

<b>Manufacturing Engineering</b>	
<b>Special Topics (Physics of Metrology)</b>	<b>Hamed Ghafarirad</b>
<ol style="list-style-type: none"> <li>1. An Introduction on Metrology</li> <li>2. Main Concepts of Metrology</li> <li>3. Errors &amp; Calibration</li> <li>4. Linear Measurement</li> <li>5. Comparative Measurement</li> <li>6. Angle Measurement</li> <li>7. Optical Measurement</li> <li>8. Gear &amp; Screw Measurement</li> <li>9. Force, Torque Measurement</li> </ol>	
<b>Universal Machine</b>	<b>Mohsen Khajehzadeh</b>
<ol style="list-style-type: none"> <li>1. Gearbox Lathes (Basics)</li> <li>2. Work Holding Devices</li> <li>3. Cutting Tool Geometry and Material</li> <li>4. Turning Operations</li> <li>5. Lathes' Gearbox</li> <li>6. Drilling Machine Tools</li> <li>7. Milling Machines</li> <li>8. Indexing Device</li> <li>9. Spur Gear Milling</li> <li>10. Helical Gear Milling</li> <li>11. Bevel Gear Milling</li> <li>12. Cam Milling</li> <li>13. Grinding Machine Tools</li> </ol>	
<b>Metal Cutting</b>	<b>Mohammad Reza Razfar</b>
<ol style="list-style-type: none"> <li>1. Week 1: Identification of machining operations</li> <li>2. Week 2: Cutting tool geometry (cutting tool geometry and under-cutting effects)</li> <li>3. Week 3: Geometry of cutting tools (roughness of machined surfaces)</li> <li>4. Week 4: Metal cutting mechanics (how to form chips and its types)</li> <li>5. Week 5: Mechanics of metal cutting (main variables affecting the discharge contract)</li> <li>6. Week 6: Metal Cutting Mechanics (Ernstomercen Theory)</li> <li>7. Week 7: Tool life, heat, and cutting fluids (tool life)</li> <li>8. Week 8: Life of tools, heat and cutting tools (heat in metal cutting)</li> <li>9. Week 9: Tool life, heat, and cutting tools (cutting fluids)</li> <li>10. Week 10: Machining Capability (Machining Capability Criteria)</li> <li>11. Week 11: Machining capability (effective variables in machining capability)</li> <li>12. Week 12: Chip control</li> <li>13. Week 13: Cutting tools (General properties of cutting tools)</li> <li>14. Week 14: Shear tools (shear inserts)</li> <li>15. Week 15: The effect of machining variables on cutting efficiency</li> <li>16. Week 16: Methods of calculating machining forces</li> <li>17. Week 17: The end of the semester</li> </ol>	
<b>Metallurgy</b>	
<b>Alireza Fallahi Arezodar</b>	
<ol style="list-style-type: none"> <li>1. Materials Composition, Microstructure-Mech. Properties Relationship &amp; Effect of Manufacturing</li> <li>2. Process on Eng. Performance</li> <li>3. Atomic Structure and Interatomic Bonding</li> <li>4. Structures of Metals and Ceramics</li> <li>5. Imperfections in Solids</li> <li>6. Diffusion</li> </ol>	
<b>Farid Reza Biglari</b>	
<b>Research Method &amp; Report Writings</b>	
Academic writing Report writing Book writing dissertation writing Technical report writing Lectruring skills Speech skills Slide prepper	
<b>Heat Transfer</b>	<b>Mohammad Reza Hajmohammadi</b>
<b>Introduction Conduction Heat Transfer Convection Heat Transfer Radiation Heat Transfer</b>	
<b>Numerical Control Machine Tools</b>	
<b>Abdolreza Rahimi</b>	
<ol style="list-style-type: none"> <li>1. Introduction to Numerical Control Machines</li> <li>2. Introducing different methods of part programming</li> <li>3. Steps of manual programming</li> <li>4. Tool dimension and shape compensation</li> <li>5. Classifying control system</li> <li>6. Machine drive units</li> <li>7. Machine moving mechanisms</li> <li>8. Positional Transducers</li> </ol>	
<b>Jig &amp; Fixture Design</b>	
<b>Bijan Mollaei Dariani</b>	
<ol style="list-style-type: none"> <li>١. Preface, Definitions, Different parts of jig &amp; Fixtures, jig &amp; Fixture design steps- dimension &amp; Tolerances / Jig &amp; Fixture Drawing</li> <li>2. Freedom degrees – plane surface locating Methods</li> <li>٣. Profile &amp; cylindrical surface locating Methods</li> <li>٤. Select the locating surface /determination of jig &amp; Fixture tolerances</li> <li>5. Design of the locators</li> <li>6. Jamming /anti-jamming locators/Centralizers</li> <li>7. Jig &amp; fixture loading &amp; unloading – fool proofing the jig &amp; fixture</li> <li>8. Ejectors in jig &amp; fixture /Cheap removal</li> <li>9. Clamping devices</li> <li>10. Design of clamping devices-equalizerstools adjuster/ Design of drill Bushing</li> </ol>	

11.Design of Jig & Fixture Body 12.Standard parts of jig & fixture 13.Project	
<b>Principles of Metal Casting</b>	<b>Mehdi AhmadiNajafabadi</b>
1.Introduction 2.Familiarity with the melt, and how to measure its properties 3.Principles of solidification in pure metals and alloys, how to control microstructure during the solidification process of parts 4.Familiarity with nutrition, different types of nutrition, principles of nutrition design 5.Familiarity with the types of occasional methods, principles of designing the way to transfer the melt to the mold cavity 6.Familiarity with the mechanism of defects in the casting method and how to remove and control them 7.Considerations in casting ferrous alloys including cast irons and steels 8.Casting Considerations of Non-Ferrous Alloys Including Aluminum and Copper Alloys	
<b>Hydraulic System Application</b>	<b>Mohammad Zareinejad</b>
1.Introduction 2.Pumps 3.Direction Control Valve 4.Pressure Control Valves 5.Flow Control Valves 6.Hydraulic Actuators 7.Accumulator 8.Pneumatics	
<b>Heat TreatmentAlirezaFallahiArezodar</b>	
Microstructure and Properties Relationship Fe-Fe <sub>3</sub> C Phase Diagram, Equilibrium Condition, Bainite & Martensite Transformation Effect of Manufacturing Process Parameters on Microstructure & Tensile Property of Dual-Phase Steel TTT and CCT Diagram Anneal, Normalizing, Carburizing, Surface Hardening	
<b>Electric &amp; Electronic ApplicationHamedGhafarirad</b>	
1.Introduction 2.DC circuits 3.R-C circuits 4.Diode 5.Transistor 6.Op-Amp 7.Logic Circuit 8.DC motors 9.AC motors	
<b>Probability &amp; Statistics</b>	<b>BijanMollaeiDariani</b>
1.preface, Definition & application in engineering 2.Definitions: sample, histogram, mean, median 3.Frequency curve and distribution, variability, deviation 4.Probability concepts, events 5.Intersection & joint events , joint & conditional probability 6.Probability theorems (1) 7.Discrete random variable & distribution 8.Binominal & Poisson distribution, Hypergeometric distribution 9.Continuous random variable distribution, normal distribution	
<b>Computer-Aided Design &amp; ManuringBehroozArezoo</b>	
1.Introduction to CAD /CAM 2.Hardware and Software of a CAD System 3.Various Data Base and Data Structure 4.Product Data Exchange 5.Introduction to 3D Geometric Modelling 6.D Wire-Frame Modelling 7.D Surface Modelling 8.D Solid Modelling 9.Introduction to Curve Equations 10.Cubic Spline, Hermit and Bezier Curves Equations 11.CAM and G-Code Generation 12.CNC Control Strategies 13.CAPP systems 14.Adaptive Control 15.Geometric Transformation 16.An introduction to cubic spline and Bezier surfaces	
<b>Welding Methods Technology</b>	
1.Introduction 2.Welding processes-1 3.Engineering materials 4.Heat transfer in welds 5.Weld metallurgy 6.Weld defects-1 7.Weld defects-2 7.Weld defects-3	

8.Welding processes-2	
9.Selected subjects	
<b>Press Die. Design</b>	<b>BijanMollaeiDariani</b>
1.Preface & definitions/press working of sheet metal 2.Different types of press machinecutting die theory, clearance 3.Determination of cutting force & energy/force reduction methods 4.Stripper in cutting dies 5.Standard parts of cutting die 6.Design of cutting die,Design criteria, permissible deflection, design of guide pin 7.Design of punch, die &.../ die technical drawing/manufacturing methods of cutting dies 8.Bending theory, bending parameter, spring back 9.Different types of bending processes & dies 10.Bending force, Bending die design 10.Forming die 11.Analysis of deep drawing- Parameter study/product defects 12.Design of deep drawing process 13.Drawing force, Elements of deep drawing die, deep drawing die design 14.project	
<b>Mechanical VibrationsHamedGhafarirad</b>	
1.Introduction 2.Free Vibration of Single DoF Systems 3.Harmonic Forced Vibration of Single DoF Systems 4.General Forced Vibration of Single DoF Systems 5.Two DoF Systems 6.Multi DoF Systems	
<b>Non-Traditional Machining</b>	<b>Amir Abdullah</b>
References: 1) McGeough, J. A. " Advanced Methods of Machining" Chapman and Hall Ltd., U.K.,1988 2) West, E. G. "Copper and its Alloys" The Ellis Horwood Series in Industrial Metals, EllisHorwood Limited, Sussex, England, 1982 3) Perrigo, O. E." Lathe Design, Construction, and Operation" The Norman W.HenleyPublishing Co., New York, 1916 4) Hans, B. Kief-Olling, G.-Waters,T.F. "Flexible Automation, The International CNCReference Book" Becker Publishing Company Ltd., U.K., 1986 5) Abdullah, A. "Voltage Injection and Performance Evaluation in EDM" Ph. D. Thesis,UMIST, U.K., 1989 6) Benedict, G. F. "Nontraditional Manufacturing Processes" Marcel Dekker Inc., USA,1987. 7) Child, J.J. "Principles of Numerical Control" Industrial Press Inc., New York, 1982 8) Machining Data Handbook, 3rd Edition, Vol. 2, Machining Data Centre (MDC), USA,1980 9) Chandiramani, k. G. - Murarka, P.D. "Mechanism, and Rate of Metal Removal inElectrothermic Machining" Int. J. Prod. Res., Vol. 12, No.4, London, 1974 10) "Laser Processing" Q?A, Daihen Corporation, Japan, No date 11) Snoeys, R. - Staelens, F. - Dekeyser, W. "Current Trends in Non-ConventionalMaterial Removal Processes" Annals of the CIRP, Vol. 35/ 2/ 1986 12) Abdullah, A. "Electrophysical Processes" M.Sc. Lecture Notes, TarbiatModarresUniv., Tehran, 1992 13) DeBarr, A. E. - Oliver, D.A." Electrochemical Machining" Macdonald?Co (publishers)Ltd., U.K., 1975 10) "Laser Processing" Q?A, Daihen Corporation, Japan, No date 11) Snoeys, R. - Staelens, F. - Dekeyser, W. "Current Trends in Non-ConventionalMaterial Removal Processes" Annals of the CIRP, Vol. 35/ 2/ 1986 12) Abdullah, A. "Electrophysical Processes" M.Sc. Lecture Notes, TarbiatModarresUniv., Tehran, 1992 13) DeBarr, A. E. - Oliver, D.A." Electrochemical Machining" Macdonald?Co (publishers)Ltd., U.K., 1975 Familiarity with Nontraditional manufacturing processes 16) Ryken, N.- Uglov, A. - Kokora, A. "Laser Machining and Welding" Translated fromthe Russian by Glebov O.,Mir Publishers, Moscow, 1978 17) NikuLari, A.- Mordike, B.L. "High Power Lasers" Pergamon Press plc, U.K., 1989 18) Frederick Julian, R. "Ultrasonic Engineering" John Wiley?Sons Inc., USA, 1965 19) Charmilles Technologies "Machining Example: Robofil" Switzerland, No date 20) American Machinist "High-Volume Hole Making with EDM" McGraw- Hill Magazineof Metalworking Manufacturing, USA, 1983 21) Peacock, R.G. - Schmitt, P.R." Small, Small Wild Holes" Charmilles, Switzerland, Nodate. 22) Mitsubishi "Wire-cut EDM Systems- H Series" Mitsubishi Electric Corporation, Tokyo,1986 23) Von Dobeneck, D.- Steigerwald, K. H. "Electron Beam Machining- The Progress andits Industrial Application" IEE Conference No. 133, 1975 24) Von Grote, K.H.- Meleka, A. H." Electron Beam, The Multi-Role Tool for ModernFabrication" MTDR Conf. No. 12, U.K. ,1971 25) Mitsubishi "EDM Systems- K Series" Mitsubishi Electric Corporation, Tokyo, 1986 26) Fanuc Tape Cut "Wire-cut Electric Discharge Machines" Fanuc Ltd. , Japan, 1985 27) Barash,M. - Sri Ram, M.G. "Some Properties of Spark Machined Heat Treated Steel"Proceedings of the Third International MTDR, U.K., 1962 28) Matchless Engineering Catalogue, Milton keynes, U.K., 1984 29) Norio Taniguchi "Current State and Future Trends of Ultraprecision Machining andUltrafine Material Processing" Annals of the CIRP,Vol. 32/ 2/ 1983 Familiarity with Nontraditional manufacturing processes Nontraditional manufacturing processes A)- Introduction and history B)- Advantages of special manufacturing processes C)- Nature of special manufacturing processes 1. Electro-Discharge Processing Diesinking-Wirecut-Drilling - Grinding-Sawing- Heat Treating- Marking- Cladding etc.	

<p>2. Laser-Beam Processing a- Cutting b- Welding c- Heat Treating d- Marking e- Cladding  3. Electron-Beam Processing a- Cutting b- Welding c- Heat Treating d- Marking e- Cladding  4. Ion-Beam Machining 5. Plasma-Beam Machining 6. Ultrasonic Processing 7. Water-Jet Cutting 8. Abrasive-Jet Machining 9. Abrasive Water-Jet Cutting 10. Abrasive-Flow Machining  11. Chemical Machining Photo-Chemical Etching-etc. 12. Electro-Chemical Machining Diesinking-Grinding-Drilling- Stream Drilling-Turning-Honing- Deburring-Electro Polishing  13. Electro-Chemical-Discharge Grinding 14. Electro-Thermic Machining 15. Thermal-Energy Method  16. High Energy-RateForming a- Explosive Forming b- Electro-Magnetic Forming c- Electro-Hydraulic Forming</p>	
<b>Production Machine Tools</b>	<b>Farid Reza Biglari</b>
<p>1.Introduction to the manufacturing process  2.Rapid Prototyping Methods  3.Attachments In Machine Tools  4.Copy Turning  5.Broaching  6.Screw Thread production  7.Grinding Technology  8.Superfinishing  9.Gear Manufacturing  10.Automation for Manufacturing</p>	
<b>Forging Die Design</b>	<b>Mehdi AhmadiNajafabadi</b>
<p>Basic Definitions informing Definition of strain and forming Stress and forming Elastic forming Yield criteria Plastic deformation Forming Processes Types of flow in forming Open Die Forging Thermodynamic forming process Draft angle Flash design in finisher die Calculation of Force and load Blocker die design Flash cutting die design Types of dies to cut the flash Standards of material selection Types of preform dies Fuller Die Roller and Edger Die Bender Die Blocker die</p>	
<b>Non-Destructive Testing</b>	
<p>1.An introduction to the importance and status of non-destructive tests  2.Areas of application of non-destructive testing  3.Mechanism of formation and characteristics of defects in manufacturing processes and operation period  4.Integration of failure mechanics and non-destructive tests in the evaluation of parts and structures  5.Theory and principles of ultrasonic tests, radiography, adicarnet, magnetic particles and penetrating liquids  6.Principles of performing non-destructive tests in quality control of welded joints</p>	
<b>Plastic Technology</b>	<b>Farid Reza Biglari</b>
<p>The basic definition of polymers Types of polymers Advantages of polymers compared to other materials Types of plastic molding Pressure Molding Integral Molding Injection molding Extrusion process Extrusion blow molding of containers Extrusion and rolling process of plastics multi-layer manufacturing of plastics Composites manufacturing</p>	
<b>Quality Control</b>	<b>HamedAdibi</b>
<p>1.Quality Improvement in the Modern Business Environment  2.Statistical Methods Useful in Quality Control and Improvement  3.Basic Methods of Statistical Process Control and Capability Analysis  4.STATISTICAL METHODS USEFUL IN QUALITY CONTROL AND IMPROVEMENT  5.Acceptance Sampling  6.QUALITY management  7.Quality Assurance  8.Total quality management</p>	
<b>Mechatronics</b>	<b>FarshadBarazandeh</b>
<p>1.Electronic Circuits  2.Digital Circuits  3.Microcontroller Programming  4.Stepper Motors  5.PLC Programming</p>	
<b>Physics of Metrology Lab.</b>	<b>Amir Abdullah</b>
<p>1.Terminology and Definitions  2.Dial Indicator Calibration  3.Vernier Caliper Calibration and Vernier Micrometer Calibration  4.Different Methods for Measuring of hole  5.Calibration of Precision Universal Vise by clinometer  6.Squareness Test  7.Sine bar for angle measurement  8.Taper measurement  9.Large hole measurement  10.Sigma Comparator</p>	
<b>Heat Treatment Lab.</b>	<b>Amir Abdullah</b>
<p>Introduction to metallurgy and heat treatment experiments to investigate the microstructure and Properties of Industrial Alloy; Metallography, Microstructure and Properties Relationship, Cast Iron, Nonferrous Alloy and microstructure of them, Age hardening of nonferrous alloy, Diffusion, Fe-C phase diagram, Martensite transformation, Time Transformation Temperature (TTT) and Continues Cooling Transformation (CCT) diagrams</p>	

and the effective parameters, Equilibrium and non-equilibrium heat tr	
Mat. Sci& Eng. W. Callister	
Hydraulic Sys. Lab. Application	S. Mehdi Rezaei
1.Hydraulics 2.Pneumatics 3.Electro-pneumatic	
CAD/CAM Lab.	S. Mehdi Rezaei
1.Introduction to cad cam software 2.Solidworks cad software Catia cad 3.Software programming with C# C 4.CATIA & SOLIDWORKS C# C	