EML2322L – MAE Design and Manufacturing Laboratory

FIRST SEMESTER TA TRAINING ASSESSMENT

Name: _____ **Grader's Initials:** _____

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Description: This assessment gages your understanding of the material covered on the first semester TA Training Checklist. Each section contains hyperlinks to the locations where the answers can be verified. We will hold an assistance session the first week you return for any remaining questions you have regarding this material. The assignment is due the second week of your second semester working as a TA.

WEEK 1

1. The MAE Student Shop is available for use by students from any department. T / F
2. Students can use our tools to cut ferrous materials in the student shop as long as they are careful and take light depth cuts. T / F
3. Never exceed your level of comfort / experience when supervising the student shop. T / F
4. All rules enforced in DML are enforced in the student shop (i.e. long pants, proper shoes, safety glasses, no jewelry, long hair tied back, etc.), NO EXCEPTIONS. T / F
5. There will be times when the shop feels crowded and you will need to tell students to wait outside until someone leaves and you can help them. There will also be times when you cannot help everyone at once and you will need to tell students working on the machines to stop and wait for your assistance before continuing. T / F
6. All students must sign the Usage Log / Roster hanging on the main door so we can track facility use statistics and ensure only MAE students are using our shop. T / F
7. Students are allowed to reserve a limited number of equipment use blocks during each week, but are not allowed to sign up on the following week's equipment reservation schedule unless they were not able to sign up for the current week. T / F
8. If students have no drawing(s), they cannot work in the student shop. Drawings don't have to be computer generated, but they do need to be legible and correct so as to not waste time deciphering them or repeating work due to errors in them. T / F
9. If a student's low level of proficiency requires excessive attention and keeps you from effectively supervising the others, kindly tell them to sign up for an equipment training session on the Machine Training Signup Sheet. T / F
10. When work is slow, Maintenance Checklist tasks should be completed and marked off. T / F
11. Each TA is responsible for helping keep the TA table organized clean and organized. T / F

WEEK 2

12. Identify the location of the following fasteners:
    a. 10-24 × 1-1/4" pan head phillips screws
    b. 10-24 × 1/2" socket set screws
    c. ¼-20 × 5/8" button head cap screws
    d. M3 × 0.5 socket head cap screws
    e. M4 × 0.7 hex head screws
    f. M6 × 1 hex head screws
13. When switching speed ranges on the mills it is always necessary to gently rock the spindle back and forth to allow the teeth on the spur gears in the gearbox to properly engage. T / F
14. List four conditions which can cause an E-STOP condition on the Southbend lathes:
    a.
    b.
    c.
    d.
15. What is the purpose of the lathe carriage stop and how close to the dangerously rotating chuck jaws should it allow the cutting tool?
    a.
    b.

WEEK 3

16. Files are bi-directional cutting tools (i.e. they can cut when moving in either direction across the workpiece). T / F
17. The spindle friction lock should always be used, unless you are confident the threaded spindle lock is screwed up tightly against the quill stop. T / F
18. List three examples of when it would be appropriate to use the milling machine axis locks:
    a.
    b.
    c.
19. Occasionally enough moisture accumulates in the air lines supplying the milling machines, to prevent the drawbar controls from functioning. The solution is to cycle the controls a few times (IN and then OUT) until they begin working. T / F
20. Keyless chucks are considerably more fragile and expensive than keyed chucks, and should therefore only be used with drills up to ½" in diameter. Above this size, collets (which are always best) or keyed drill chucks should be used. Keyed drilled chucks should also be used for any tools requiring additional cutting torque (such as hole saws) or any tools requiring reversing of rotation direction (such as taps). T / F
21. The Southbend lathe DROs are configured to display part diameter, but the Ajax cross slide vernier dial displays part radius. T / F

WEEK 4

22. Fine threads are stronger when the female thread is strong relative to the male thread, and coarse threads are stronger when the female thread is weak relative to the male thread. T / F
23. Male fasteners fail in tension across the minor diameter and female fasteners fail in shear across the major diameter. T / F
24. What is the minimum steel part thickness necessary to thread for a #10 screw?
25. Talon jaws can clamp on a very small amount of material with sharp knife-like edges. T / F
26. The lab has a variety of taller and wider vise jaws for clamping larger workpieces. T / F
27. Workstops preserve X-axis zeros for multiple parts, eliminating the need to re-zero each time an identical part is reloaded, and are installed onto the fixed vise jaw. T / F
28. If you have trouble realigning the wheel hub in the lathe when creating the counterbore in the Entstort hub, use the polycarbonate disc on the front shoulder. T / F

WEEKS 5 - 6

29. It is often helpful to clamp/cut multiple pieces of (non-circular) material in the Marvel or Roll-In bandsaws at the same time (such as 80/20 extrusion). When doing this, it's important to clamp the parts horizontally in the bandsaw vise, NOT VERTICALLY; this ensures each part will be clamped securely, even if they aren't all the exact same thickness. T / F
30. When cutting parts in the bandsaw you should always orient parts so the cross-sectional cutting area remains as constant as possible throughout the cut and so the parts engage the largest number of teeth on the blade. T / F
31. The Marvel vise can be adjusted to cut wider parts by loosening the ½" bolt on the top, sliding the moveable jaw rearward, and re-torquing the bolt. When finished, please return the vise to the original position for use cutting normal lab stock. T / F
32. List five items to check when prepping the Marvel for weekly use:
    a.
    b.
    c.
    d.
    e.
33. List five cautions when using the Ajax lathe:
    a.
    b.
    c.
    d.
    e.
34. When using the Roll-In bandsaw never tighten the viscous damper adjustment knob, as doing so can damage the precision needle valve seat; always be gentle when closing the valve. T / F

WEEK 7

35. When using the Hobart MIG welder, power setting 2 is used for steel sheetmetal, setting 3 is used for 1/8" steel (i.e. the welding demos), and setting 5 is used for ¼" steel. When tack welding, adjust the welder to one voltage setting higher than normal, but adjust the machine back before performing the actual welding. T / F
36. When using the Hobart welder, make sure the nozzle extends approximately 1/16" past the internal collet. T / F
37. When the a regulator on the welding gas tank reads less than 1000 PSI the tank is getting low and Mike should be notified so replacement gas can be ordered. T / F
38. When using the MIG welder, check the status of the wire spool located under the flap on the left side of the machine, and notify Mike when the spool appears low enough to be replaced. T / F
39. When clamping workpieces prior to plasma cutting, always ensure the portion getting cut does not intersect with the table. T / F
40. List 3 process tips when using reamers:
    a.
    b.
    c.
41. When working with plastics with good machinability, use the cutting parameters for aluminum up until the point that the plastic melts. T / F
42. Based on the Recommended Surface Speeds for Common Materials table, the cutting (surface) speed for steel is about 2.5 times lower than that for aluminum (~100 vs 250 sfm). T / F

WEEK 8

43. List 5 motor respect / use guidelines:
    a.
    b.
    c.
    d.
    e.
44. As explained in the Robot Testing Procedures, groups should use battery switch boxes for simple motor testing, empty control boxes for general fitment checks, and control boxes when performing mobile platform testing during office hours. T / F
45. Never turn on the control box while the robot is on top of a lab table. T / F
46. When plugging in the charger leads or switching batteries, NEVER pull directly on the wires; if you aren't strong enough to separate the connectors properly, ask for assistance. T / F
47. Batteries should be swapped or recharged when the voltage display reads < 11V. T / F
48. When clamping a workpiece with non-parallel sides (anything greater than 0.003" out of parallel) insert a paint paddle against the moveable jaw to provide a complaint material on which to clamp. T / F

49. Ultrathin parallels can be left under parts so they don't slip down into the vise (when opposite sides are not parallel or the part can't be clamped too tightly). The lab has two sets of 16 gage aluminum parallels are cut to the heights needed to hold one or two 3/16" thick workpieces for motor mount manufacturing, as well as a full set of ultrathin steel parallels. T / F

WEEK 9

50. The tapping station is used to quickly thread workpiece that have already been tapped drilled. Hex-shaped holders contain labeled taps ranging from #8 to 1/2". There is also a rectangular block for use tapping the holes in the face of the wheel hubs (which takes about 15 seconds per hole). T / F
51. Based on the Boring Facts Summary document, list 3 benefits of HSS:
    a.
    b.
    c.
52. Based on the Boring Facts Summary document, list 2 benefits of tungsten carbide:
    a.
    b.
53. Based on the Boring Facts Summary document, larger corner radii produce better surface finish and can achieve tighter tolerances, but are more fragile and fracture much quicker than smaller radii. So typically smaller Rs are used for roughing and larger Rs are used for finishing. T / F
54. Based on the Boring Facts Summary document, heat resistant coatings allow higher surface (spindle) speeds and thus faster boring in tougher materials like steels and titanium. T / F
55. Based on the Boring Facts Summary document, list 3 things to consider when setting up boring bars:
    a.
    b.
    c.
56. Based on the Boring Facts Summary document, list 3 tips when selecting cutting parameters:
    a.
    b.
    c.
57. Based on the Boring Facts Summary document, list 3 tips for obtaining repeatable results:
    a.
    b.
    c.
58. Based on the Parting Facts Summary document, list the two options for part-off tool materials:
    a.
    b.

59. Based on the Parting Facts Summary document, list two options for maximizing cutting stiffness:
    a.
    b.

60. Based on the Parting Facts Summary document, list the tool used to align the parting blade holder parallel to the X-axis of motion:

61. When parting on a manual machine, the parting tool should be run at approximately ____ of the recommended surface speed for the same workpiece/cutting tool material (like all manual machining operations).

62. Based on the Parting Facts Summary document, list three cutting tips when parting:
    a.
    b.
    c.

63. List the four types of common drills from shortest to longest:
    a.
    b.
    c.
    d.

64. 5C collet blocks are used to cut square or hexagonal features on round parts (e.g. a hex head on a fastener or rod). T / F

WEEK 10

65. List seven guidelines for endmill selection:
    a.
    b.
    c.
    d.
    e.
    f.
    g.

66. Live or dead centers are used to provide support to longer workpieces where deflection will cause poor dimensional accuracy and surface finish. T / F

WEEK 11

67. Spiral tip taps (aka gun taps) should be used when tapping blind holes. T / F

68. Spiral flute taps should be used when tapping thru holes. T / F

69. Taper taps normally have 7 – 10 tapered threads, plug taps normally have 3 -5 tapered threads, and bottoming taps typically have 1 – 2 tapered threads. T / F

70. Typically, thread cutting dies are round and thread repairing dies are hexagonal in shape. T / F

71. Before using a threading die it's important to make sure the major diameter of the shaft to be threaded matches the range listed in the Machinery Handbook. For example, a ½-20 UNF 2A thread must have a major diameter between 0.4906 and 0.4987". The smaller the major diameter, the easier the die will cut. In general, undersize the shaft diameter by 2% of the major thread diameter. T / F

72. When using a threading die on the lathe it's important to start the thread die collinear to the axis of the part, so use the body of the drill chuck for alignment and guidance. It's also important to cut a generous chamfer on the end of the part to help the threading die start cutting. T / F

73. Rigid tapping should NEVER be performed using a keyless chuck. T / F

74. When rigid tapping, smaller taps up to 3/8" can be clamped in a keyed Jacob's style chuck **(NEVER a keyless chuck!)** and larger taps should be clamped using a split sleeve or heavy duty tap driver. T / F

75. Based on the Precision Metrology document, the rule of ten states reliably measuring a part feature specified as ±0.005" requires a measurement tool with a resolution and accuracy of:
    a. ±0.005"
    b. ±0.001"
    c. ±0.0001"
    d. 0.005"
    e. 0.001"
    f. it's a trick question, nothing can be reliably measured ☺!

76. Based on the Precision Metrology document, Explain the two types of errors that plague analog dial calipers:
    a.

    b.

WEEK 12+

77. List the primary benefits of the following types of lathe chucks:
    a. four jaw chucks:

    b. six jaw chucks:

    c. collet chucks: