

## COURSE PACKAGE

### Part A: Course Specifications

<b>Course Code</b>	: MACH 2				
<b>Course Descriptive Title</b>	: Machine Shop Practice 1				
<b>Prerequisite</b>	: Mach 1		<b>Corequisite</b>	: E Mat	
<b>Year Level</b>	: First Year		<b>Semester Offered</b>	: Second Semester	
<b>Course Credits</b>	: 2 units	<b>Theoretical Contact Hours Per Week</b>	: 0 hours	<b>Demonstration/ Practical Work Contact Hours Per Week</b>	: 4 hours
<b>Course Description</b>	: This course aims to provide knowledge, skills and instill the work attitude towards proficiency in the use of hand and power tools, and measuring tools, and for fabrication applying the safe working practices at all times.				
<b>STCW Reference</b>	<b>STCW Table</b>	<b>Function</b>	<b>Competence</b>	<b>Knowledge, Understanding and Proficiency</b>	
	A-III/1	Maintenance and repair at the operational level	Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board	Characteristics and limitations of materials used in construction and repair of ships and equipment  Characteristics and limitations of processes used for fabrication and repair  Properties and parameters considered in the fabrication and repair of systems and components  Methods for carrying out safe emergency/temporary repairs  Safety measures to be taken to ensure safe working environment and for using hand tools, machine tools and measuring instruments  Use of hand tools, machine tools and measuring instruments	



				Use of various types of sealants and packings.
<b>Course Outcomes</b>	:	PO-E.8 PO-E.9	<p><i>At the end of the course, the student must be able to:</i></p> <p><b>CO1.</b> Use personal protective equipment (PPE) to address identified and associated risks specific to the tasked to be performed</p> <p><b>CO2.</b> Apply safety measures in using power and hand tools, measuring instruments, sealants and packings based on the manufacturer's recommendation and/or best industry practices</p> <p><b>CO3.</b> Use of hand and power tools, measuring instruments, sealants and packings in basic workshop practice and fittings</p> <p><b>CO4.</b> Fabricate various workpieces with the use of the hand and power tools and measuring instruments emphasizing the important fabrication parameters, selection of materials, and design tolerances.</p>	
<b>Course Intake Limitations</b>	:	The number of students that can be accommodated shall not exceed 40 for lecture and 20 for laboratory.		
<b>Faculty Requirement</b>	:	<p><b>Instructor</b></p> <p>The faculty that will be assigned to handle the Course must possess the following qualifications:</p> <ul style="list-style-type: none"> <li>• Graduate of Bachelor of Science in Marine Engineering;</li> </ul>		

	<ul style="list-style-type: none"> <li>• Officer-in-charge of an Engineering Watch on seagoing ships powered by propulsion machinery of 750 kW propulsion power or more;</li> <li>• completed Training Course for Instructors (IMO Model Course 6.09);</li> <li>• completed Training Course on Assessment, Examination and Certification of Seafarers (IMO Model Course 3.12);</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Registered professional holding a bachelor's degree in Mechanical Engineering or holder of bachelor's degree in Industrial Technology with major in machine shop technology and/or welding and fabrication technology with Master's Degree in the same discipline</li> <li>• with at least one (1) year industrial experience and/or teaching experience;</li> <li>• completed Approved Training Course for Instructors (IMO Model Course 6.09);</li> <li>• completed Approved Training Course on Assessment, Examination and Certification of Seafarers (IMO Model Course 3.12);</li> </ul> <p><b>Assessor</b> The assessor assigned shall have the same qualifications above.</p> <p><i>Note:</i></p> <ol style="list-style-type: none"> <li>1. <i>The instructor shall conduct the formative assessment.</i></li> <li>2. <i>Summative assessment shall be conducted by an Assessor not teaching the students (assessee).</i></li> </ol>										
<p><b>Teaching Facilities and Equipment</b></p>	<p><b>CLASSROOM</b> The standard class room size shall be a minimum of 48 square meters, no side shall be less than 6 meters for a class of 30 students. Classroom must be illuminated at 50.76 Lux and well-ventilated. It should contain the following:</p> <ul style="list-style-type: none"> <li>• Tables and chairs or armed chairs</li> <li>• Whiteboards or boards</li> <li>• Multimedia equipment</li> </ul> <p><b>MACHINE SHOP</b> For the mechanical workshop, the following training facilities and equipment shall be available:</p> <p style="text-align: center;"><b>EQUIPMENT FOR PRACTICAL WORK</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Facilities and Equipment</th> <th style="text-align: center;">Equipment to Student Ratio</th> </tr> </thead> <tbody> <tr> <td colspan="2" style="text-align: center;"><i>Workplace (Shall be provided by the MHEI)</i></td> </tr> <tr> <td>1. Lockers for storing personal belongings</td> <td></td> </tr> <tr> <td>2. Washing facility (including hand and eye wash)</td> <td></td> </tr> <tr> <td>3. Work benches fitted with vise on each end</td> <td style="text-align: center;">1:4</td> </tr> </tbody> </table>	Facilities and Equipment	Equipment to Student Ratio	<i>Workplace (Shall be provided by the MHEI)</i>		1. Lockers for storing personal belongings		2. Washing facility (including hand and eye wash)		3. Work benches fitted with vise on each end	1:4
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	(minimum size of 50cm x 125cm)	
	4. Scrap Disposal Containers	
	<b>Personal Protective Equipment</b> (Shall be provided by the students)	
	1. Cover-all	1:1
	2. Ear muffs	1:1
	3. Face shield	1:1
	4. Safety gloves	1:1
	5. Safety goggles	1:1
	6. Safety helmet with chin strap	1:1
	7. Safety shoe with steel toe	1:1
	<b>Measuring Instruments</b> (Shall be provided by the MHEI)	
	1. Dial micrometer with magnetic base	1:4
	2. Gauge, depth	1:4
	3. Gauge, feeler (metric/inches)	1:4
	4. Gauge, screw pitch (metric/inches)	1:4
	5. Gauge, surface	1:4
	8. Micrometer (inside and outside)	1:4
	9. Steel tape	1:4
	10. Steel ruler	1:4
	11. L-square (steel)	1:4
	12. Vernier caliper (steel)	1:4
	13. Divider	1:4
	14. Scriber	1:4
	15. Level bar	1:4
	<b>Basic Hand Tools</b> (Shall be provided by the MHEI)	
	1. Screwdriver, philips (various sizes)	1:4
	2. Screwdriver, flat (various sizes)	1:4
	3. Pliers, mechanical (lineman's pliers)	1:4
	4. Vise grips	1:4
	5. Ball peen hammer	1:4
	6. Straight peen hammer	1:4
	7. Sledge hammer	1:4
	8. Torque wrench	1:4
	9. Hacksaw	1:4



		10. Drift punch	1:4
		11. Center punch 60mm	1:4
		12. Center punch 90mm	1:4
		13. Drive pin punch	1:4
		14. Gasket hole punch set	1:4
		15. Flaring tools	1:4
		16. Copper Tube cutters	1:4
		17. Double-cut rough files	1:4
		18. Second-cut smooth files	1:4
		19. Single-cut smooth files	1:4
		20. Second-cut files	1:4
		21. Hand wire brush	1:4
		22. Wheel type brush	1:4
		23. Cup-type brush	1:4
		24. Screw/bolt extractor	1:4
		25. Bearing puller	1:4
		26. Chain Block (min 0.5-ton capacity)	1:4
		27. Metal cutting shear (snip)	1:4
		28. Flat chisel	1:4
		29. Cross-cut chisel	1:4
		30. Diamond cut chisel	1:4
		31. Grease gun	1:4
		32. Oil applicator	1:4
		33. Reamer handset (assorted)	1:4
		34. Wrench, socket type, 10mm – 24mm	1:4
		35. Wrench, open type (metric), 10mm – 24mm	1:4
		36. Tap and dies	1:4
		37. Drill bit, 13-25mm tapered shank	1:4
		38. Drill bit, 15-30mm cylinder shank	1:4
		39. Pipe wrench (various sizes)	1:4
		40. Pipe Cutter	1:4
		41. Anvil (must be placed accordingly near workbench)	1:4
		42. Hooks, eye bolt and shackles	1:4
		43. Wire rope and polyester slings	1:4
		44. Hand tube bender	1:4
		45. Hydraulic pipe bender	1:4



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<p><b>Teaching Aids</b></p>	<p>:</p>		<p><b>TA1</b> Machine Shop Familiarization Checklist  <b>TA2</b> Machine Shop Safety and Signages  <b>TA3</b> Sawing and Cutting Tools  <b>TA4</b> Smoothing Tools  <b>TA5</b> Pipe Bending, Pipe Works and Heat Treatment  <b>TA6</b> Sealants and packings  <b>TA7</b> Power hand tools</p>		<p><i>Note: The MHEIs can use additional teaching facilities and equipment as deemed necessary to meet the learning outcomes of this course.</i></p>														
<p><b>References / Bibliographies</b></p>	<p>:</p>		<p><b>References:</b>  <b>R1</b> International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended  <b>R2</b> Officer in Charge of an Engineering Watch (IMO Model Course 7.04)  <b>R3</b> Maritime and Coastguard Agency (2011). <i>Code of Safe Working Practices for Merchant Seamen</i>. London: The Stationery Office  <b>R4</b> Machine Tool Practices, International Edition By: Richard Kibbe          Publisher: Pearson; 9 edition (15 July 2009)          Language: English          ISBN-10: 0137032854          ISBN-13: 978-0137032853</p>																

	<p><b>R5</b> Maritime and Coastguard Agency (MCA), Code of Safe Working Practices for Merchant Seamen London. The Stationery Office Publications Centre Consolidated Edition, 2009 ISBN 9780115530784</p> <p><b>R6</b> Manufacturer’s Manual</p> <p><i>Note: The MHEIs can use alternate and/or additional references/bibliographies as deemed necessary to meet the learning outcomes of this course.</i></p>
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## Part B: Course Outline and Timetable

Term	Week	Topic	Time Allotment (in hours)	
			Theoretical	Demonstration / Practical Work
<i>Note: MHEIs shall determine the number of periods for terms the semester is divided based on their school calendar activities</i>	1-2	1. Machine Shop Safety 2. Sawing and Cutting	-	8
	3-4	3. Smoothing	-	8
	5	4. Taps, Dies and Extractors	-	4
	6-7	5. Bending	-	8
	8	6. Sealants and packings	-	4
	9-11	7. Power hand tools	-	12
	12 - 17	8. Fabrication	-	24
<b>Sub-total (Contact Hours)</b>			<b>0</b>	<b>64</b>
<b>Total Contact Hours</b>			<b>64</b>	
<b>Examination and Assessment</b>				

**Note:**

1. The MHEIs are to develop their respective timetable according to their resources but meets with the minimum time allocation for the contact hours. OR
2. The MHEIs shall determine the time allotment for the conduct of summative assessments.





## Part C: Course Syllabus

CO	Topics Learning Outcomes	References/ Bibliographies	Teaching Aids
CO1	<b>1. Machine Shop Safety</b> 1.1. Wear PPE in accordance with the tasked to be performed such as cutting, smoothing, extracting, bending	R2, R3, R4, R5	TA1, TA2
CO2 CO3	<b>2. Sawing and Cutting</b> 2.1. Cut of a piece of flat bar using hacksaw with correct type of blade and technique 2.2. Use a pipe cutter and pipe threader in a given activity in accordance with manufacturer's manual/recommendation or industry best practices. 2.3. Use tube cutters and flaring tool in a given activity in accordance with manufacturer's manual/recommendation or industry best practices	R6	TA3
	<b>3. Smoothing</b> 3.1. Smooth rough edges of flange by using any type of file in accordance with manufacturer's manual/recommendation or industry best practices.	R6	TA4
	<b>4. Taps, Dies and Extractors</b> 5.1 Use of tap and die and screw/bolt extractors in a given activity in accordance with manufacturer's manual/recommendation or industry best practices	R6	TA5
	<b>5. Bending</b> 5.1. Bend at least ¼ inch diameter copper pipe using hand tube bender in accordance with manufacturer's manual/recommendation or industry best practices 5.2. Bend at least 1-inch diameter pipe using hydraulic pipe bender in accordance with manufacturer's manual/recommendation or industry best practices	R6	
	<b>6. Sealants and packings</b> 6.1 Apply sealant on metal pipes with cracked/hole. <i>Note: packing will be addressed in another course, Maintenance and Repair (Maint).</i>	R6	TA6
	<b>7. Power hand tools</b> 7.1 Use of portable electric and pneumatic power drills in accordance with manufacturer's manual/recommendation or industry best practices 7.2 Use of electrical saw in accordance with manufacturer's manual/recommendation or industry best practices 7.3 Use of portable electric grinders in accordance with manufacturer's manual/recommendation or industry best	R6	TA7



CO	Topics Learning Outcomes	References/ Bibliographies	Teaching Aids
	practices		
CO4	<b>8. Fabrication</b> 8.1 Fabricate a C-clamp with the use of the hand, power tools and measuring instruments emphasizing the important fabrication parameters, selection of materials, design tolerances and safety measures.		

*Note: The MHEIs are to develop Part D: Detailed Teaching Syllabus and Instructional Materials (IMs), and Part E: Course Assessment and Assessment Tools (ATs) which satisfactorily meets with the requirements of the course as prescribed in the course outcomes and learning outcomes.*

