MAT^2 TPD Courses By School Period

Period	Course Topics
	Year One
School Period 1	Blueprint Reading
	2D Design Basics
	Math
	MS Office
School Period 2	Intro to 3D Design
	Math
	MS Office
	Safety
School Period 3	Design Intent
	Materials and Evaluations
	Math
School Period 4	GD&T
	Tool, Jig & Fixture Design
	Basic Machining
	Technical Physics
	Year Two
School Period 5	Metal Fabrication
	Plastics Manufacturing
School Period 6	Intro to Simulation and Analysis
	Product Development Process
School Period 7	Product Data Management Processes
	Advanced Materials
	Year Three
School Period 8	CNC Milling and Lathe
School Period 9	

CV	Goal & Sublevels	DACUM Item Description
DAC1	1.	**ORGANIZATIONAL / CULTURAL DYNAMICS - Establish working relationships at all levels that are productive and respectful across cultural and organizational boundaries. QFD = 3**
DAC2	1.1	Given directions, leverage available resources to complete project tasks on time and to company standards.
DAC3	1.2	Represent different points of view and approach to a given job assignment.
DAC4	1.2.1	Based on a cultural perspective
DAC5	1.2.2	Based on job role
DAC6	1.3	Describe different organizational structures and the characteristics and advantages/disadvantages of each.
DAC7	1.3.1	Create and communicate a representation of the hierarchy, workflow, authority, roles, responsibilities, and expectations for each department and level of an organization.
DAC8	1.4	With background knowledge of Legal and Corporate compliance standards, identify a non-compliant situation and explain why.
DAC9	1.4.1	HR
DAC10	1.4.2	Intellectual Property
DAC11	1.4.3	Union
DAC12	2.	**TECHNICAL DRAWING AND GD&T - In compliance with international/ national /company standards, apply standard drafting conventions to create various 2D drawings that include Gd&T and any other identified annotations or information necessary to communicate production design QFD = 9**
DAC13	2.1	Create a 2D technical drawing from a 3D CAD model
DAC14	2.2	Understand different drawing formats
DAC15	2.2.1	ANSI (A,B,C,D)
DAC16	2.2.2	ISO (A4,..., A0)
DAC17	2.3	Apply technical drawing standards to the creation of all necessary views and sections
DAC18	2.3.1	Orthographic view
DAC19	2.3.2	True view
DAC20	2.3.3	Section view
DAC21	2.3.4	Section cut
DAC22	2.3.5	Broken Section view
DAC23	2.3.6	Detail view
DAC24	2.4	Create drawings in first and third angle projections
DAC25	2.5	Annotate 2D drawings with conventional and GD&T dimensions and tolerances.
DAC26	2.5.1	Tolerances appropriate to the manufacturing capabilities
DAC27	2.5.2	Tolerances appropriate to use case
DAC28	2.5.3	Tolerances appropriate to cost considerations
DAC29	2.6	Create other technical documents to company standards
DAC30	2.6.1	Assembly instructions
DAC31	2.6.2	Interface descriptions
DAC32	2.6.3	Create a User manual

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DAC33	2.7	Add other pertinent drawing information
DAC34	2.7.1	Notes
DAC35	2.7.2	Title block information
DAC36	2.7.3	Change description / versioning
DAC37	2.8	Create other technical drawing views
DAC38	2.8.1	Exploded views
DAC39	2.8.2	Isometric views
DAC40	3.	**DESIGN REVIEW - Use available graphical and presentation tools to create and present design proposals in alignment with design phase and audience QFD = 3**
DAC41	3.1	Select or create design review materials based on audience.
DAC42	3.1.1	Embedded animations in ppt
DAC43	3.1.2	Screen grabs
DAC44	3.1.3	Rendered models
DAC45	3.1.4	Sections, sketches,etc
DAC46	3.2	Articulate how / why the design solution was chosen in a logical sequence
DAC47	3.3	Conceptual review
DAC48	3.3.1	Feasibility study
DAC49	3.3.2	Collaborative sketches
DAC50	3.3.3	Typical sections
DAC51	3.4	Draft review
DAC52	3.4.1	In progress CAD design
DAC53	3.4.2	Packaging study
DAC54	3.5	Detail Review
DAC55	3.5.1	Finalized 3D CAD design
DAC56	3.5.2	2D technical drawing
DAC57	3.5.3	Technical powerpoint presentation
DAC58	3.5.3.1	Present a design proposal to a customer that shows the phases of design development including: - design requirements (VoC) -sketching -possible solutions -special considerations - final proposed solution
DAC59	4.	**3D CAD - Use a 3D CAD tool to create complex models and assemblies QFD = 9**
DAC60	4.1	Logic / order of build structure for development of 3D model
DAC61	4.2	Analyze 3D models

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DAC62	4.2.1	Make measurements
DAC63	4.2.2	Section
DAC64	4.2.3	Moment of inertia
DAC65	4.2.4	Volume
DAC66	4.2.5	Cross sectional area
DAC67	4.2.6	Center of gravity
DAC68	4.2.7	Draft angle
DAC69	4.3	Develop 3D models
DAC70	4.3.1	Solid model
DAC71	4.3.2	Surface model
DAC72	4.3.3	Combined surface and solid model
DAC73	4.3.4	Apply feature constraints
DAC74	4.4	Develop 3D Assemblies
DAC75	4.4.1	3D Assembly
DAC76	4.4.2	Exploded model
DAC77	4.4.3	Apply assembly constraints
DAC78	5.	**DESIGN INTENT - Capture Voice of the Customer requirements, tooling and manufacturing considerations, and validate the design QFD = 9**
DAC79	5.1	Capture the Voice of the Customer requirements and design specifications
DAC80	5.1.1	Customer requirements
DAC81	5.1.2	Government
DAC82	5.1.3	Supplier
DAC83	5.1.4	Company/ Best practices
DAC84	5.2	Implement tooling considerations in design decision making
DAC85	5.2.1	Draft angle
DAC86	5.2.2	Slides / tool complexity
DAC87	5.2.3	Undercuts
DAC88	5.2.4	Optimum materials
DAC89	5.2.5	Optimum blank size
DAC90	5.2.6	Minimum radii
DAC91	5.2.7	Die draw

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DAC92	5.3	Meet Design for Assembly, Design for Manufacturability, Design for Serviceability needs and requirements in design decision making.
DAC93	5.3.1	Order of assembly / joining
DAC94	5.3.2	Part access
DAC95	5.3.3	Assembly / joining tool access
DAC96	5.3.4	Fixtures and validation
DAC97	5.4	Validate 3D design to requirements
DAC98	5.4.2	Design checklist
DAC99	5.4.2	Simulation
DAC100	5.4.3	Prototype
DAC101	6.	**PRODUCT VALIDATION CAD MODEL CHANGES - Read product validation reports and implement design changes as directed QFD = 3**
DAC102	6.1	Incorporate change request processes into design intent and validation revisions
DAC103	6.2	Read a CMM report and identify and describe potential design changes necessary to address issues raised by the CMM data.
DAC104	6.3	Identify tools used in product validation.
DAC105	6.4	Select the tools necessary to compare a specified physical product to the CAD model
DAC106	6.5	Compare the physical product to the CAD design and report differences/causes/ and potential design changes
DAC107	6.6	Implement CAD model changes specified by the engineer
DAC108	7.	**CONVERT DATA FORMATS and EXCHANGE - From 2D and 3D models convert data to different data formats based on recipient and data security needs. QFD = 3**
DAC109	7.1	Describe the purpose of neutral data formats
DAC110	7.1.1	For use with simulation
DAC111	7.1.2	For use with prototyping
DAC112	7.1.3	For use in exchanging data with customers and suppliers
DAC113	7.1.4	Sharing within the organization
DAC114	7.2	Explain the need for data security and sensitivity to whom/what data is shared
DAC115	7.2.1	Protect Intellectual Property
DAC116	7.2.2	Protect ability to edit data
DAC117	7.3	Identify common file formats
DAC118	7.3.1	IGES
DAC119	7.3.2	STEP
DAC120	7.3.3	VDAFS

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DAC121	7.3.4	JT
DAC122	7.3.5	PDF
DAC123	7.3.6	DXF
DAC124	7.3.7	Idea
DAC125	8.	**PRODUCT LIFECYCLE MANAGEMENT - Describe the need for a PLM system and how it is used to facilitate a company's business processes QFD = 9**
DAC126	8.1	Describe the rationale and need for CAD data management in a company that does product development
DAC127	8.1.1	Single source of data
DAC128	8.1.2	Revision control
DAC129	8.1.3	Access control/security
DAC130	8.1.4	Data release and distribution
DAC131	8.1.5	Capture and maintain iterative designs throughout the product lifecycle
DAC132	8.2	Describe how a PLM system can be used to facilitate a company's business processes
DAC133	8.2.1	Use electronic workflows to capture and automate business processes
DAC134	8.2.2	Approval process for product design
DAC135	8.2.3	Release and distribute data to other groups in the organization
DAC136	8.2.4	Exchanging information with other enterprise systems, ERP (SAP) , MRP, etc.
DAC137	8.2.5	Develop a change process
DAC138	8.2.5.1	Create a Change Request process flow chart
DAC139	8.2.5.2	Create CR sheet in compliance with company standards
DAC140	8.3	Describe a typical Design Collaboration process
DAC141	9.	**TECHNICAL SIMULATION - Identify and explain various simulation techniques and add kinematics to a product design. QFD= 9**
DAC142	9.1	Be familiar with and explain various types of Simulation techniques
DAC143	9.1.1	Kinematics
DAC144	9.1.2	Analysis
DAC145	9.1.2.1	FEA
DAC146	9.1.2.2	Plastic fill
DAC147	9.1.2.3	Sheet metal
DAC148	9.1.2.4	CFD
DAC149	9.1.2.5	Collision/Clearance

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DAC150	9.1.2.6	Movement
DAC151	9.2	Use a CAD tool to add kinematics to a model
DAC152	9.2.1	Fundamental principles of kinematics and kenetics
DAC153	9.2.2	Application of idealized structures
DAC154	9.2.3	Boundary condition definition
DAC155	9.2.4	Linear, rotary, and interactive movement of multiple components
DAC156	9.3	Use at least one manufacturing simulation tool to demonstrate a manufacturing process
DAC157	9.3.1	Ergonomics
DAC158	9.3.2	Robot
DAC159	9.3.3	Discrete events / throughput
DAC160	9.3.4	Machining
DAC161	9.3.5	Assembly
DAC162	9.3.6	CMM
DAC163	10.	**MFG / PRODUCTION PROCESSES - Contribute to design development collaborations by applying knowledge of manufacturing and production processes QFD = 9**
DAC164	10.1	Describe manufacturing processes and how each influences the design
DAC165	10.1.1	Casting
DAC166	10.1.2	Molding
DAC167	10.1.3	Forming / Metal Forming
DAC168	10.1.3.1	Stamping
DAC169	10.1.3.2	Cutting
DAC170	10.1.3.2.1	Water jets
DAC171	10.1.3.2.2	Laser cutting
DAC172	10.1.4	Machining
DAC173	10.1.5	Joining
DAC174	10.1.5.1	Welding
DAC175	10.1.5.1.1	Spot
DAC176	10.1.5.1.2	Laser
DAC177	10.1.5.2	Epoxy
DAC178	10.1.5.3	Riveting
DAC179	10.1.5.4	Thermoform

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DAC180	10.1.5.5	Heat Staking
DAC181	10.1.6	Material removing / refinishing
DAC182	10.1.6.1	CNC
DAC183	10.1.7	Rapid Mfg / Additive processes
DAC184	10.1.7.1	3D Printing
DAC185	10.1.7.2	SLA
DAC186	10.1.8	Identify the types of tooling appropriate for various materials
DAC187	11.	**MATERIAL PROPERTIES - Consider the impact involved in the material selection process of a design development process. QFD = 3**
DAC188	11.1	Recognize common materials
DAC189	11.2	Mechanical and technical properties of metals
DAC190	11.2.1	Hardness testing
DAC191	11.2.2	Material data sheet
DAC192	11.3	Mechanical and technical properties of plastics
DAC193	11.3.1	Thermoplastics
DAC194	11.3.2	Thermosetting plastics
DAC195	11.3.3	Elastomeric
DAC196	11.3.4	Material data sheet
DAC197	11.4	Use of Composites
DAC198	11.4.1	Fiberglass
DAC199	11.4.2	Carbon Fiber
DAC200	11.4.3	MDF ...
DAC201	11.4.4	Others
DAC202	11.5	Post material processes
DAC203	11.5.1	Heat treating
DAC204	11.5.2	Stress release
DAC205	11.5.3	Surface treatments
DAC206	11.5.3.1	Galvanizing
DAC207	11.5.3.2	Painting
DAC208	11.5.3.3	Chroming

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DAC209	12.	**BASIC MATHEMATICAL AND MECHANICAL BACKGROUND - Contribute to design development collaborations by applying knowledge of basic tools, safety considerations, and standards for mechanical craftsmanship QFD = 9**
DAC210	12.1	Safety standards
DAC211	12.1.1	MIOSHA
DAC212	12.1.2	Others
DAC213	12.2	Applying metrology
DAC214	12.2.1	Calipers
DAC215	12.2.2	Micrometers
DAC216	12.2.3	Ruler/Scales
DAC217	12.2.4	Optical comparison
DAC218	12.2.5	CMM
DAC219	12.2.6	Xray / CT scan
DAC220	12.2.7	Infra red
DAC221	12.3	Drilling
DAC222	12.4	Marking out
DAC223	12.5	Use of Machine tools
DAC224	12.6	Welding
DAC225	12.6.1	Arc
DAC226	12.6.2	Gas
DAC227	12.6.3	Mig / Tig
DAC228	12.7	Grinding / Finishing
DAC229	12.8	Applied Mathematics
DAC230	12.8.1	Forces
DAC231	12.8.2	Energy
DAC232	12.8.3	Surface area
DAC233	12.8.4	Weight
DAC234	12.8.5	Geometry
DAC235	12.8.6	Static / Dynamic calulations
DAC236	12.8.7	Trigonometry
DAC237	12.8.8	Algebra
DAC238	12.8.9	Tolerance calculations