.S.Automated Manufacturing Engineering

Academic program

First Year											
code	First Semester	Teaching Scheme			Credits	code	Second Semester	Teaching Scheme			Credits
	Course Title	L	T	P			Course Title	L	T	P	
AME111	Calculus I	3	1		3	AME121	Calculus II	3	1		3
AME112	General physics I +lab	2		2	3	AME122	General physics II +lab	2		2	3
AME113	General Chemistry I	2		2	3	AME123	Engineering Statics	3	1		3
AME114	Computer application I			2	1	AME124	Computer programming II	2		2	3
AME115	Human Rights & General freedom	2			2	AME125	Eng. Graphics II	1		2	2
AME116	Computer programming I	2		2	3	AME126	Electric Circuit I+ Lab I	2		2	3
AME117	Eng. Graphics I	1		2	2	AME127	Computer application II			2	1
AME118	Arabic Language	2			2	AME128	English Language I	1	1		1
Total		14	1	10	19		Total	14	3	10	19
		25			19			27			19

Second Year											
code	First Semester	Teaching Scheme			Credits	code	Second Semester	Teaching Scheme			Credits
	Course Title	L	T	P			Course Title	L	T	P	
AME211	Calculus III	3	1		3	AME221	Engineering numerical analysis	3	1		3
AME212	CAD/CAM I	2		2	3	AME222	Mechanical drawing II	1		2	2
AME213	Kinematics and Dynamics	3	1		3	AME223	Automation Logic Design	2	1	2	3
AME214	Mechanical drawing	1		2	2	AME224	CAD/CAM II	2		2	3
AME215	Electric Circuit II+ Lab II	2		2	3	AME225	Material Science II	2	1		2
AME216	Material Science I	2		2	3	AME226	Product planning control and forecasting	3	1		3
AME217	Computer application III			2	1	AME227	Computer application IV			2	1
AME218	English Language II	1	1		1						
Total		14	3	10	19		Total	13	4	8	17
		27			19			25			17

Third Year

code	First Semester	Teaching Scheme			Credits	code	Second Semester	Teaching Scheme			Credits
	Course Title	L	T	P			Course Title	L	T	P	
AME311	Automation instrumentation& Measurement	2		2	3	AME321	Vibration	2		1	2
AME312	Automation Process Design	3	1		3	AME322	PLC System+ lab	3		2	4
AME313	Mechanics of Material	2	2		2	AME323	Machine Design	3	1		3
AME314	Electronics + lab	1	1	2	2	AME324	Hydraulics and Pneumatics in Automation	1	1	2	2
AME315	Manufacturing Process I	2		1	2	AME325	Manufacturing Process II	2		1	2
AME316	Product and Process Design for manufacturing	3			3	AME326	Microprocessor & Microcomputer	1	1	2	2
AME317	Theory of Machine	2		1	2	AME327	English Language III	1	1		1
AME318	Thermodynamics	2			22	AME328	Fluid Mechanics	2			2
Total		17	4	6	19		Total	15	4	8	18
		27			19			27			18

Fourth Year

code	First Semester	Teaching Scheme			Credits	code	Second Semester	Teaching Scheme			Credits
	Course Title	L	T	P			Course Title	L	T	P	
AME411	CIM	2		2	3	AME421	Automation and Robotics II	2		2	3
AME412	Network System Automation	2		2	3	AME422	Senior Design Project II	2		2	3
AME413	Engineering systems Dynamic	2		2	3	AME423	Mechatronics applications	2		2	3
AME414	Senior Design Project I	2		2	3	AME424	Modeling of Manufacturing Process	2		2	3
AME415	Automation and Robotics I	2	1	2	3	AME425	Feedback and control systems	2		2	3
AME416	Manufacturing system	2		2	3	AME426	Micro electro Mechanical system	2	2		2
AME417	English Language IV	1	1		1						
Total		13	2	12	19		Total	12	2	11	17
		27			19			25			17

Program syllabus

Program Syllabus for the First Year
First Semester

Human Rights and General Freedom (2. Hourse)
Human rights, definition, objectives; characteristics of human rights; types of human rights; categories of human rights ; Human rights in ancient civilizations ;Human rights in medieval civilizations ;Human rights in contemporary civilizations ; Human rights in the heavenly laws (Judaism) ; Human rights in divine laws (Christianity); Human rights in divine laws (Islamic law)

General Physics I (4 Hours, 2 hours theoretical, 2 hours practical)
Introduction to General Physics, Physical Units and Unit system, Mathematical calculation of Dimension and Vector, Newton's laws , Motion , Velocity, Acceleration, Forces, Power, Momentum ,Energy, Periodic motion, Heat expansion, Properties of solids materials, Fluid dynamics.

Calculus I (4 Hours)
Function, Domain &Range of Function, Graph of Function, Limit, Derivative, Chain rules, implicit functions, Applications of derivative, Exponential Function, Logarithmic Function, Derivatives & Integrals Trigonometric functions, Inverse Trigonometric Functions, Inverse Hyperbolic Functions

Engineering Graphics I (3Hours, 1 Hour Theoretical, 2 Hour Practical)
Introduction, Graphic instruments and their use, Graphic geometry, Lettering, Orthographic drawing and sketching. Pictorial drawing and sketching, Auxiliary views, Sectional views and conventions, How to put the dimensions on the projections, Surface instruments, Developed views methods used in manufacture, Dimensions, notes, limits, and precision, Drawing three dimensional isometrics., how to merge more than one isometric to produce combined one., Cutting of an object, How to put the dimensions on the cutting objects, Cutting of a three dimension isometrics, Drawing for engineering design and construction.

Computer Programming I (4 Hours, 2 hours theoretical, 2 hours practical)
Introduction of C++, Simple program in C++, statements in C++ If-statement & Loops, Function in C++

General Chemistry (4 Hours, 2 hours theoretical, 2 hours practical)

Food Chemistry and Technology, Raw material preparation, Screening, Size reduction, Food grinding, Food mixing and forming, Separation and concentration of food components, Extrusion, Food Granulation, Thermal food preservation processes, Drying.

Program Syllabus for the First Year

Second Semester

Electric Circuit I (4 Hours, 2 hours theoretical, 2 hours practical)
Basic of Ohm's Law; Current Divider rule ; Voltage divider rule ; Series and Parallel connection , Combination circuits ; Star and Delta conversion ,Kirchhoff's low ; Mesh Analysis ,Node analysis ,Thevenin theorem ,Norten Theorem ; Superposition theorem.

Computer Application II (2 Hours)
Introduction to Microsoft Word ; File and Home Tabs, Page Layout and Views Tabs, Insert Tab, Tables Tab, Illustrations and Picture Tools, References Tab, Mailings Tab, Review Tab, Introduction of Microsoft PowerPoint, File and Home Tabs ,Design and Slide Show Tabs, Animations

Arabic Language (2 Hours)
The engineering Arabic word, The technician Arabic language, The English word and its Arabic originality, The vocabulary, The grammar, Type of sentences, The writing science, Lecturing science

Computer Programming II (4 Hours, 2 hours theoretical, 2 hours practical)

Introduction of Matlab, Simple of Matlab, Statements of Matlab, If –Statement and repeating statements, 2D function drawing, 3D function drawing, Matrix in Matlab,Image Processing

Calculus II (4 Hours)
Integrals, Integration Methods, Applications of integrals, Indeterminate Forms, Improper integrals, Infinite Sequence & Infinite Series, Complex Numbers

Engineering Static (4 Hours)
Introduction to static) Mechanics, Basic concepts , Scalars and vectors, Newton's law, units, Law of gravitation, Force (2-D), Moment, Couple (2-D), Resultant (2-D), Force (3-D), Moment, Couple (3-D), Resultant (3-D), Equilibrium (3-D), Plane Trusses (Method of Joints, Method of sections), Frames and Machines, Friction

Program Syllabus for the Second Year
Third Semester
Electric Circuit II (4 Hours, 2 hours theoretical, 2 hours practical) Complex Number, Ac Input Voltage, Average and R.M.S values , Resistance ,Inductance and Capacitance ,Series and Parallel Connection for AC circuits ,Power and Power Factor, Power factor correction ,Series and Parallel Resonance **Computer Application III (2 Hours)** Introduction of Microsoft Excel, File and Home Tabs, Page Layout and Views Tabs, Insert Tab, Tables Tab, Illustrations and Picture Tools, Charts, Sparklines Tools, Formulas Tab, Communications, Sort & Filter **Mechanical Drawing, I (3 Hours, 1hour theoretical,2 hour practical)** Auxiliary planes, Bolts and Nuts, Screws **Calculus III (4 Hours)** Polar coordinates, Partial differentiations, Multiple integrals, **Engineering Kinematics & Dynamic (5 Hours)** Introduction to dynamic) Mechanics, Basic concepts, Rectilinear Kinematics, Motion of a Projectile, Curvilinear Motion: Normal and Tangential Components, Absolute Dependent Motion Analysis of Two Particles, Relative-Motion of Two Particles Using Translating Axes, Equations of Motion: Rectangular Coordinates Equation of Motion: Normal and Tangential Coordinates **CAD/CAM I (4 Hours, 2 hours theoretical, 2 hours practical)** Introduction to CAD/CAM, Fundamentals of CAD Mathematical modeling/first degree spline, Second degree spline, Hermit curve, Biezer curve, De-castafjan algorithm, 2-dimentional transformation method, 3-dimentional transformation method, Computer graphics software and data base. **Engineering Material I (4 Hours, 2 hours theoretical, 2 hours practical)** Atomic structure, Basic types of interatomic bonds: (covalent, ionic, metallic bonding, van der Waals interactions, dipolar interactions, hydrogen bonding, The Structure of Crystalline Solids, CRYSTALLOGRAPHIC POINTS, DIRECTIONS, AND PLANES Imperfections in Solids, POINT DEFECTS, Diffusion, Applications of diffusion, Mechanical Properties of Metals

Program Syllabus for the Second Year
Fourth Semester
Automation Logic Design (5 Hours, 3 hours theoretical, 2 hours practical) Digital Systems and Binary Numbers and Number-Base Conversions and Octal and Hexadecimal Numbers , Complements of Numbers and Signed Binary Numbers and Binary Codes, Boolean Basic Definitions and Axiomatic Definition of Boolean Algebra and Basic Theorems and Properties of Boolean Algebra and Boolean Functions, Canonical and Standard Forms and Other Logic Operations, Product-of-Sums Simplification and Don't-Care Conditions and NAND and NOR Implementation, Sequential Circuits and Storage Elements: Latches and Storage Elements: Flip-Flops **Computer Application IV (2 Hours)** Introduction of Microsoft Excel, File and Home Tabs, Page Layout and Views Tabs, Insert Tab, Tables Tab, Illustrations and Picture Tools, Charts, Sparklines Tools, Formulas Tab, Communications, Sort & Filter **Mechanical Drawing, II (3 Hours, 1hour theoretical,2 hour practical)** Auxiliary planes, Bolts and Nuts, Screws, Thread terminology **Engineering numerical analysis (4 Hours)** Integrals, Integrals techniques, Applications of integrals, Indeterminate Forms, Improper integrals, Infinite Sequence & Infinite Series, Complex Numbers **Product Planning-Control and Forecasting (4 Hours)** Introduction to Production Planning and Control, Production and manufacturing Processes, Fundamental of Statistics, Definition, Type of Data, Describing Data, Frequency Distributio, Grouped & Ungrouped Data, Histogram, Measures of Central Tendency and Dispersion, Probability Theory, Sampling Theory, Conditional Probability, Probability Distribution (Bernuilli, Binomial, Poisson, Normal Distribution, Depreciation Definition Objective and Methods, Straight Line, Reducing Balance, Sum of Digits (Years, Forecasting Definition and Methods **CAD/CAM II (4 Hours, 2 hours theoretical, 2 hours practical)** The NC procedure, NC coordinate system, NC motion control, Applications of numerical control, NC part programming, The punched taps of nc, Tape coding and format, G-code and M-code, APT language, the MACRO statements in APT NC programming with interactive graphics, FMS **Engineering Material II (3 Hours)** Phase diagram, Phase transformation, Processing of metal alloys, Heat treatment of metals, Properties of ceramics, Processing of ceramics, Properties of polymers, Processing of polymers, Properties of composites, Materials selections

Program Syllabus for the Third Year
Five Semester
Electronic (4 Hours, 2 hours theoretical, 2 hours practical) Physics of semiconductors, PN junction, Characteristics, and modeling of different types of diodes, analysis and applications of diodes. Photo diode, photocell, light emitting diode, Characteristics and modeling of bipolar transistor, biasing and analysis of bipolar transistor, field effect transistor characteristics, modeling and analysis of FET transistor, Characteristics and modeling of bipolar transistor, biasing and analysis of bipolar transistor, field effect transistor characteristics, modeling and analysis of FET transistor, amplifiers **Automation instrumentation& Measurement (4 Hours, 2 hours theoretical, 2 hours practical)** System of tolerances and fits. Basic definitions, Tolerances for fits, Preferred Metric Sizes and Calculated Limits of Tolerance, Preferred Metric Sizes and Calculated Limits of Tolerance, Assembly the standards parts without geometry parameters , Assembly the standards parts without geometry parameters Calculations and choices the tolerances for Interference Fit, Calculations and choices the tolerances for Interference Fit, Calculation to find the assembly temperatures **Product and Process Design for manufacturing (3 Hours)** Introduction to DFMA (Design for Manufactureand assemply), Selection of Manufacturing Processes Design for Bulk Deformation Processes, Design for Casting & Sheet Metal Forming Processes Design for Assembly/Review of Assembly Processes Design for AssemblyDesign for Adhesive bonding Design for Assembly/ Design for Joining of Plastics, Design for Quality control/control chart for variables, Design for Quality control/CONTROL CHARTS for ATTRIBUTES **Manufacturing Process I (3 Hours,2 hour theoretical, I hour practical)** Classification of manufacturing processes, Manufacturing defined Fundamental of casting processes, Solidification of metals, Sand casting, Types of sand casting, Metal forming, Rolling, Forging, Extrusion, Wire and bar drawing, Sheet metal working, Cutting operations, Bending operations

Program Syllabus for the Third Year
Six Semester
Hydraulic and Pneumatic (4 Hours, 2 hours theoretical, 2 hours practical) Helical springs , Hydraulic systems , Pascal's Law ,Hydraulic pumps Hydraulic motor , Hydraulic Cylinder Hydraulic control valves Flow control valves Pneumatic systems, Speed control applications Pneumatics Circuits and Applications **Machine Design (4 Hours)** Fundamentals of machine element design, Analyze, design, and/or select component, Stresses at a point, Stresses concentration factors and notch sensitivity, Steady load failure theories, Distortion energy theory, Fatigue1, Shaft loading Shaft analysis, Ball bearing Helical springs. **Manufacturing Process II (3 Hours)** Overview of Powder Metallurgy, Engineering Powders, Powder Metallurgy Process, Design Considerations in Powder Metallurgy, Shaping processes for plastics, properties of polymers melts, Extrusion, coating process, Injection molding, Design considerations, Fundamental of welding, Overview of welding processes, The weld joints, physics of welding, Features of a fusion welded joints, Solid state welding processes, weldability **Vibration (4 Hours, 2 hours theoretical, 2 hours practical)** Introduction, Simple mechanics, Position diagram, Velocity in mechanisms, Velocity in mechanisms: relative velocity method , Acceleration in mechanisms, Coriolis component of acceleration Belt and Rope drives, Turning moment diagrams and flywheel, Free vibratio

Program Syllabus for the Fourth Year
Seven Semester
CIM Computer Integrated Manufacturing (4 Hours, 2 hours theoretical, 2 hours practical) Introduction To CIM , CIM Architecture-1, CIM Architecture-2, Design sub sys cim, Sub sys, assignment, CIM-networking-1, CIM-networking-2 Managing CIM system, Implant artificial intelligent in CIM **Automation and Robotics I (4 Hours, 2 hours theoretical, 2 hours practical)** Introduction: Robotic Manipulation: Robot classification (Drive technologies, work envelope geometries, motion control methods), applications , Robot specifications (number of axes, capacity and speed, reach and stroke, tool orientation, repeatability, precision, Direct Kinematics: The Arm Equation:dot and cross products, coordinate frames, fundamental, Homogeneous coordinate frames, translations and rotations, composite homogeneous transformations Link Coordinates: kinematics parameters, the Denavit-Hertrnberg (D-H) Representation, A four-axis SCARA robot (Adept one), the link coordinate diagram, arm matrix **Manufacturing System (4 Hours)** Introduction to manufacturing systems, Component of manufacturing system, Classifications of manufacturing systems, Flexible manufacturing systems, A Single machine cell, Human resources system, process system for manufacturing, product planning and design **Engineering System Dynamic (4 Hours, 2 hours theoretical, 2 hours practical)** Basic concepts of vibration, Introduction to oscillatory motion, Free vibration of a viscously damped, Forced vibration of a single degree of freedom system, Eigen values and Eigenvectors, Rayleigh and Dunkerly methods for determining natural frequencies, Multi –degree of freedom system

Program Syllabus for the Fourth Year
Eight Semester
Mechatronics Application (4 Hours, 2 hours theoretical, 2 hours practical) Introduction: Mechatronics system, Mechanisms for MotionTransmission (Rotary To Rotary Motion Transmission Mechanisms)(Rotary To Translational Motion Transmission Mechanisms, Mechanisms for Motion Transmission(Cyclic Motion Transmission Mechanisms)(Shaft Misalignments And Flexible Couplings **Automation and Robotics II (4 Hours, 2 hours theoretical, 2 hours practical)** Solving inverse kinematic problem using matrix inverse algorithm, Workspace analysis and Trajectory Planning: workspace analysis, work envelope, joint space work envelope, work envelope of Rhino XR-3 robot, Work envelope of SCARA robot (Adept one), Workspace fixtures, the pick and place operation, Continuous path control of Rhino –XR3 robot, Continuous path control of SCARA robot, Interpolated motion: cubic polynomial paths, Linear interpolation with parabolic blends, Differential motion and statics: the tool configuration Jacobian matrix (examples : Rhino, SCARA, and 3-axis **MEMS (4 Hours)** Overview of MEMS and microsystem Evolution of micro fabrication Microsystem and miniaturization, Application of microsystem in automotive industry and other industries ,Micro actuation :Micro grippers :Micromotor :Micro valve :Micropumps **Engineering Modeling (4 Hours, 2 hours theoretical, 2 hours practical)** Methods of Solution of Boundary Value Problems (BVP), Exact Solution, Approximate Solution (FDM and Trial Function, FDM, 2-D Introduction to FEM, Fundamental Concepts, Minimization of Function, Calculus of Variation Approximation of Integral, FEM methodology, Variational Statement, Discretization of the Domain, Choice of Element Type Shape Function and Interpolation, Linear Interpolation Local Coordinates, 1-D, 2-D, 3-D, FEM for 1-D Problems, FEM for 2 D Problems, FEM and ANSYS, ANSYS Basics Creating the model, Creating the Finite Element Model **Control and Feed back system (4 Hours, 2 hours theoretical, 2 hours practical)** Introduction to control systems, The Laplace Transform, Block diagram algebra, Modeling mechanical systems, Common inputs used in control system design and analysis, Mathematics for control, System poles and zero's, Root locus method