الخطة الدراسية لبرنامج "الدرجة الجامعية المتوسطة"

في

تخصص الهندسة البحرية

(تم اعتماد هذه الخطة الدراسية بموجب قرار مجلس عمداء جامعة البلقاء التطبيقية رقم تاريخ وتطبق اعتباراً من مطلع العام الجامعي 2021/2020)

تتكون الخطة الدراسية لنيل الدرجة الجامعية المتوسطة في برنامج تكنولوجيا الهندسة البحرية/ تخصص الهندسة البحرية من (105) ساعات معتمدة، موزعة على النحو الآتي:

الرقم	المتطلب	ساعة معتمدة
.1	المهارات العامة	**12**
.2	مهارات التشغيل	**6**
.3	العلوم المساندة	**9**
.4	المهارات المتخصصة	**78**
	المجموع	**105**

وصف الهدف من البرنامج:

يهدف البرنامج إلى إعداد تقنيين في مجال الهندسة البحرية للعمل على متن السفن التجارية ومنصات النفط وأحواض تصنيع وصيانة السفن والترسانات البحرية وشركات الإدارة والتفتيش البحري.

مخرجات التعلم للخطة الدراسية

الرقم	المخرج	المهارات المطلوبة
.1	**صيانة وتشغيل ومراقبة محركات الديزل البحري والآلات والأنظمة المساعدة**	**محركات الاحتراق الداخلي، المحركات التوربينية البخارية والغازية، المضخات والضاغطات والأنظمة الهيدروليكية والهوائية، أنظمة التحكم الآلي والتوجيه والدفع،** أنواع محركات الاحتراق الداخلي البحرية, مبدأ عمل محركات الاحتراق الداخلي البحرية, المكونات والأجزاء الداخلية لمحرك الاحتراق الداخلي البحرية, طرق فك وتركيب مكونات المحركات الداخلية البحرية, قراءة كتيبات ومخططات الصيانة والتشغيل, أخذ القراءات والقياسات المطلوبة حسب تعليمات الصانع, تشخيص الأعطال ومعالجتها, إدارة قطع الغيار حسب منظومة السلامة البحرية, الإختبارات الميكانيكية والكيميائية (الماء والزيوت), استخدام آلات ومعدات اللحام وقطع المعادن
.2	**إدارة وتشغيل منظومة الطاقة الكهربائية على متن السفن التجارية ومنصات النفط**	تمييز وتشغيل ومراقبة أداء الآلات الكهربائية البحرية, قراءة المخططات وكتيبات التشغيل, إجراء فحص العازلية الكهربائية ومعدات وأجهزة الوقاية من الحوادث الكهربائية البحرية، تعزيز مفهوم كفاءة الطاقة الكهربائية.

.3	**تطبيق تعليمات وإجراءات الإبحار الآمن وتركيب السفن وأنواعها**	طرق مكافحة الحرائق البحرية، المعاهدات الدولية البحرية،اتزان السفن أثناء الإبحار وأثناء الاستطفاف،بناء السفن وطرق اللحام و الصيانة لبدن السفينة،مكافحة التلوث البحري،الاتصالات البحرية وادارتها ومباديء الأمن السبراني وبرمجة تطبيقاته
.4	**تقييم وحسابات البضائع السائلة والسائبة على السفن التجارية**	التفتيش البحري وحساب الكميات،اتزان السفن الهيدروستاتيكي،معايرة أجهزة القياس وحساب الكميات
.5	**إعداد التقارير الفنية والإدارية**	اعداد تقارير الصيانة الدورية الوقائية و التصحيحية،اعداد تقارير الموارد التشغيلية و البشرية،تقييم و ادارة المخاطر البحرية،إدارة غرفة المحركاتومحاكاتها.
6	**تنمية المهارات الفنية**	اللحام الكهربائي، اللحام بالأكسجين، الخراطة ،أعمال القص،أعمال الفك و التركيب الميكانيكي، أعمال التمديدات الكهربائية البحرية و طرق المعايرة

مصفوفة ربط المواد التعليمية في الخطة الدراسية بمخرجات التعلم

الرقم	المادة	المخرج 1	المخرج 2	المخرج 3	المخرج 4	المخرج 5	المخرج 6
1	الفن البحري					X	
2	القانون البحري			X		X	
3	التفتيش البحري				X	X	
4	لغة إنجليزيه متخصصة	X	X	X	X	X	
5	التصميم الميكانيكي بالحاسوب	X		X			
6	الميكانيكا الهندسية	X		X			
7	ميكانيكا الموائع	X		X	X	X	
8	المواد الهندسية	X		X			X
9	المشاغل الهندسية					X	X
10	هندسة بناء السفن			X		X	
11	الهيدروستاتيك و اتزان السفن			X	X		
12	الرياضيات الهندسية	X	X	X			
13	التحكم الآلي البحري		X				
14	مشغل التحكم الآلي البحري		X				
15	أساسيات الهندسة الكهربائية		X				
16	الألات الكهربائية البحرية		X				X
17	مقدمة في الكيمياء البحرية	X			X		
18	الألات البحرية المساعدة 1	X					
19	الألات البحرية المساعدة 2	X					
20	مشغل الألات البحرية المساعدة	X					X
21	المحاكيات البحرية	X		X	X	X	
22	الديناميكا الحرارية	X					
23	محركات الديزل البحرية 1	X					
24	محركات الديزل البحرية 2	X					

25	مشغل محركات الإحتراق الداخلي	X					X
26	البرمجة باستخدام لغة بايثون		X	X		X	
27	مهارات وتطبيقات عملية متخصصه	X	X	X	X	X	X

المجالات المعرفية للمهارات الفنية المتخصصة

الرقم	اسم المجال المعرفي	س. م. نظري	س. م. عملي	المواد التعليمية
1	تشريعات الإبحار الامن و القانون البحري الدولي	7	8	الفن البحري، القانون البحري، التفتيش البحري، مهارات وتطبيقات عملية، لغة انجليزية متخصصة
2	أساسيات الهندسة الكهربائية والإلكترونيات وادارة منظومة الطاقة	10	4	الرياضيات الهندسية، التحكم الالي البحري، مشغل التحكم الالي البحري، أساسيات الهندسة الكهربائية، الالات الكهربائية البحرية، البرمجة بلغة بايثون،
3	أساسيات محركات الديزل البحرية و الأنظمة المساعدة وادارتها	15	6	مقدمة في الكيمياء البحرية، المحاكيات البحرية، الديناميكا الحرارية، الالات البحرية المساعدة1، الالات البحرية المساعدة2، مشغل الالات البحرية المساعدة، محركات الديزل البحرية 1، محركات الديزل البحرية 2، مشغل محركات الاحتراق الداخلي،
4	أساسيات بناء السفن و اتزانها	13	2	التصميم الميكانيكي بالحاسوب، الميكانيكا الهندسية، ميكانيكا الموائع، المواد الهندسية، هندسة بناء السفن، الهيدروستاتيك واتزان السفن،
5	المهارات الفنية	0	1	المشاغل الهندسية
6	التدريب والخبرة العملية/ ممارسة المهنة	0	12	التدريب الميداني، الخبرة العملية
	المجموع	45	33	

الخطة الدراسية لتخصص "الهندسة البحرية"

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أولاً: المهارات العامة، (12) ساعات معتمدة موزعة على النحو الآتي:

رقم المادة	اسم المادة	س.م	نظري	عملي	لغة الدراسة	المتطلب السابق
020000111	المواطنة الإيجابية ومهارات الحياة	3	3	0	A	
020000101	مهارات في اللغة الإنجليزيه	3	3	0	E	
020000131	التربية الوطنية	2	2	0	A	
020000181	العلوم العسكرية	1	1	0	A	
020000121	الثقافة الاسلامية	3	3	0	A	
المجموع (س.م)		**12**	**12**	**0**		

ثانياً: مهارات التشغيل ، (6) ساعات معتمدة موزعة على النحو الآتي:

رقم المادة	اسم المادة	س.م	نظري	عملي	لغة الدراسة	المتطلب السابق
020000122	مهارات الاتصال باللغة الإنجليزية	2	2	0	E	
020000231	ريادة الأعمال	2	2	0	A	
020000141	الصحة والسلامة المهنية	2	2	0	A	
المجموع (س.م)		**6**	**6**	**0**		

ثالثاً: المهارات المساندة، (9) ساعات معتمدة موزعة على النحو الآتي:

رقم المادة	اسم المادة	س.م	نظري	عملي	لغة الدراسة	المتطلب السابق
020000151	مفاهيم رياضية	3	3	0	E	
020000161	مفاهيم فيزيائية	3	3	0	E	
020000162	مختبر مفاهيم فيزيائية	1	0	2	E	*020000151
020000171	الرسم الهندسي بالحاسوب	2	0	4	E	
المجموع (س.م)		**9**	**6**	**6**		

رابعاً: المهارات المتخصصة، (78) ساعة معتمدة، موزعة على النحو الآتي:

رقم المادة	اسم المادة	س.م	نظري	عملي	لغة الدراسة	المتطلب السابق
020701111	الفن البحري	3	3	0	E	لا يوجد
020701314	القانون البحري	3	3	0	E	لا يوجد
020701315	التفتيش البحري	3	1	4	E	020701314
020701313	لغة إنجليزيه متخصصة	3	0	6	E	020000122*
020701223	التصميم الميكانيكي بالحاسوب	1	0	2	E	020000171
020701222	الميكانيكا الهندسية	3	3	0	E	020000161
020701124	ميكانيكا الموائع	3	2	2	E	020000161
020701225	المواد الهندسية	2	2	0	E	020000161
020701226	المشاغل الهندسية	1	0	2	E	لا يوجد
020701227	هندسة بناء السفن	3	3	0	E	020701222 020701111
020701328	الهيدروستاتيك و اتزان السفن	3	3	0	E	020701227 020701111
020701131	الرياضيات الهندسية	3	3	0	E	020000151
020701234	التحكم الآلي البحري	3	3	0	E	020000161 020701131
020701235	مشغل التحكم الآلي البحري	1	0	2	E	020701234
020701232	أساسيات الهندسة الكهربائية	3	2	2	E	020000161
020701335	الألات الكهربائية البحرية	3	2	2	E	020701232
020701241	مقدمة في الكيمياء البحرية	3	2	2	E	لا يوجد
020701242	الألات البحرية المساعدة 1	3	3	0	E	020000161
020701243	الألات البحرية المساعدة 2	3	2	2	E	020701242
020701344	مشغل الألات البحرية المساعدة	1	0	2	E	020701243
020701345	المحاكيات البحرية	**1**	**0**	2	E	020701242 020701252
020701151	الديناميكا الحرارية	3	2	2	E	020000161
020701252	محركات الديزل البحرية 1	3	3	0	E	020701151 200000161
020701353	محركات الديزل البحرية 2	3	3	0	E	020701252
020701354	مشغل محركات الإحتراق الداخلي	1	0	2	E	020701253
020701336	البرمجة باستخدام لغة بايثون	1	0	2	E	لا يوجد
020701261	مهارات وتطبيقات عملية	3	0	6	E	لا يوجد

رقم المادة	اسم المادة	س.م	نظري	عملي	لغة الدراسة	المتطلب السابق
020701371	**التدريب الميداني	6	0			انهاء الطالب 50 س م
020701372	**لخبرة العملية	6	0			انهاء الطالب 99 س م
المجموع (س.م)		**78**	**45**	**33**		

**. تدريب ميداني لمدة فصل دراسي كامل.

** . تدريب عملي في مواقع العمل لمدة فصل كامل.

ملاحظة: تم تحديد الساعات المعتمدة للمهارات المتخصصة بما يتلائم مع تحديثات المنظمة البحرية الدولية- معاهدة واتفاقيات STCW 2010 وتعديلات مانيلا و Model Course 7.04 والخاصة بتعليم وتأهيل العمالة التقنية على متن السفن التجارية و التطبيقات البحرية.

الخطة الاسترشادية لتخصص "الهندسة البحرية"

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الفصل الدراسي الأول			الفصل الدراسي الثاني		
اسم المادة	رقم المادة	س.م.	اسم المادة	رقم المادة	س.م.
المواطنة الإيجابية ومهارات الحياة	200001110	3	مهارات الاتصال باللغة الإنجليزية	200001220	2
مهارات في اللغة الإنجليزيه	020000101	3	مقدمة في الكيمياء البحرية	020701241	3
التربية الوطنية	020000131	2	الصحة والسلامة المهنية	020000141	2
مختبر مفاهيم فيزيائية	020000151	1	الرياضيات الهندسية	020701131	3
الثقافة الاسلامية	020000121	3	الرسم الهندسي بالحاسوب	020000161	2
مفاهيم رياضية	020000151	3	الفن البحري	207011110	3
مفاهيم فيزيائية	020000161	3	الميكانيكا الهندسية	020701222	3
المجموع		**18**	**المجموع**		**18**

الفصل الدراسي الصيفي		
اسم المادة	رقم المادة	س.م.
الديناميكا الحرارية	020701151	3
ميكانيكا الموائع	020701124	3
لغة إنجليزيه متخصصة	020701313	3
المجموع		**9**

الفصل الدراسي الثالث			الفصل الدراسي الرابع		
اسم المادة	رقم المادة	س.م.	اسم المادة	رقم المادة	س.م.
هندسة بناء السفن	020701227	3	محركات الديزل البحرية 2	020701353	3
المواد الهندسية	020701225	2	الهيدروستاتيك و اتزان السفن	207013280	3
أساسيات الهندسة الكهربائية	020701232	3	ريادة الأعمال	020000231	2
محركات الديزل البحرية 1	020701252	3	القانون البحري	207013140	3
الألات البحرية المساعدة 1	020701242	3	البرمجة باستخدام لغة بايثون	020701336	1
التحكم الآلي البحري	020701234	3	الألات البحرية المساعدة 2	207012430	3
			مهارات وتطبيقات عملية	020701261	3
المجموع		17	المجموع		18

الفصل الدراسي الصيفي		
اسم المادة	رقم المادة	س.م.
التدريب الميداني	020701371	6
المجموع		6

الفصل الدراسي الخامس			الفصل الدراسي السادس		
اسم المادة	رقم المادة	س.م.	اسم المادة	رقم المادة	س.م.
التفتيش البحري	207013150	3	الخبرة العملية	020701372	6
المحاكيات البحرية	207013450	1			
مشغل الألات البحرية المساعدة	020701344	1			
مشغل محركات الإحتراق الداخلي	207013540	1			
مشغل التحكم الآلي البحري	020701235	1			
المشاغل الهندسية	207012260	1			
التصميم الميكانيكي بالحاسوب	207012230	1			
العلوم العسكرية	020000181	1			
الألات الكهربائية البحرية	207013350	3			
المجموع		13	المجموع		6

الوصف المختصر للمساقات التعليمية لتخصص "الهندسة البحرية"

أولاً: الثقافة العامة

المواطنة الإيجابية ومهارات الحياة 020000111	س م :3	س نظري:3	س عملي:0

يوضح المساق مفهوم المواطنة ومهارات الحياة وأهميتهما في اكتساب مهارات قيمة، والعمل على استخدام هذه المهارات في سعيهم للحصول على تعليم أفضل ونتائج ايجابيه في العمل، حيث أن المساق يراعي بناء المعرفة في الموضوعات التي يتضمنها البرنامج كما ويبني المهارة عند الشباب لاستخدامها في تطبيق المعرفه ,كما ويبني الثقه في قدرات الشباب على استخدام هذه المعرفه والمهارة بالإضافه الى توفير الدعم الشخصي والبيئي لتغيير السلوك من خلال تعزيز قيم المواطنة الايجابية والثقافة المجتمعية البناءة والعمل المجتمعي التطوعي.

التربية الوطنية 020000131	س م :2	س نظري:2	س عملي:0

يعد مساق التربية الوطنية من المتطلبات الإجبارية لجميع طلبة كليات المجتمع الأردنية وامتدادا عضويا لفلسفة التربية الوطنية والتعليم باعتبارها بعدا من أبعاد الإستراتيجية الوطنية للتعليم العالي، وينطلق مساق "التربية الوطنية" من مجموعة الثوابت الأردنية وعلى رأسها العقيدة الإسلامية السمحة، ومبادئ الثورة العربية الكبرى، والدستور الأردني والتجربة الوطنية.

مهارات في اللغة الإنجليزية 020000101	س م :3	س نظري:3	س عملي:0

تتكون المساق من 8 وحدات. كل وحدة لديها أنشطة التحدث التي تتعامل مع الحوارات ، وتقديم نفسه ، والحديث عن الأسرة. أيضا ، وتشمل .الوحدات النطق والإستماع مع أنشطة المحادثة. تركز أنشطة القراءة والكتابة على سيرة كتابة الأسئلة والبريد الإلكتروني وكتابة المدونة

الثقافة الإسلامية 020000121	س م :3	س نظري:3	س عملي:0

تعريف الثقافة الاسلامية وبيان معانيها وموضوعاتها والنظم المتعلقة بها – وظائفها وأهدافها, مصادر ومقومات الثقافة الإسلامية والأركان والأسس التي تقوم عليها خصائص الثقافة الاسلامية, الإسلام والعلم ، والعلاقة بين العلم والايمان و التحديات التي تواجه الثقافة الاسلامية، رد الشبهات التي تثار حول الإسلام , الأخلاق الاسلامية والآداب الشرعية في إطار الثقافة الاسلامية و النظم الاسلامية.

ثانياً: مهارات التشغيل والاستخدام

مهارات الإتصال باللغة الإنجليزية 020000122	س م :2	س نظري:2	س عملي:0

هذا المساق في مهارات الاتصال يهدف إلى تحسين مهارات التواصل الشفوية والكتابية للمتعلمين من خلال تزويد المتعلمين باللغة اللازمة للتواصل بشكل طبيعي مما يزرع الثقة في بيئة العمل الناطقة بالإنجليزية ومواقف الحياة الواقعية.

ريادة الأعمال 020000131	س م :2	س نظري:2	س عملي:0

يوضح المساق مفهوم ريادة الأعمال، تأثيرها في الإقتصاد الوطني ودورها في القضاء على البطالة، وكيفية استحداث أفكار ريادية ومبتكرة لتوائم احتياجات المجتمع و مواجهة المخاطر والتحديات التي تعترضها، وتقييم فرص نجاحها من خلال دراسة الجدوى، وكيفية حساب كلفتها وتمويلها وإدارة شؤؤونها المالية، وكيفية عمل تسويق لها، والطبيعة القانونية لها وخطة العمل اللازمة للبدء بها مع التركيز على التجربة الأردنية في هذا المجال.

الصحة و السلامة المهنية 020000141	س م : 2	س نظري :2	س عملي:0

اهداف الصحة والسلامة في بيئة العمل وطرق حماية المتواجدين والمتأثرين. دراسة أهم الاخطار وأكثرها إنتشارا في مختلف مجالات العمل ، تمييز المخاطر الكيماوية والبيولوجية والسقوط من المرتفعات والمخاطر الفيزيائية في بيئة العمل و الحريق والكهرباء والمخاطر الناتجة من الملائمة، تمييز مصادر المخاطر وتأثيرتها على الصحة وسلامة العمل وطرق ضبط المخاطر لتخفيف إحتمالية حدوثها والتخفيف من نتائجها في حالة حدوثها. مناقشة التسلسل الهرمي للسيطرة على المخاطر وطرق إختيار معدات الحماية الشخصية وتطبيق الاسعافات الاولية في حالات الإصابات البشرية.التعرف على المتطلبات القانونية الأردنية الرئيسية لحماية العاملين.

ثالثاً: العلوم المساندة

مفاهيم رياضية 020000151	س م :3	س نظري:3	س عملي :0

يعتبر هذا المساق تمهيدا لعلم التفاضل والتكامل حيث يبدأ بمجموعات الأعداد والمجموعات والعمليات عليها ومعادلة الخط المستقيم وحل أنواع من المعادلات والمتباينات، ومن ثم الإقترانات (كثيرات الحدود والجذرية والنسبية والمثلثية والاسية واللوغريتمية) إضافة للتطرق للمتطابقات المثلثية الأساسية وحل معادلات مثلثية وبعد ذلك التعرف على المفهوم الهندسي للمشتقة وقواعد وقوانين الإشتاق لبعض الإقترانات وكذلك مفهوم النهايات وأخيرا قواعد وقوانين تكامل الإقترانات الأساسية والمحددة في الأهداف الخاصة.

مفاهيم فيزيائية 020000161	س م :3	س نظري:3	س عملي:0

شرح وتوضيح لمفاهيم و تطبيقات الفيزياء الميكانيكيه (الحركه و القوه و الطاقه الميكانيكيه) و توضيح المفاهيم الأساسيه في الضوء و خصائصه. و تعريف الطالب بأساسيات الفيزياء الحراريه و مفاهيمها. و مفاهيم في الكهرباء السكونيه و الكهرباء المتحركه .(القوه الكهربائيه, المجال الكهربائي, الجهد الكهربائي ,. التيار و المقاومه الكهربائيه) و التعريف بمفاهيم الفيزياء المفناطيسيه الأساسيه و تطبيقاتها .(الحث المغناطيسي, النفاذيه المغناطيسيه.المواد المغناطيسيه)

مختبر المفاهيم الفيزيائية 020000162	س م :1	س نظري: 0	س عملي :2

يشمل المختبر التجارب الفيزيائية الأساسية في مجال الميكانيكا و الكهرباء و المغناطيسيه لتعزيز المفهوم الفيزيائي النظري

المتطلب السابق/ المتزامن: 020000161

الرسم الهندسي بالحاسوب 020000171	س م :2	س نظري:0	س عملي:4

مقدمة لاستخدام برمجية الأوتوكاد وتطبيقاتها و الأوامر و الكيانات الهندسية والبناء الهندسي و الرسم والإسقاط الانشائي

رابعاً: المهارات المتخصصة

الفن البحري	رقم المساق 020701111	س م 3 : 3- 0

أنواع السفن التجارية ، الأجزاء الرئيسية للسفينة التجارية ، علامات بيلمسول و خطوط التحميل ، غاطس السفينة ،أنواع حبال الرباط ، التطقيم ، الرتب البحرية ، النوبة البحرية أثناء الابحار ، النوبة البحرية أثناء الرسو في الميناء ،مهمات ضباط سطح السفينة ، مهمات مهندسي غرفة المحركات ،المرساة ، الأنوار الملاحية ودلالاتها، الأجهزة الملاحية و وظائفها

المتطلب السابق: لا يوجد

القانون البحري	رقم المساق 020701314	س م 3 : 3- 0

مقدمة في الاتفاقيات والمعاهدات في المنظمة البحرية الدولية،معاهدة السلامة البحرية ، معاهدة مكافحة التلوث البحري،معاهدة التدريب و التأهيل البحري، معاهدة حقوق البحارة ،خطوط التحميل ، كودة نظام ادارة السلامة البحرية،كودة منظومة الأمن و الحماية البحرية،سلطة دولة العلم ،سلطة تفتيش المواني،هيئات التصنيف البحرية،منظومة النقل البحرية وما يتعلق بها من لوجستيات،مهارات القيادة و الاتصال على متن السفن التجارية،كودة صيانة السفن التجارية،كودة الحوض الجاف.

المتطلب السابق: لا يوجد

التفتيش البحري	رقم المساق 020701315	س م 3 : 1- 2

مباديء التفتيش البحري و أنواعه ، الكشف الحسي و الفني على مكونات السفينة و معداتها،التحقيق في الحوادث البحرية،حساب كميات البضائع و الكشف الحسي عليها،التفتيش على غاطس السفينة و تقدير الكيات الفيزيائية و المالية للبضائع.

القسم العملي

يتم تطبيق بعض التدريبات العملية على طرق التفتيش البحري من خلال الزيارات الميدانية للمواني و السفن الراسية و بعض شركات الإدارة البحرية

المتطلب السابق:القانون البحري

لغة انجليزية متخصصة	رقم المساق 020701313	س م 3 : 0- 3

القسم العملي يحتوي تدريبات عملية كتابية و صوتية باللغة الإنجليزية تتم معظمها باستخدام اللاسلكي على المواضيع التالية:
تحديد نوع السفن التجارية و رقمها الملاحي وسرعتها وحالتها الملاحية باستخدام منظومة اللاسلكي ،التعامل مع الزوار للسفينة ،التحدث في مقابلات العمل لدى الشركات الملاحية ،قراءة لوحة معلومات المعدة الميكانيكية،قراءة حالة الطقس ، معلومات القوافل البحرية ، وصف حوادث العمل المهنية عبر اللاسلكي،التفتيش الدوري على معدات غرفة المحركات وطرق التخابر داخل غرفة المحركات،قراءة تقارير التلكس البحري ،العلاقات الاجتماعية على متن السفينة.تعبئة كتيب التدريب البحري وفهم مكوناته.

المتطلب السابق:مباديء الاتصال باللغة الانجليزية

التصميم الميكانيكي بالحاسوب	رقم المساق 020701223	س م 1 : 0- 2

القسم العملي يقوم على تدريبات عملية باستخدام برمجية سوليد ورك في المواضيع التالية:
مقدمة في استخدام البرمجية ثلاثية الأبعاد،تدريبات عملية على المخططات الهندسية البحرية وتنفيذها باستخدام البرمجية،فهم الأوامر المختصرة في البرمجية ، استخدام البرمجية لتصميم بعض قطع معدات غرفة المحركات مثل الجسور المعدنية ، قطع غيار محرك الديزل ، قطع غيار المضخات ، قطع غيار ميكانيك بحري ومن ثم تنفيذها على الطابعة الثلاثية

المتطلب السابق:مباديء الرسم الهندسي باستخدام الحاسوب

الميكانيكا الهندسية	رقم المساق 020701222	س م 3 : 3- 0

تعريفات للكتلة و الحجم و الكثافة ومركز الكتل والكثافات السطحة و الحجمية و الطولية،مباديء المتجهات ، مباديء الاتزان الاستاتيكي ومحصلة القوى باستخدام الرسم و طرق التحليل العددي ، العزوم الميكانيكية و الزخم الخطي و الدوراني ، طرق تحليل قوى الشد و السحب على الهياكل المعدنية،مباديء الديناميكا الحركية و تحولات الطاقة الميكانيكية،تطبيقات على الديناميكا بتسارع ثابت و تسارع متغير في الحالة الخطية أو الدورانية، العزوم الميكانيكية و القدرة و الشغل الميكانيكي،قوى الاحتكاك و تحليلها ، معاملات السلامة البحرية في التطبيقات الميكانيكية،تحليلات الكفاءة الالية و الكفاءة النوعية للروافع البحرية.

المتطلب السابق: المفاهيم الفيزيائية

ميكانيكا الموائع	رقم المساق 020701124	س م 3 : 2- 1

تعريف المائع وعلاقته بالكثافة وتغيرات درجات الحرارة ،خصائص الموائع ،حالة الموائع السكونية وما يتعلق بها من ضغوط،اللزوجة وقانون ستوكس ،ديناميكا حركة الموائع القابلة للانضغاط وغير المنضغطة ،الموائع النيوتونية و غير النيوتونية،ومباديء الإنسياب،ومعادلة الاستمرارية ومعادلة برنولي،مبدأ حفظ الكتلة و الطاقة ،مباديء علوم الهيدروليك،تحليل حركة الموائع اخل الأنظمة المغلقة،

القسم العملي:
الضغط الهيدروستاتيكي ، المفاقيد في أنابيب النقل،التوربين،المضخات،دوائر القوى الهيدروليكية

المتطلب السابق: المفاهيم الفيزيائية

المواد الهندسية	رقم المساق 020701225	س م 2 : 2- 0

تصنيفات المواد الهندسية،الخصائص الفيزيائية و الكيميائية و الحرارية للمواد الهندسية،تأثير العوامل المحيطة على المواد الهندسية،قوى الشد و السحب ،المعالجة الحرارية ،تكنولوجيا التصنيع،تطبيقات المواد الهندسية في الأعمال البحرية،الفحوص التدميرية و الفحوص غير التدميرية،

المتطلب السابق: المفاهيم الفيزيائية

المشاغل الهندسية	رقم المساق 020701226	س م 1 : 0- 1

تدريبات عملية على :
الخراطة ،اللحام الكهربائي،اللحام بالغازات،أعمال القص،استخدام الأدوات الميكانيكية،الفك و التركيب،مباديء القياس ،أعمال الثقب،السباكة ،الحف و الفبركة،مباديء التوصيلات الكهربائية،اللحام الالكتروني،أعمال السباكة،

المتطلب السابق: لا يوجد

هندسة بناء السفن	رقم المساق 020701227	س م 3 : 3- 0

الأبعاد الهندسية و التصميم للسفن التجارية،القوى المؤثرة على بدن السفينة،البناء الهيكيلي لأجزاء السفن،هيكلية بدن السفينة،هيكلية جوانب السفينة،هيكلية مقدمة ومؤخرة السفينة،مستوعبات التخزين،تصميمات الحماية من تأثير الحرائق،القطاعات العازلة للمياه،نظام الدفة و الرفاص ،علامات الغاطس.مباديء الترسانات البحرية والمنصات النفطية البحرية

المتطلب السابق: الفن البحري الميكانيكا الهندسية

الهيدروستاتيك واتزان السفن	رقم المساق 020701328	س م 3 : 3- 0

الكثافة الكتلية،قانون الطفو،تأثيرات الكثافة الكتلية على الغاطس و الإزاحة ،اتزان السفينة،تنقل مناطق الاتزان،تأثيرات السطح الحر على اتزان السفينة،تي بي سي ،معاملات الاتزات ومنحنياتها،كي جي،حسابات كي بي و بي ام ،أنواع الميلان وتأثيراتها على اتزان السفينة،الاتزان ومنحنى الهيدروستاتيك،العزوم وتأثيراتها،تحميل وتفريغ البضائع وحسابات الاتزان،اتزان الهيل ،معدلات تغير الكتل على اتزان السفينة.

المتطلب السابق: هندسة بناء السفن

الرياضيات الهندسية	رقم المساق 020701131	س م 3 : 3- 0

المعادلات التفاضلية من الدرجة الأولى و الثانية وطرق حل أنظمتها،الجبر الخطي وطرق تحليله،المصفوفات و المحددات واستخدامها في حل الأنظمة الخطية،قانون ستوكس و نظرية التقارب،مباديء وتطبيقات التحليل العددي،تطبيقات البرمجة في حل المسائل الهندسية غير الخطية.

المتطلب السابق: المفاهيم الرياضية

التحكم الالي البحري	رقم المساق 020701234	س م 3 : 3- 0

أجهزة قياس الضغط و الحرارة و المنسوب و التدفق،أجهزة قياس نسب الغازات و السرعة و اللزوجة و الملوحة،تناقل الاشارة وتصفيتها،الصمامات المتحكمة،أنظمة التحكم المفتوحة و المغلقة و المتكاملة ،انظمة المعالجة ،دوائر التحكم الالكترونية و الهوائية و الهيدروليكية وتطبيقاتها البحرية،التحكم الاتوماتيكي ومنظومة التحكم المبرمج،منظومة التوجيه و الدفة،منظومة التحكم بالمحرك الرئيسي ،منظومة التحكم باللزوجة،محددات الحماية لمعدات غرفة المحركات،منظومة التحكم بالغلاية.

المتطلب السابق: المفاهيم الفيزيائية الرياضيات الهندسية	
مشغل التحكم الالي البحري	رقم المساق 020701235 س م 1 : 0- 1
تدريبات عملية على المواضيع التالية: دوائر التحكم الكهربائي وعناصرها، دوائر التحكم الهوائي وعناصرها،دوائر التحكم الهيدروليكي وعناصرها،اجهزة القياس ،تتبع الخطأ وطرق المعايرة،انظمة التحكم المبرمج ، المتطلب السابق: التحكم الالي البحري	

أساسيات الهندسة الكهربائية	رقم المساق 020701232 س م 3 : 2- 1
التيار والجهد الكهربائي وقانون اوم وطريقتي كيرشوف ،المقاومات و المواسعات و المحاثات،الدوائر الكهربائية البسيطة و طرق تحليلها،دوائر الرنين،مباديء التيار المباشر ،مباديء التيار المتناوب،الحث الكهرومغناطيسي وقانون فارادي ،مباديء الدوائر الالكترونية وطرق تحليلها،تطبيقات الكهرباء في الأنظمة البحرية. القسم العملي : أجهزة الفحص الكهربائي ،تمديدات الانارة و المقابس ،مقاطع الكوابل ،دوائر الشحن و التفريغ،البوردات الالكترونية ،اللحام الالكتروني **المتطلب السابق: المفاهيم الفيزيائية**	

الالات الكهربائية البحرية	رقم المساق 020701335 س م 3 : 2- 1
المحرك الحثي و التزامني أحادي الطور و ثلاثي الطور،محركات التيار المباشر ،المحولات الكهربائية ،كوابل وقضبان التوصيل الكهربائي،مولدات التيار المباشر،مولدات التيار المتناوب،الشبكات الكهربائية البحرية،الفحوص الكهربائية ،الجهد الكهربائي العالي على متن السفينة.السلامة الكهربائية على متن السفن التجارية.لوحات التوزيع،لوحات اقلاع المحركات. القسم العملي : فحوص الاستمرارية و العازلية للمعدات الكهربائية،محاكاة توزيع الأحمال الكهربائية،محاكاة تشغيل المولدات على التوازي ، مولد الطوارىء،تتبع الخطأ في لوحات التحكم بالمحركات، **المتطلب السابق: اساسيات الهندسة الكهربائية**	

مقدمة في الكيمياء البحرية	رقم المساق 020701241	س م 3 : 2- 1

التركيب الجزيئي للمواد،معادلات الأحماض و القواعد وتطبيقاتها الصناعية،الهيدروكربون،كيمياء مياه الغلايات البحرية وطرق معالجتها،كيمياء وقود الاحتراق ،كيمياء زيوت التشحيم الصناعية،الفحوص المخبرية البحرية وتحليل العينات.

القسم العملي:

تدريبات على تحليل مياه الغلاية،تحليل وقود الاحتراق،تحليل عينات الزيوت .

المتطلب السابق: لايوجد

الالات البحرية المساعدة 1	رقم المساق 020701242	س م 3 : 3- 0

ضاغطات الهواء وأجزائها وتشغيلها، المضخات وأجزائها وتشغيلها،نظام الأنابيب و الصمامات،الغلايات البحرية وأجزائها وطرق تشغيلها،منظومة التكييف و التبريد المركزي على متن السفن التجارية،منظومة التوجيه الهيدروليكي.

المتطلب السابق: المفاهيم الفيزيائية ومقدمة في الكيمياء البحرية ميكانيكا الموائع

الالات البحرية المساعدة 2	رقم المساق 020701243	س م 3 : 2- 1

المبادلات الحرارية وانتاج المياه العذبة،الوقود البحري و زيوت التشحيم،أعمدة الدوران و الرفاص،الحرائق البحرية و منظومة السلامة والأمان،مكافحة التلوث البحري.

القسم العملي:

الفك و التركيب للصمامات،لمنظومة الأنابيب،محاكاة تشغيل المبادلات الحرارية،محاكاة تنقية الوقود و الزيوت،محاكاة منظومة مكافحة التلوث و الحريق البحري،محاكاة تتبع الخطأ في الأنابيب.

المتطلب السابق: الالات البحرية المساعدة 1

مشغل الالات البحرية المساعدة	رقم المساق 020701344	س م 1 : 0- 1

تدريبات عملية ومحاكاة على:

تجهيز وتشغيل الغلاية ، تجهيز وتشغيل وحدة معالجة الوقود و الزيوت،صيانة المضخات،تجهيز وتشغيل وصيانة وحدة التوجيه،تشغيل وصيانة وحدات التكييف المركزي والثلاجات المساندة،صيانة عمود الدوران الرئيسي،صيانة منظومة اطفاء الحريق الثابتة،تجهيز وتشغيل وحدات فصل الزيوت.

المتطلب السابق: الالات البحرية المساعدة 2

المحاكيات البحرية	رقم المساق 020701345	س م 1 : 0- 1

تدريبات عملية ومحاكاة على:

محاكاة وموائمة مراقبة أجهزة القياسات،محاكاة العمليات التشغيلية لغرفة المحركات ،محاكاة العمليات التشغيلية لمنظومة ادارة الطاقة،محاكاة العمليات التشغيلية لمنظومة التزويد،محاكاة العمليات الملاحية في غرفة القيادة و التوجيه،محاكاة عمليات الاتزان ،محاكاة عمليات الحريق ومكافحة التلوث.

المتطلب السابق:محركات الديزل البحري 2 و الالات البحرية المساعدة 2

الديناميكا الحرارية	رقم المساق 020701151	س م 3 : 2- 1

الخصائص الثيرموديناميكية،الثيرموديناميك و نظرية انتقال الحرارة،الأنظمة الثيرموديناميكية،الغازات و البخار،الغازات المثالية و القوانين المتعلقة بها،المعالجة الثيرموديناميكية،انتقال الشغل.

القسم العملي:

تدفق الغازات،كفاءة الاحتراق الداخلي،تجربة بويل،

المتطلب السابق: المفاهيم الفيزيائية

محركات الديزل البحري 1	رقم المساق 020701252	س م 3 : 3- 0

مباديء الاحتراق الداخلي،محركات الديزل البحري رباعية الأشطواط وأجزائها،محركات الديزل البحري ثائية الأشواط وأجزائها،محركات الديزل البحري الأخرى،حسابات القدرة ،التدفق الحراري.

المتطلب السابق: المفاهيم الفيزيائية

محركات الديزل البحري 2	رقم المساق 020701353	س م 3 : 2- 1

منظومة تبريد محركات الاحتراق الداخلي ، منظومة الوقود،منظومة الزيت،منظومة الشاحن التوربيني،منظومة التحكم بالسرعة،منظومة الاقلاع،منظومة السلامة و الحماية،الضاغطات الهوائية المتخصصة.

القسم العملي عمليات الفك و التركيب لكل من الأنظمة التشغيلية في محركات الاحتراق الداخلي.

المتطلب السابق: محركات الديزل البحري1

مشغل محركات الاحتراق الداخلي	رقم المساق 020701354	س م 1 : 0- 1

القسم العملي:

عمليات الأفرهول للمحركات،عمليات الأفرهول للأنظمة المرتبطة بالمحركات،عمليات الصيانة الوقائية و التصحيحية للمحركات.

المتطلب السابق: محركات الديزل البحري2

البرمجة باستخدام لغة بايثون	رقم المساق 020701336	س م 1 : 0- 1

القسم العملي:

التعرف على لغة البرمجة بايثون، ، وكيفية تحميل بايثون والتعامل مع الأرقام في بايثون، وكتابة وفهم العمليات الحسابية القيام بعمليات حسابية خاصة، والتعرف على النصوص البرمجية تنفيذ العمليات الحسابية مع النصوص التعرف على بعض الدوال في بايثون، وطريقة تحويل الأنواع تعلم كيفية تعريف المتغيرات، وتعرف على النوع المنطقي التعرف على الجمل الشرطية التعرف على المنطق الشرطي كتابة أول برنامج لك في بايثون - برنامج حساب مؤشر كتلة الجس

المتطلب السابق: لايوجد

مهارات وتطبيقات عملية	رقم المساق 020701261	س م 3 : 0- 6

القسم العملي:

تقوم رئاسة القسم بتحديد الموضوعات العملية بداية كل قسم تناغما مع التطورات و التحديثات في قطاع الصناعة البحرية من ضمن المجالات التالية:

الأمن السيبراني البحري، شبكات المعلومات البحرية،التفتيش البحري الالكتروني،كفاءة الطاقة البحرية،ترسانات الصيانة البحرية،أحواض بناء السفن،صيانة اليخوت البحري،صيانة معدات السلامة البحرية، تطيقات الطاقة المتجددة البحرية

المتطلب السابق:لايوجد

الوصف التفصيلي:

Engineering Program

Specialization	Marine Engineering
Course Number	207012320
Course Title	Basics of Electrotechnology
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

Theoretical Issue

Electrical theory
Electrical circuit
Impedance and inductance
Fundamentals of alternating current:
Electromagnetic induction
Operate Electrical
Basic electronic circuit elements
IC and LSI

Practical Issue

Describes the cause of electric shock
Principles of maintenance explains the need for maintenance
Insulation tester
Continuity tester
Multi-tester
Clamp meter

Course Objectives

Theoretical Issue

1- Electrical theory:

A- Ohm's law: describes the effect of resistors in a circuit and uses the symbol R, names and uses the symbol Defines the unit of resistance, defines Ohm's law, defines Ohm's law to find current, voltage and resistance in simple problems, describes how the current through and the voltage across resisters are affected, in series and in parallel circuits

B- Kirchhoff's law: states and applies Kirchhoff's, calculates the current flowing and the voltage drop across resistors in simple circuits, constructs and uses a Wheatstone Bridge, given the voltage and total current, calculates the total (or equivalent) resistance of a parallel circuit, given the values of the resistances in a parallel circuit, calculates the total resistance, compares the effect of adding a further resistance to: a parallel circuit, a series circuit, explains how the objective affects the e.m.f. and the terminal potential, difference of a supply, demonstrating the effect by calculations and by experiment, explains the effect of internal resistance in the supply source, determines current flows, resistance values and voltages in: series circuits parallel circuits by calculation.

2- Electrical circuit :states that current can only flow in a closed circuit ,explains why some materials and names commonly used materials in each group, names the different sources of electricity and explains their effect when connected to a conductor, explains potential difference and electromotive force, stating the units and the symbols used, explains the current flow, stating its symbol (I), states that current strength is measured in amperes, represented by A states that a steady current flowing in a single direction is called a direct current (D.C.), states that when the direction of flow of a current is continually reversing it is called an alternating current (A.C.) states that in modern ships the main supply is usually A.C. but that D.C. has many uses, describes what is meant by static electricity, describes electrostatic charging and the principles of overcoming potential hazards,

3- Impedance and inductance: explains what is meant by "impedance" and uses the correct symbol, compares impedance of an A.C. circuit with resistance of a D.C. circuit, states the relationship between impedance, voltage and current, compares the effect in an A.C. circuit and in a D.C. circuit, of a simple resistance, the same resistance wound in the form of a coil the same coiled resistance, into which an iron core is inserted, describes what is meant by "reactance" and uses the correct symbol, sketches the impedance triangle, indicating R, X, Z and the phase angle (φ), states that the cosine of the phase angle is called the power factor calculates impedances and power factors, given the resistance and reactance of coils, explains the effect of changing current and its associated magnetic flux on the induced e.m.f., explains why, in a circuit containing only reactance, there is a difference in phase of 90° between the applied voltage and the current, sketches graphs showing the variation of current, applied voltage and back e.m.f. over one cycle when an A.C. is applied superimposes a curve representing the power dissipated in both cases in the above objective, states the value of the power factor in both cases in the above objective, states that, in practice, an inductor will always have a resistance, sketches a phasor diagram for a circuit containing an inductance which has resistance, indicating the resultant applied voltage and the phase angle, states that in cases such as those in the above objective, i.e. in inductive circuits, the current always lags the applied voltage, states that shipboard installations produce power demand with a lagging power factor, explains the effect of varying power factor on the power consumed solves simple problems concerning power, current, resistance, impedance, reactance and power factor and verifies the solutions, using laboratory equipment.

4- Fundamentals of alternating current: Alternating current how alternating current is produced in a simple loop rotating in a magnetic field, by means of sketches, relates the position of the loop in the above objective to the voltage wave form for one cycle at 90° intervals of rotation explains the relationship between: instantaneous voltage, conductor velocity, the sine of the displaced angle, sketches the wave form of an A.C. voltage shows diagrammatically a simple circuit for a three-phase supply from an alternator, develops the expression to produce, where e is the instantaneous voltage, Emax, is the maximum voltage and □□is the displaced angle, projects the vertical components of a rotating vector to draw one complete cycle of a sine wave, states that the rotating vector is called a

phasor, using a triangle produced from the above objective, confirms that superimposes degrees and radians on the sine wave drawn in the above objective ,uses the correct symbols and conventions, calculates instantaneous voltages, given the unknown quantities, explains what is meant by phase difference between voltage and current values, explains why root mean square (r.m.s.) values are used, given a series of values of instantaneous voltage or current for a hall cycle, calculates r.m.s. value, states that the r.m.s. value for a sine wave is 0.707 of the peak value,

5- Electromagnetic induction: describes the principle of electromagnetic induction and states its main applications, explains how the following factors affect the induced voltage, explains Faraday's law of electromagnetic induction, explains Lenz's law.

6- Operate Electrical:, explains in simple terms the principle of static induction, to include mutual, induction and self-induction, Work, energy and power, explains the difference between work, energy and power, giving the units and symbols commonly used, states that work = current × time × voltage, giving the units used, makes simple calculations to determine energy and work, defines power, giving the units and symbols used, from the above objective, derives the expression

7- Basic electronic circuit elements : Semiconductor ,defines the semiconductor describes how semiconductors are utilized, explains the current and the free electrons in the semiconductor explains what types of intrinsic/extrinsic semiconductor are, explains the following characteristics of semiconductors: photoelectric effect , thermoelectric effect ,communicating action ,hall effected ,explains the following with regard to semiconductors: P-n junction and its properties semiconductor diode rectification structure of diode function principle transistor amplification effect. Thyristor defines the thyristors lists various types of thyristors and describes their actions and characteristic describes how thyristors are utilized, taking some applications as examples states advantages and disadvantages when using thyristors.

8- IC and LSI: defines Integrated Circuit (IC) and Large-scale Integrated Circuit (LsI) as circuit Elements, describes the structures of IC, describes briefly the functions of the following types of IC: Transistor Logic (TTL), Emitter-Coupled Logic (ECL), Complementary Metal-Oxide semiconductor (CMOs, Erasable Programmable Read-Only Memory (EP-ROM), Random Access Memory (RAM), Central Processing Unit (CPU)

Practical Issue

1- Describes the cause of electric shock, giving the level of current which could be fatal ,states the voltage range which is considered safe, applies safety precautions necessary when working on electrical equipment I practice, states the isolation procedures required for electrical equipment states the safety and isolation precautions necessary before commencing work, explains the purpose of interlocks fitted to

circuit breakers, explains the danger associated with the spaces in the vicinity of busbars, explains the potential danger of instrument voltage/current transformer circuits and the safe procedure for working on such circuits, describes the protection normally provided on the doors of switchboard Cubicles, explains that safety and emergency procedures are documented in the ship's

2- Principles of maintenance explains the need for maintenance, describes briefly what is meant

3- Insulation tester states the operation principles of an insulation tester states the precautions when using an insulation tester states the range of voltages used for testing ships' equipment uses an insulation tester: to check the zero reading to check that the equipment is dead to measure values of phase-to-phase insulation to measure values of phase-to-earth insulation

4- Continuity tester: uses a continuity tester to: check that the equipment is dead measure the resistance of circuit enters test readings and relevant comments on an appropriate record card explains the significance of individual and comparative test readings.

5- Multi-tester uses digital and analog multimeters, taking the necessary precautions, to: check the accuracy of the meter check for battery failure measure resistance measure voltage measure current test diodes

6- Clamp meter: states the operation principles of a clamp meter states the precautions when using a clamp mete uses a clamp meter to measure current uses a live-line tester to determine whether equipment is live or

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	Electrical theory	5 hours
2	Electrical circuit	5 hours
3	Impedance and inductance	5 hours
4	Fundamentals of alternating current:	5 hours
5	Electromagnetic induction	5 hours
6	Operate Electrical	5 hours
7	Basic electronic circuit elements	2 hours
8	IC and LSI	2 hours
10	Describes the cause of electric shock	2 hours
11	Principles of maintenance explains the need for	2 hours
12	maintenance	2 hours
13	Insulation tester	2 hours
14	Continuity tester	2 hours
15	Multi-tester	2 hours
16	Clamp meter	2 hours

Evaluation Strategies:

Exams Name	Percentage	Date
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Text Books & References:

Reeds Vol06: Basics of Electrotechnology, marine engineering
ISBN: 9781483105178

Engineering Program

Specialization	Maritime Science- Marine Engineer diploma
Course Number	207012420
Course Title	Marine Engineering Knowledge 1
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

The course description has been designed in accordance to the IMO model course (7.04) Function 1 and the STCW conventions to prepare a marine Engineering student with the requirements for knowledge, understanding and proficiency related to maritime sciences.
This course introduces the main concepts that are concerned with selecting, implementing and discusses.

- Main Air compressor, Pumps, pumping system &Valves, Marine Boilers, Refrigeration and air condition, Steering Gears

Course Objectives

This course covers the requirements of being competence on the above-mentioned proficiencies and provides the background knowledge and practical work to support:

- Auxiliary essential systems onboard
- Basic principles steering gears and ship propulsion.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Main Air compressor**	- explain isothermal, adiabatic compression 2- define volumetric efficiency, volume clearance 3-actual air compressor cycle 1st and multi stage. 4- explain P-V diagram 5-types of air compressor 6- Advantage of multi stage air compressor. 7- Safety devices fitted on air compressor. 8-explain the different fittings on air receiver. 9- explain why we are using air receiver. 10- explain how you start and stop the air compressor manually.	**Week 1**
2.	**Pumps & piping systems &Valves**	1. Pumps Principles & types. 2. Pumping system components & description. 3. Types of losses in the pump & system. 4. Operation of centrifugal pumps. 5. Show the meaning of Net positive suction head expression. 6. Cavitations phenomena. 7. Absolute, atmospheric & gauge pressures idea. 8. Operation of positive displacement pumps. 9. Types of PDP: Reciprocating& air vessel, Screw, Gear, Rotary vane…etc. 10. An idea about performance curves.	**Week 2&3**

		11. Filters and strainers 12. Bilge system 13. Ballast system 14. Bunker and Fuel transfer systems 15. Sea water cooling system 16. Domestic water system 17. Sanitary water system 18. Valve types ➢ Difference between Valves ➢ Functions of Valves. ➢ Valves specifications. ➢ Construction of Valves	
3.	**Marine Boilers**	1. Boilers types 2. Difference between water and fire tube boilers 3. Functions of boilers. 4. Boiler specifications. 5. Construction of any fire tube boiler (Scotch or composite) 6. Package auxiliary boiler / Automatic firing control logic/ and boiler safety alarms & shut down devices. 7. Boilers mountings (fittings) 8. Test & setting of safety valve: 10% press accumulation test, setting safety v/v. 9. Water treatments: External & internal treatment 10. Give a brief idea about boiler water tests. 11. Steam service system 12. Exhaust gas boilers (economizer) Steam turbines principles	**Week 4&5**
4.	**Refrigeration and air condition**	1. Idea about marine refrigeration & why it is important. 2. Refrigeration cycle / P-H curve. 3. Refrigeration system main components: Function & definition of each.	**Week 6&7**

		4. Refrigerants: Several refrigerants, Specifications (Thermodynamically & physically). 5. Effect of condenser And supper-heating/sub-cooling on R.E.(refrigeration effect) & C.O.P.(coefficient of performance). 6. Expansion valve. 7. Other accessories in the plant; define the function of each. 8. List the main methods for refrigerant Leak detection. 9. Ozone depletion. 10. Some trouble shootings: overcharging, humidity& air in the system. 11. Just mention safety devices that prevent carryover of liquid. 12. Air Condition system components (Air Handling Unit) Sketch & explanation. 13. Just mention the four factors that are controlled within air conditioning. What is meant by relative humidity & how it can be measured, controlled in summer and winter?	
5.	**Steering Gears**	1. Steering gear main regulations. 2. Steering gear components (in a block diagram) 3. Function & use of each system component (Definitions): • Telemeter (Transmitter & receiver); State several types: completely hydraulic, Electro-hydraulic& completely electric. • Hunting gear or floating lever: idea & function only.	**Week 9&10**

		• Power unit or amplifier: Mention & give major specifications for pumps types (Hele-show and Swash plate). • Actuators: 2 rams, 4 rams & Rotary Vane steering gear • Hydraulic systems & St.Gr. oil specifications. • Rudder & rudder stock. • Tiller arm & Feedback signal. 4. Steering gear testing (as per regulations). 5. Only mention non-reverse locking gear & its function.	

Evaluation Strategies:

Exams	Percentage	Date
Home Works	**10%**	…../…../….
Med exam	**40%**	…../…../….
Final Exam	**50%**	…../…../….

Teaching Methodology:

This module will be taught using available resources including: lectures, data show and materials uploaded to the e-learning system.

Text Books & References:

Text Books

- General Engineering Knowledge Vol-8

REFERENCE BOOKS

- Introduction to Marine Engineering

Engineering Program

Specialization	Maritime Science- Marine Engineer diploma
Course Number	207012430
Course Title	Marine Engineering Knowledge 2
Credit Hours	3
Theoretical Hours	2
Practical Hours	2

Brief Course Description:

The course description has been designed in accordance to the IMO model course (7.04) Function 1 and the STCW conventions to prepare a marine Engineering student with the requirements for knowledge, understanding and proficiency related to maritime sciences.
This course introduces the main concepts that are concerned with selecting, implementing and discusses.

- , Heat Exchangers, fresh water generator, main shafting and propeller, marine fuel and lubrication oil, safety and pollution prevention, Marine auxiliaries' systems.

Course Objectives

This course covers the requirements of being competence on the above-mentioned proficiencies and provides the background knowledge and practical work to support:

- Auxiliary essential systems onboard
- Basic principles steering gears and ship propulsion.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
6.	**Heat Exchangers & Fresh water generator**	**1.** Heat Exchangers types: Tube & Shell, Plate types. **2.** Explain construction & parts of each type. **3.** Explain cleaning methods (Mechanical and chemical). **4.** = leak detection & remedy. **5.** Let students know how to sketch both types. **6.** Counter & Parallel flow. **7.** Stream line & turbulent flow. **8.** Advantages of counter flow over parallel flow. **9.** Control of temperature in heat exchangers. 10. Advantages & disadvantages of plate type H.E. 11. Fresh water generator: • (Drawing, construction & operation principle): of low pressure evaporators. • Difference between high pressure & low pressure evaporators. • To give an idea about types of scales & fouling formed in evaporators. • Maintenance and Cleanings	
7.	**Marine fuel and lubricating oil**	1. Types of fuels. 2. The distillation process for crude oil. 3. Marine fuel oil 4. Marine diesel oil 5. Marine Lubricating oil 6. Fuel and lubricating oil properties definitions only: (Density,	

		viscosity, flash point, calorific value, pour point, carbon residue, water in oil, T.B.N., firing point, ash content, ignition quality, sulfur, emulsion, octane no., cetane no., diesel index, viscosity index, catalyst fins. 7. Combustion idea: Hydro-carbons, air for combustion. 8. Fuel & oils additives. 9. Lubricating oils grads & functions. 10. Grease composition. 11. Fuel treatment methods (State & briefly describe): Gravitation, filtration & purification: • Settling tank use, function & its fittings. • Types of filters & strainers. • Clarification & purification by dynamic means. • Factors affecting oils purifications. • Types of purifiers (Just to give an idea): clarifier, manual & self cleaning purifiers… etc. • Simple centrifuge drawing, show direction of flows of clean & dirty phases.	
8.	**Shafting and propellers**	1. Screw propeller concept and its individual expressions & their definitions. 2. Fixed propellers. 3. Controllable pitch propellers. 4. Advantages & disadvantages of C.P.P. 5. Stern tube types (Wooden/White metal); explain operation and construction idea showing the difference between both types. 6. Stern tube seals; illustrating its	

		importance. 7. Shaft alignment in brief. 8. Reduction gear in brief. 9. Thrust block in brief.	
9.	**Fire and Safety**	1. Fire triangle & theory. 2. Classification of fire. 3. Portable fire extinguishers & Types of extinguishing media. 4. Fire detecting system & Types of fire detectors. 5. Fire prevention methods & precautions. 6. Action to be taken on discovering a fire. 7. Fixed water extinguished system. 8. Fixed CO2 system. 9. Sprinkler system. 10. Drencher system	
10.	**Pollution Prevention**	1. Importance of pollution prevention. 2. Pollution sources. 3. Marpol Regulations & rules. 4. Special areas, oil record book. 5. Oily water separator. 6. Oil content monitoring. 7. Sewage plants: Biological / chemical or mechanical. 8. Waste oil incinerator. 9. Garbage management. 10. Shore side facilities.	

Evaluation Strategies:

Exams	Percentage	Date
Home Works	**10%**	…../…../….
Med exam	**40%**	…../…../….
Final Exam	**50%**	…../…../….

Teaching Methodology:

This module will be taught using available resources including: lectures, data show and materials uploaded to the e-learning system.

Text Books & References:

Text Books

- General Engineering Knowledge Vol-8

REFERENCE BOOKS

- Introduction to Marine Engineering

Engineering Program

Specialization	Marine Engineering
Course Number	207013350
Course Title	Marine electro machinery
Credit Hours	3
Theoretical Hours	2
Practical Hours	2

Brief Course Description:

Theoretical Issue

Generators
D.C. generators
Power distribution systems
Transformers
Insulation
Electrical motors
D.C. motor
Electrical motor starting methodologies:
Lighting
Cables
Batteries

Practical Issue

Generator
Switchboard

Electrical motors
Starters
Distribution system
Cables
Fault protection
Fault location

Course Objectives

Theoretical Issue

1- Generators: A.C. generators, uses Fleming's hand rules to determine the directions of magnetic field, motion and current, on an actual machine, or by using a given diagram that shows the arrangement of a simple generator, identifies and explains the function of: the armature, slip rings, brushes and springs, field poles, field coils, sketches a graph showing the variation of e.m.f. when a simple loop generator, coil is rotated between two poles, states the range of voltage and frequency at which ships' electrical power is generated, states that the A.C. voltages normally given are root mean square values and that all equipment is rated in these terms states that peak values are 2 times larger than r.m.s. values, describes in simple terms an A.C. generator with three-phase windings, stating the phase difference, sketches a schematic arrangement of a three-phase alternator with star connection, in the terminal box of a stator field winding, identifies the outlets of the three phases and the common neutral connection explains how excitation of the rotor is produced and supplied, describes how a generator is cooled, lists the parts of a generator fitted with temperature alarms, explains why heaters are fitted to a generator, explains the function of an automatic voltage regulator, sketches a blo diagram of an automatic voltage regulator, naming the main components and explaining the purpose of the hand trimmer, explains such sources of supply can be run in parallel and those which cannot performs or describes the synchronizing sequence to bring a generator int service in parallel with a running generator, using both a synchro scope and lamps, adjusts, or describes how to adjust, the load sharing of two generators running in parallel, either performs the procedure, or describes how, to reduce the load on a generator and takes it out of service states that load sharing can be automatically controlled, states that the emergency generator feeds its own switchboard and that both are usually installed in the same compartment above the waterline, describes the connections between the emergency and main switchboards and the necessary safeguards, describes the situation where the emergency generator would be started up automatically and the methods of starting describes the regular "no load" running and the occasional "on load" running, of the emergency generator

2- D.C. generators: sketches, in diagrammatic form, the basic circuit for a D.C. generator on a given drawing or an actual generator, identifies the field poles, yoke, shoe, field windings and interlopes, describes the differences in appearance of shunt coils and series coils, on a given drawing or an actual generator, identifies the windings, commutator, commutator insulation, laminations, clamping arrangement, ventilation holes, coil-retaining arrangements, brushes, tails, brush loading arrangement and bearings, names the two types of winding used on armatures, on an actual machine

or by using a given diagram that shows the arrangement of a simple direct-current generator, identifies and explains the function of: the armature, the commutator, brushes and springs, field poles, field coils

3- Power distribution systems: Distribution explains the basic purposes of switches, circuit breakers and fuses, describes briefly the principle of the various types of closing mechanism of circuit breaker , lists the ways in which a circuit breaker can be tripped explains the purpose of interlocks fitted to circuit breakers, lists the essential services which are supplied by electrical power, explains the purpose of an emergency power supply, states the possible sources of emergency power supply and how they are brought into use draws a system diagram of a typical distribution system, showing: main generators, emergency generators, shore supply battery charging, 440 volt supply, 220 volt supply, circuit breakers, transformers by means of simple sketches, shows the difference between insulated systems, and earthed-neutral systems

4- Transformers: states that transformers on ships are usually air-cooled, shows diagrammatically the connections between the main switchboard and the main distribution board through: delta-delta transformers, delta-star transformers, delta-star transformers with an earthed neutral describes the procedure when connecting to a shore supply

5- Insulation: explains what is meant by an insulator and the purpose of insulation describes leakage in an insulated cable, explains why the insulation resistance of large installations is normally relatively lower than those of small installations, describes the factors which affect the value of insulation resistance, explains why the current-carrying capacity of a machine is governed by its insulation, describes what is meant by insulation resistance and explains how it often deteriorates, describes the materials and general physical characteristics of insulation materials and the factors and conditions which cause deterioration states the maximum temperature which common insulation materials can withstand and the maximum ambient air temperature used in design explains why the ventilation and cooling of insulation is essential

6- Electrical motors: A.C. motors states the normal supply for three-phase induction motors name the types of motor commonly used on board ships, giving their applications, given the actual components from a three-phase induction motor, identifies: rotor bearings fan stator field windings rotor cage method of lubrication terminals, explains the differences between the following motor enclosure, describing how cooling is achieved in each case: drip-proof totally enclosed deck watertight flameproof sketches a graph showing the relationship between speed and load and between current and load, from no load to full load given a motor name plate, explains the meaning of all of the information displayed explains in simple terms how the driving torque is produced in an induction motor explains why slip is essential

7- D.C. motor: explains what is meant by the back e.m.f. (Eb) of a motor, relates the supply voltage to the back e.m.f. and to the voltage drop in the armature (V = Eb + Ia Ra) explains why the starting current is high compared to the load current explains why a starter is required and the principle involved states that rotational speed (n) is approximately proportional to: applied voltage, from the

above objective, explains how the rotational speed is affected by: varying the voltage, varying the strength of the magnetic field ,describes typical applications of: shunt motors, series motors, in compound motors, explains what is meant by: long shunt short shunt cumulatively connected.

8- Electrical motor starting methodologies: explains the following starting methods for D.C. motors and its characteristics: starting rheostat automatic starter explains the following starting methods for A.C. motors and its characteristics: direct on line starting star-delta starting compensator starting states what should be taken into consideration when selecting starting methods for A.C. motor explains the basic reason for the provision of motor protection explains the principles of the most common overcurrent relays explains the difference between the largest possible overload current and a fault current describes the function of the overcurrent trip, time delays and fuses with both overload and fault currents explains the basis upon which fuses are chosen explains the principle of a thermal relay, including the means of its adjustment explains what is meant by single phasing and its effect on a motor: when running when starting, if continued attempts to start are made, describes in principle the protection against running with a phase open circuited, explains why under voltage trips are necessary, states applications where the following speeds are suitable: single fixed speed two or three fixed speeds infinitely variable speed describes briefly how stepped speeds can be provided lists the means of producing variable speed describes the principle of the Ward-Leonard drive explains the principle of a variable-frequency motor

9- Lighting: states that correct levels of lighting are vital to safety, efficiency and comfort describes the principle of the incandescent lamp explains the difference between lamps for general lighting and for rough service describes briefly the principle, application and care when handling tungsten-halogen lamps explains the principle of discharge lamps explains how fluorescent tubes are started up explains how the power factor of fluorescent tubes is improved explains how radio interference is suppressed in a fluorescent tube explains the effect of variation in voltage on both incandescent and gas- discharge lamps explains how energy lights are marked states which emergency lights are on the emergency switchboard system and which lights may be on the battery circuit explains why the correct power of lamp should be used

10- Cables: names materials commonly used for the following part of cables: conductors insulation sheathing describes the reaction of electric cables to a fire explains why cable sockets need to be securely attached and locked on to the terminal

11- Batteries: describes the principle of the voltaic cell quotes an example of and explains the difference between: primary cells secondary cell lists the routine and emergency services normally supplied by batterie states the range of voltages and/or alkaline batteries which are used states that lead-acid and/or alkaline batteries are used explains the effect on current and voltage when connecting , states that 12 lead-acid or 20 alkaline cells connected in series produce a nominal 24 volt explains how cells or batteries are connected to increase their capacity explains how capacity is stated and what it means describes the dangers which may exist in a battery compartment and explains how they are overcome explains the topping up procedure for batteries describes how batteries are recharged and the periods during which gassing takes place describes how a battery is connected for recharging explains how the condition of an alkaline battery is determined explains the effect of the internal resistance of a battery on its terminal voltage demonstrates the above

objective by means of simple examples describes the first-aid necessary if parts of the body and eyes are in contact with electrolyte from: a lead-acid battery an alkaline battery states that the appropriate first-aid equipment should be available in the place where the batteries are housed

Practical Issue

1- Generator: states the safety and isolation precautions necessary before commencing work lists the parts to be inspected, their common faults and the necessary remedial action tests and records values of insulation resistance performs routine maintenance and testing of a generator

2- Switchboard: describes or carries out a maintenance routine on main circuit breakers describes the care to be taken when handling circuit breakers detects and corrects faults implanted in circuit breakers

3- Electrical motors: lists the principal maintenance equipment for motors carries out the maintenance necessary for a cage electric motor, paying attention to: damp, condensation and air flow dust and oil external and internal surfaces frequency of maintenance deterioration of insulation cleaning, inspection, renewal and lubrication of bearing describes the most common causes of failure of insulation checks the insulation resistance of a three-phase induction motor

4- Starters: carries out the maintenance necessary, and completes reports on, starters and controllers, with specific reference to: casings, corrosion and bonding contactors, magnet faces, pitting, overheating, spring force, lubrication connections, cables and leads correct operation when in use detects and rectifies faults implanted in motors, starters and protection equipment

5- Distribution system:

A- Transformer: describes the maintenance checks required by a transformer

B- Distribution: explains what is meant by the following faults: open-circuit earth short-circui estimates the current flowing during given fault conditions explains how earth faults occur and the potential danger explains the effects of an earth fault with an insulated distribution system given a diagram showing earth-fault lamps, describes the appearance of the lamps when an earth fault occurs explains the principle of using earth-fault instruments on a given distribution circuit, carries out a logical procedure to detect the location of an earth, using earth-fault lamps and an insulation-testing instrument explains why the circuit must be switched off when replacing a lamp describes the deterioration common in both lamp holders and their wire connections explains the care necessary when working on fluorescent lamp circuits describes how failed lamps are disposed of describes the care necessary when maintaining: exposed watertight fittings portable hand lamps carries out routine testing and maintenance of lighting circuits and fittings detects and rectifies implanted faults likely to be encountered at sea (high voltage) tastes that high-voltage systems are normally earthed via a resistor explains how the presence of earth faults is indicated in a high-voltage system with an earthed neutral states routine maintenances and inspection/testing's to be needed

C- Cables fits cables through glands into a terminal box, earthing the armoring as appropriate solders and crimps terminal sockets to conductor's measures resistance of cables explains the limitation of temporary repairs to insulation carries out temporary repairs to insulation

6- Fault protection: explains why fault protection is essential names the component parts of fault-protection equipment explains why fault currents can be extremely high names the three types of overcurrent-protection relay and describes the principles of operation of each explains the advantages and disadvantages of high-rupturing capacity fuses names the protection provided against: short circuits small overloads describes the procedure when replacing a blown fuse explains in simple terms, preferential tripping when overload occurs explains the purpose of under voltage protection of generators and of motors explains the purpose of reverse power protection sketches the layout of a typical main switchboard, indicating the function of the main parts explains the danger associated with the spaces in the vicinity of busbar explains the use of transformers for switchboard instruments, stating the voltages and current produced describes the earthing of instruments explains the potential danger of instrument voltage/current transformer circuits and the safe procedure for working on such circuits explains how status indicator lamps are usually supplied with power describes the procedure if a fault develops with a miniature circuit breaker adjusts, maintains and tests the types of fault protection normally encountered

7- Fault location: describes the essential requirements for the automatic operation of marine machinery uses control and instrumentation terminology in its correct context compares pneumatic, hydraulic and electronic-electrical control systems describes a simple control loop names analog and digital devices locates faults in simple control systems on locating fault takes actions to best prevent damage states what is necessary to prevent damage from electrical malfunctions such as burned circuit elements, poor contacts, breaking and faulty limit/micro switches

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	Generators	4 hour
2	D.C. generators	4 hour
3	Power distribution systems	4 hour
4	Transformers	4 hour
5	Insulation	4 hour
6	Electrical motors	4 hour
7	D.C. motor	4 hour
8	Electrical motor starting methodologies:	4 hour
9	Lighting	4 hour
10	Batteries	4 hour
11	Generator	2 hour
12	Switchboard	2 hour
13	Electrical motors	2 hour
14	Starters	2 hour
15	Distribution system	2 hour
16	Cables	2 hour
17	Fault location, Fault protection	2 hour

Teaching Methodology:

- **Lecture.**
- **Data how Presentation**
- **Workshop**

Evaluation Strategies:

Exams Name	Percentage	Date
HomeWorks	10 %	…../…../….
Med term exam theoretical	20 %	…../…../….
Final exam theoretical	30 %	…../…../….
Tasks	5 %	…../…../….

Med term exam Practical	15 %	…../…../….
Final exam Practical	20 %	…../…../….

Text Books & References:
Reeds Vol 7 : advanced Marine Electrotechnology
ISBN: 9781408176030

Engineering Program

Specialization	Marine Engineering
Course Number	207013360
Course Title	Introduction to Python programming
Credit Hours	1
Theoretical Hours	0
Practical Hours	2

Brief Course Description:

This course will provide a comprehensive, fast-paced introduction to Python. we are all eager to help student learn to code related with marine engineering and applications

Course Objectives

1. Describe the core syntax and semantics of Python programming language.
2. Discover the need for working with the strings and functions.
3. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
4. Indicate the use of regular expressions and built-in functions to navigate the file system.
5. Infer the Object-oriented Programming concepts in Python

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	**Parts of Python Programming Language,** Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language, **Control Flow Statements,** The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Catching Exceptions Using try and except Statement, **Functions,** Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.	7 hour
2	**Strings,** Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, **Lists,** Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The del Statement.	6 hour
3	**Dictionaries**, Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement, **Tuples and Sets,** Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples,	6 hour

	Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Traversing of Sets, Frozenset.	
4	**Files,** Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules, **Regular Expression Operations,** Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with glob Module.	8 hour
5	**Object-Oriented Programming,** Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, The Polymorphism.	8 hour

Teaching Methodology:

- **Lecture.**
- **Data how Presentation**
- **Computer lab**

Evaluation Strategies:

Exams Name	Percentage	**Date**
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Text Books & References:

1. Jake VanderPlas, **"Python Data Science Handbook: Essential Tools for Working with Data",** 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058

Engineering Program

Specialization	Marine Engineering
Course Number	207012340
Course Title	Applied Marine Control Systems
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

Theoretical Issue

Theoretical Issue

Introduction of instrumentation principle
Temperature measurements
Pressure measurements
Level measurements
Flow measurements
Other measurements
Telemetering systems
Error detectors
Control Valves

Practical Issue

Develop and understanding of computerized data acquisition, the method of experimentation in fluid and solid mechanics and dynamics and methods for analysis of experimental data.

Manipulator elements
Fundamentals of automatic control

Various automatic controls
ON-OFF control
Sequential control
Flowchart for automatic and control systems

Practical Issue

Monitoring systems
Explains briefly how each system component works and its operation Mechanism
Automatic control devices
System control

Course Objectives

Theoretical Issue

When completing this course, the student should be able to:

1- Introduction of instrumentation principle:
Basic measurements and control concepts, Definition of terminology, Overall control systems

2- Temperature measurements technique:
Principles of temperature measurements, Thermocouples, Resistance temperature detector Thermistor, Liquid in glass, Filled system, Bimetallic, Non-contact pyrometer, Humidity Installation consideration, Impact on the overall control loop, Selection tables, Future technologies.

3- Principles of pressure measurements:
Pressure sources, pressure transducers and elements – mechanical, pressure transducers and elements – electrical, installation considerations, impact on the overall control loop, selection tables, future technologies.

4- Principles of level measurements:

Simple sight glasses and gauging rods, buoyancy type, hydrostatic pressure, air burger system, ultrasonic measurements, radar measurements, vibration switches, radiation measurements, electrical measurements, density measurements, installation consideration, impact on overall control loop, selection tables, future technologies.

5- Principle of flow measurement:

Differential pressure flowmeters, open channel flow measurements, variable are flow meters, oscillatory flow measurements, magnetic flow meter, positive displacement, ultrasonic flow meter, mass flow meter, installation consideration, impact on overall control loop, selection tables, future technologies.

6- Other measurements:

fire detectors, salinity detectors …ext

7- Control valves:

Principles of control valves, sliding stem valves, rotary valves, control valve selection and sizing, control valves characteristic and trim, control valves noise and clavation, actuators and pointier operation, valve benches and stroking, impact on overall control loop, selection tables, future technologies

8- New smart instrument and field bus:

Noise and earthing consideration, materials of construction, linearization

Practical Issue

1- Understanding of computerized data acquisition
2- Understanding of computer interfacing & statistical data analysis

Knowledge of the types of sensors for measuring fluid solid and dynamical quantities and learn how to calibrate and troubleshoot faulty side.

Theoretical Issue

When completing this course, the student should be able to:

1- Manipulator elements:

A- Pneumatic: states that the final controller might be operated pneumatically, hydraulically or Electrically, sketches a diaphragm-operated control valve, describes the characteristics of the motor element and the correcting element in the above objective, describes or, preferably, determines by experiment the flow characteristics and applications, explains what is meant by "turn-down ratio" describes the conditions which may dictate the need for a positioner, describes the principal features of a positioner , explains the circumstances when piston actuators might be used, describes the conditions where butterfly valves might be used, describes the wax-element temperature-control valve and states its normal temperature range.

B- Electrical servomotors: describes a D.C. servomotor and explains how it varies from common Motor, explains the problems of using a three-phase A.C. machine as a servomotor, describes the applications of a two-phase A.C. servomotor, explaining how its characteristics can be varied.

C- Hydraulic servomotor: describes the principles of a swash plate pump, explains the advantage of using high pressures, explains the applications of a hydraulic ram servomotor

2- Fundamentals of automatic control

defines an automatic control and states its purpose, describes what devices/equipment construct control systems and their role functions, relates sensing unit, controller, controlled variable, manipulating variable an controlled object to each of them in the control system, describes what sort of devices are included in the sensing unit, describes variety of controllers such as electronic (PID, PLC, computer), controller and pneumatic controller, defines setting value, input value, deviation and output value/controlled variable in the controller, describes what sort of devices are included as manipulators, describes variety of controlled object, describes how automatic controls are utilized in the ship's propulsion, machinery, taking examples of temperature and level control systems, including control parameters such as time lag, time constant, dead time, first , second-order lag element, disturbance and offset.

3- Various automatic controls: classifies systematically automatic controls in terms of control methodologies, states what an optimal control means, explains briefly feedback control and feedforward control, describes briefly On-OFF control, sequential control, PID control and program control, explains how these automatic controls are applied to the control systems explains briefly program control and how the control is realized, describes the applications of program control in the ship's propulsion machinery.

4- ON-OFF control: explains what On-OFF control means, explains the characteristics of On-OFF control, explains how On-OFF control is utilized, lists components comprising On-OFF control system, describes On-OFF control taking some applications as examples.

5- Sequential control: explains what a sequential control means, explains the characteristics of a sequential control, explains how a sequential control is utilized, lists components comprising a sequential control system, describes sequential controls taking some applications as examples

6- Flowchart for automatic and control systems: explains symbol marks used in flow charts such as terminal, processing, determination, input/output, etc., states what is understood with flow charts, explains flow charts indicating automatic control system for main engine, generator control system and others taking some of them as examples, describes briefly the major components in relation to the function found in the flow charts.

Practical Issue

1- Monitoring systems: states what a monitoring system or data logger is explains monitoring system is constructed showing its system configuration, explains functions of the following system components for a monitoring system,

2- Explains briefly how each system component works and its operation Mechanism: explains how measured/monitored values can be confirmed if it is correct, explains how alarm setting values in a

monitoring system can be changed, explains how function/performance tests can be carried out taking a typical system as an example.

3- Automatic control devices: states what components are comprised in various automatic control systems, showing their system configurations explains briefly the functions of components and their operation mechanism ,explains how function/performance tests for each component cited above can be carried out, describes testing equipment for function/performance of each component cited above, explains what is meant by mechatronics and how it is utilized in automatic control systems.

4- System control: describes how functions/performances of automatic control systems incorporated in the operation systems can be tested: main engine, power generation and distribution boiler auxiliary machinery

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	Introduction of instrumentation principle	3 hour
2	Temperature measurements	3 hour
3	Pressure measurements	3 hour
4	Level measurements	3 hour
5	Flow measurements	3 hour
6	Other measurements	3 hour
7	Telemetering systems	3 hour
8	Error detectors	3 hour
9	Control Valves	3 hour
10	Lab: Computer Overview	3 hour
11	Lab: Check out parts and tutorials	3 hour
12	Lab: Digital I/O & Serial Communication	3 hour
13	Lab: D/A converters	3 hour
14	Lab: Strain gage sensor dynamic measurements	3 hour
15	Lab: Flow meter and Level meter	3 hour
16	Lab: Control valves	3 hour
17	Manipulator elements	3 hour
18	Fundamentals of automatic control	3 hour
19	Various automatic controls	3 hour
20	ON-OFF control	3 hour
21	Sequential control	3 hour
22	Flowchart for automatic and control systems	3 hour
23	Monitoring systems	3 hour
24	Explains briefly how each system component works	3 hour
25	operation Mechanism	3 hour
26	Automatic control devices	3 hour

27	System control	3 hour

Terminology:

Instrumentation Lab

Evaluation Strategies:

Exams Name	Percentage	Date
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Text Books & References:

1- Reeds Vol 10: Instrumentation and marine control systems
ISBN:9781408175606

2- Introduction to Engineering Experimentation, 3rd edition, Wheeler and Ganji, Prentice Hall, 2009

Engineering Program

Specialization	Marine Engineering
Course Number	207012230
Course Title	Mechanical Design CAD technology
Credit Hours	1
Theoretical Hours	0
Practical Hours	2

Brief Course Description:

The Mechanical Design/CAD Technology curriculum provides courses that include fundamental theories and principles, as well as hands-on training involving modern computer aided design technologies and traditional mechanical design techniques to design, model, validate and communicate ideas before production and manufacturing. Traditional technical drawing theory and practices are utilized alongside the most up-to-date CAD applications, rapid prototyping, and 3D printing technologies.

Introduces SolidWorks software as a 3-D design tool. Covers creation, retrieval and modification of 3-D and layout drawings using basic SolidWorks commands. Includes skills needed to create parametric models of parts and assemblies; generate dimensioned layouts; and Bill of Materials of those parts and assemblies

Course Objectives

1. Demonstrate competency with multiple drawing and modification commands in SolidWorks.
2. Create three-dimensional solid models.
3. Create three-dimensional assemblies incorporating multiple solid models.
4. Apply industry standards in the preparation of technical mechanical drawings.

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	1.0 Introduction Instructional Goal: A. Outline of course, grading criteria, materials, and SolidWorks commands to be used. B. Overview of the SolidWorks User Interface and suggested settings.	7 hour
2	2.0 Basic Part Modeling and Terminology	6 hour
3	3.0 Viewing, Extruding, Revolving, and Patterns	6 hour
4	4.0 Sweep and Loft, Creating a Helix, Shell	8 hour
5	5.0 Work Axis, Work Planes, Work Points, and Sketch Planes	8 hour
6	6.0 Creating a Design Table, Thin-Walled Parts	4 hour
7	7.0 Sheet Metal Features	4 hour
8	8.0 Part Configurations, Assembly Configurations	4 hour
9	9.0 Bottom-Up Assembly Modeling, Bill of Materials	4 hour
10	10.0 Creating Drawing Views and Annotations	4 hour
11	11.0 Problem-solving techniques	4 hour

Teaching Methodology:

- **Lecture.**

- **Data how Presentation**
- **Computer lab**
- **FAB lab**

Evaluation Strategies:

Exams Name	Percentage	**Date**
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Text Books & References:

Engineering Program

Specialization	Marine Engineering
Course Number	207013150
Course Title	Marine Survey
Credit Hours	3
Theoretical Hours	1
Practical Hours	4

Brief Course Description:

The overall aim of the Marine Surveying Course is to provide participants with solid marine technical knowledge required to understand the role of the marine surveyor and the details of the surveys, inspections, claims and investigations for ships and cargoes so they can perform as effective marine surveyors.

Course Objectives

On completion of the Marine Surveying Course, the trainees are expected to be able to:

- Understand the meaning, the role and the liabilities of marine surveyor.
- Outline the types of surveys performed by the marine surveyor.
- Understand the considerations in writing the reports.
- Demonstrate the understanding of the purposes of marine incident investigations.
- Recognize the types and role of evidence collected for a specific incident.
- Demonstrate technical skills required for structural, hull and marine engineering surveys.
- Understand the cargo surveys, the causes of cargo damage and marine cargo claims.
- Explain the tasks of the marine surveyor in relation to specific types of marine surveys.
- Understand the international maritime laws and conventions

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	• Understand the meaning, the role and the liabilities of marine surveyor.	7 hour
2	• Outline the types of surveys performed by the marine surveyor.	6 hour
3	• Understand the considerations in writing the reports.	6 hour
4	• Demonstrate the understanding of the purposes of marine incident investigations.	8 hour
5	• Recognize the types and role of evidence collected for a specific incident.	8 hour
6	• Demonstrate technical skills required for structural, hull and marine engineering surveys.	6 hour
7	• Understand the cargo surveys, the causes of cargo damage and marine cargo claims. • Explain the tasks of the marine surveyor in relation to specific types of marine surveys. • Understand the international maritime laws and conventions	23 hour

Teaching Methodology:

- **Lecture.**
- **Data how Presentation**
- **Ships site visit**

Evaluation Strategies:

Exams Name	Percentage	**Date**
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Text Books & References:

1- **Lloyd GL references**
2- **BV references**

Engineering Program

Specialization	Maritime Science- Marine Engineer diploma
Course Number	207011510
Course Title	Thermodynamics
Credit Hours	3
Theoretical Hours	2
Practical Hours	2

Brief Course Description:

The course description has been designed in accordance to the IMO model course (7.04) (2014 edition) **Function 1 and the STCW conventions as amended in Manila to prepare a marine Engineering student with the requirements for knowledge, understanding and proficiency in table** A-III/1 of the STCW**. related to maritime sciences.**

This course introduces the main concepts that are concerned with selecting, implementing and discusses.

1.1 Thermodynamic Properties

1.2 Thermodynamic Energy

1.3 Thermodynamic Systems

1.4 Energy Change

1.5 Heat Transfer

1.6 Vapors

1.7 Ideal Gases

1.8 Thermodynamic Processes

1.9 Work Transfer

Course Objectives

The objective of this course is to develop the ability of Marine Engineering student to analyze and understand the basic concepts of thermodynamics. To develop an intuitive understanding of the subject matter by emphasizing the physics and physical arguments related to marine engineering as the following concepts according to IMO module course 7.04 appendix III:

- Work and energy for dissipative systems
- First Law of Thermodynamics
- Second Law of Thermodynamics
- Thermodynamic parameters entropy
- Closed and Open systems
- The pure substance, liquid, solid and gas
- Applications to engineering systems
- Refrigeration and air conditioning
- Introduction to cooling load calculations
- Experiments and practical exercises related to measure efficiency of various thermal heater, specifications of heat pump, find volume expansion factor for liquids, draw curve of steam pressure, thermal conductivity experiments and heat engine operation

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
10.	**Thermodynamic Properties**	– Describes the properties used to specify the state, or condition, of a substance, the units in which the property is measured and the usual symbol - Pressure - Temperature - Volume - Energy - Explains what is meant by: - Absolute quantities - Specific quantities - Intensive value - Extensive values	**Week 1**
11.	**Thermodynamic Properties**	-- Explains that a substance can exist in three states, or phases, which are: - Solid - Liquid - Gaseous - describes the energy required to change phase as: - Enthalpy of fusion (solid-liquid) - Enthalpy of evaporation (liquid-vapor) - states that a change of phase is a constant-temperature process - explains that fluids can have a liquid or a gaseous form	**Week 2**
12.	**Thermodynamic Energy**	- States that "internal" or "intrinsic" energy (U) is related to the motions of the molecules of a substance or a system	**Week 3**

		- States that internal energy is derived only from molecular motions and vibrations, is dependent only on thermodynamic temperature and is energy stored in the molecule - States that the total energy stored in a body, or system, is termed enthalpy - Defines total stored energy the sum of internal energy and the product of pressure (P) and volume (V), i.e. H = U + PV - Defines potential energy as energy stored in the molecules by virtue of their vertical position above some datum level	
13.	**Thermodynamic Energy**	- Defines kinetic energy as energy stored in molecules by virtue of their velocity; kinetic energy has a value of(i.e. 0.5 of velocity squared) per unit mass of substance. - States that energy in transition between bodies or systems can only be heat flow (or heat transfer) (Q) and work flow (or work transfer) (W) - Defines the first law of thermodynamics as "the energy stored in any given thermodynamic system can only be changed by the transition of energies Q and/or W" - Solves problems to demonstrate the above objectives	**Week 4**
14.	**Thermodynamic Systems**	- States that systems are identified in terms of mass of substance (i.e. molecules) contained within a system and/or the mass entering and leaving - States that this identification is of	**Week 5**

		importance when evaluating property changes taking place during thermodynamic operations	
15.	**Energy Change**	- Explains that the "non-flow" equation derives directly from the first law of thermodynamics and is applicable only to "closed" systems (i.e. no molecules of substance are entering or leaving the system during the thermodynamic operation) - Defines the general form of the non-flow equation as (U2 – U1) = ± W ± Q - Explains that the mathematical sign associated with the transition energies of Q and W will be governed by "direction", i.e. whether the energy transfer is "into" or "out of" the closed system - Solves simple problems concerning energy changes in practice	**Week 6**
16.	**Heat Transfer**	- States that heat transfer can take place by conduction, convection and radiation and that when substances at different temperatures are placed in contact they will, in time, reach a common temperature through transfer of heat - Defines specific heat capacity as the heat transfer, per unit mass, per unit of temperature change, for any given body or system - Specific heat capacity of substances final temperature of mixtures, and verifies the observed	**Week 7&8**

		value by calculation - Solves simple numerical problems involving heat transfer between substances when placed in contact with each other; to include mixtures of liquids and solids placed in liquids solves simple problems on the application of the Fourier law to solid homogeneous materials performs laboratory work to verify the above objective.	
17.	**Vapors**	- defines the vapor phase as intermediate stage between the solid and the perfect gas state, and the property values, such as pressure, energy, volume - states that the important fluids in this group are H2O (i.e. steam) and the refrigerants define the following conditions: – Saturated vapor – Dry vapor – Wet vapor – Dryness fraction – superheated vapor - Explains and uses the "corresponding" relationship that exists between pressure and temperature for a saturated liquid or saturated vapors - Demonstrates the above objective, using laboratory equipment uses tables of thermodynamic properties to determine values for enthalpy, internal energy and volume at any given condition of pressure and/or temperature defined in the	**Week 9&10**

		above objective	
18.	**Ideal Gases**	- States the "critical temperature" as being the limit of the liquid phase - Defines an "ideal" gas as one which behaves almost as a perfect gas, whose temperature is above the critical one and whose molecules have a simple monatomic structure - States that an "ideal" gas cannot be liquefied by alteration of pressure alone - States the laws of Boyle and Charles. - Sketches a P–V curve demonstrating Boyle's law - Sketches a graph of V and T, demonstrating Charles' law - Explains that R will have a different numerical value for each ideal gas or mixture of ideal gases. - Applies simple numerical calculations involving the elements of the above objectives.	**Week 11&12**
10.	**Thermodynamic Processes**	- Defines a thermodynamic process as "an operation during which the properties of state, pressure, volume and temperature may change, with energy transfer in the form of work and/or heat flow taking place" - States that the following processes are applicable to ideal gases and vapors: - Heat transfer: heating and cooling - Work transfer; compression and expansion - Explains in simple terms the second law of thermodynamics	**Week 13&14**

		- Explains with the aid of a sketched P–V diagram, where appropriate, the following "standard" Processes: – Pressure remaining constant – Volume remaining constant – Temperature remaining constant – zero heat transfer – Polytrophic expansion and compression - Describes a process of constant temperature as "isothermal" - Describes a process in which there is no heat transfer as "adiabatic" - Describes practical applications of the process described in the above objectives - Solves simple numerical problems relating to the elements in the above objectives	
11.	**Work Transfer**	- Explains that "work" is calculated by force × distance moved by that force - Sketches a P–V diagram relating the area of the diagram to the work done when a fluid exerts constant pressure on a piston in a cylinder - Explains the work transfer for a vapors or an ideal gas terms of pressures and volumes - Sketches a P–V diagram, relating the area of the diagram to work done on or by a piston in a cylinder during polytrophic expansion and compression - States the equation for work transfer states that, for most practical operations, n has numerical values between 1.2 and 1.5	**Week 15**

		- Applies simple numerical calculations related to the elements in the above objectives	
12.	**Revision**	Give comprehensive examples as a revision.	**Week 16**

Evaluation Strategies:

Exams Name	Percentage	Date
HomeWorks	10 %	…../…../….
Med term exam theoretical	20 %	…../…../….
Final exam theoretical	30 %	…../…../….
Tasks	5 %	…../…../….
Med term exam Practical	15 %	…../…../….
Final exam Practical	20 %	…../…../….

Teaching Methodology:

This module will be taught using available resources including: lectures, data show and materials uploaded to the e-learning system.
Preparation Chick lists
Syllabus Model course
Lesson Plan

Text Books & References:

Text Books

- Applied Mechanics for Marine Engineers & AMETC Notes Prepared by Lecture Engineer.

REFERENCE BOOKS
Applied Mechanics for Marine Engineers, Paul Anthony Russell, Reeds Volume 2, ISBN: 9781472910561
Reeds Marine Engineering and Technology Series

Engineering Program

Specialization	Marine Engineering
Course Number	207011310
Course Title	Engineering Mathematics
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

Identify homogeneous equations, homogeneous equations with constant coefficients, and exact and linear differential equations. Solve ordinary differential equations and systems of equations using:
Direct integration, Separation of variables, Reduction of order, Methods of undetermined coefficients and variation of parameters, Series solutions, Operator methods for finding particular solutions
Perform calculus operations on vector-valued functions, including derivatives, integrals curvature, displacement, velocity, acceleration, and torsion. 2. Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals. 3. Find the extrema and tangent planes. 4. Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, The Divergence Theorem and Stokes' Theorem.
define basic terms and concepts of matrices, vectors and complex numbers 2. comprehended the use of various forms of complex numbers to solve numerical problems 3. apply the matrix calculus in solving a system of linear algebraic equations 4. calculate the area of planar shapes (triangle, parallelogram) and the volume of parallelepiped using vector algebra

Course Objectives

1.Identify homogeneous equations, homogeneous equations with constant coefficients, and exact and linear differential equations.
2.Solve ordinary differential equations and systems of equations using:
3.Direct integration
4.Separation of variables
5.Reduction of order
6.Methods of undetermined coefficients and variation of parameters
7.Series solutions
8.define basic terms and concepts of matrices, vectors and complex numbers
9.comprehended the use of various forms of complex numbers to solve numerical problems
10.apply the matrix calculus in solving a system of linear algebraic equations
11.calculate the area of planar shapes (triangle, parallelogram) and the volume of parallelepiped using vector algebra
12.Perform calculus operations on vector-valued functions
13.including derivatives, integrals curvature, displacement, velocity, acceleration, and torsion.
14. Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals.

15. Find the extrema and tangent planes.
16. Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, The Divergence Theorem and Stokes' Theorem.
17. Apply the computational and conceptual principles of calculus to the solutions of real- world problems

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	1.Identify homogeneous equations, homogeneous equations with constant coefficients, and exact and linear differential equations.	3 hour
2	2.Solve ordinary differential equations and systems of equations using:	3 hour
3	3.Direct integration	3 hour
4	4.Separation of variables	3 hour
5	5.Reduction of order	3 hour
6	6.Methods of undetermined coefficients and variation of parameters	3 hour
7	7.Series solutions	3 hour
8	8.define basic terms and concepts of matrices, vectors and complex numbers	3 hour
9	9.comprehended the use of various forms of complex numbers to solve numerical problems	3 hour
10	10.apply the matrix calculus in solving a system of linear algebraic equations	3 hour
11	11.calculate the area of planar shapes (triangle, parallelogram) and the volume of parallelepiped using vector algebra	3 hour
12	12.Perform calculus operations on vector-valued functions	3 hour
13	13.including derivatives, integrals curvature, displacement, velocity, acceleration, and torsion.	3 hour
14	14. Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals.	3 hour
15	15. Find the extrema and tangent planes.	3 hour
16	16. Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, The Divergence Theorem and Stokes' Theorem.	3 hour
17	17. Apply the computational and conceptual	3 hour

	principles of calculus to the solutions of real-world problems	

Evaluation Strategies:

Exams Name	Percentage	Date
Med term	40%	…../…../….
Final	50%	…../…../….
HomeWorks	10%	…../…../….

Text Books & References:

Reeds Vol 1: Mathematics for Engineers (Reed's Marine Engineering) (v. 1) 0007

- ISBN-10 : 0713668377
- ISBN-13 : 978-0713668377

Engineering Program

Specialization	Maritime Science- Marine Engineer diploma
Course Number	020701111
Course Title	Seamanship
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

The main types ship, uses of each type, the main part of the ship, general knowledge of its uses, Plimsol mark and Load Lines, location and benefit. The reading of draft in feet & meters The main types of ropes, construction, description and practical uses on board. Manning (crew of ship), main departments, watch keeping at sea, securing watches at port. The main duties of every deck officer at sea and in ports. Ship's navigation lights, anchor lights and shapes. Navigation equipment, gyro compass, magnetic compass, radar.

Course Objectives

To meet the mandatory minimum requirements for knowledge navigation at operational level for the function of ship's parts, types general knowledge.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Needed Time
	The main parts of the ship & general knowledge of its uses.	Sketch show the main parts for the ship, (side view & plan view).	3
	The main type of the ship's & vessels of each type.	Passenger ship's & categorize Cargo ship & categorize Specialist ships & categorize	15
	Plimosol mark & load, location & benefit the reading of drafts in feet & meters	- Plimsole marks drawing and dimensions location. Reading of draft marks in feet & mtrs	3
	the main types of ropes, construction description & practical uses O/B.	- Introduction - Natural fiber ropes - Lay of rope - Small stuff - Synthetic fiber ropes - Bend and hitches - Working a loft and overside - Seizing - Rope work and cordage tools - Worming, parceling and serving - Cordage splice - Whippings - Marrying two ropes together - To pass a stopper Breaking out mooing rope	18
	Manning (crew of ship) main departments, watch keeping at sea	- Main departments - Crew structure Watch keeping at sea	6
	Ship's navigation equipment, gyro compass magnetic compass & radar	- Gyro compass - Magnetic compass Radar	3

Evaluation Strategies:

Exams Name	Percentage	Date
HomeWorks	10 %	…../…../….
Med term exam theoretical	40%	…../…../….
Final exam theoretical	50%	…../…../….

Teaching Methodology:

- **Laboratory**

Text Books & References:

Seamanship 1, The equipping and handling of vessels under sail or steam. For the use of the united states naval academy.by commodore s. B. Luce, u.

Engineering Program

Specialization	Maritime Law
Course Number	020701314
Course Title	Maritime law
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

introduction to maritime law
IMO conventions SOLAS, MARPOL, STCW ,MLC and load line
ISM code, ISPS code, Port state control and flag state control, Classification Societies and ship statutory certificates
Transport and Trade with marine aspects and terminology of shipping
Leader ship and communication, ships maintenance and dry-docking

Course Objectives

This course aims to provide the student with the requirements for knowledge, understanding and proficiency in the following concepts according to IMO module course 7.04 Function 4 and IMO module course 1.39:

1- introduction to maritime law
2- IMO conventions SOLAS, MARPOL, STCW ,MLC and load line
3- ISM code

4- ISPS code
5- Port state control and flag state control
7- Classification Societies and ship statutory certificates
8- Transport and Trade with marine aspects and terminology of shipping
10- Leader ship and communication
11- ships maintenance and dry-docking

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	introduction to maritime law	3 hour
2	IMO conventions SOLAS, MARPOL,	3 hour
3	STCW, MLC and load line	3 hour
4	ISM code	3 hour
5	ISPS code	3 hour
6	Port state control and flag state	3 hour
7	Classification Societies and ship statutory certificates	3 hour
8	Transport and Trade with marine aspects and terminology of shipping	3 hour
9	Leader ship and communication	3 hour
10	ships maintenance and dry-docking	3 hour

Evaluation Strategies:

Exams Name	Percentage	Date
Med term	40%	…../…../….
Final	50%	…../…../….
HomeWorks	10%	…../…../….

Teaching Methodology:

- **Lecture.**
- **Data how Presentation**

Text Books & References:
The Shipmaster's Business Companion, ISBN: 9781870077453

Engineering Program

Specialization	Marine Engineering
Course Number	207013450
Course Title	Engine Room Simulator
Credit Hours	1
Theoretical Hours	0
Practical Hours	2

Brief Course Description:

The course is essentially a practical one, consisting of a series of exercises structured around the operation of a ship's machinery installation and carried out in conjunction with an engine room simulator. The exercises are supervised by an instructor and will, initially, allow the student to become familiar with the instrumentation and controls used in the engine rooms of modern merchant ships. The student shall become skilled in the scanning of instrument displays when assessing the normal operational conditions of an engineering plant. The exercises increase in complexity as the course progresses, as the student works through and becomes familiar with the procedures used for starting up auxiliary and propulsion plants, setting the normal operation condition and keeping an engine room watch. The final exercises deal with watch keeping and the procedures and techniques needed for the location and trouble-shooting of faults, diagnosis and malfunctions that can occur in an operational plant. Each exercise should be preceded by a briefing session and followed up by a group debrief, which will analyze the actions and decisions of the student. During the series of exercises each student will assume different roles in the engineering watch keeping team, and shall have more than one opportunity to take on the part of the engineer in charge of the watch.

Course Objectives

- familiarization with the use of instrumentation and controls used in the engine rooms of modern merchant ships

- awareness of the need for proper pre-planning, the use of checklists and of the timescales involved in startup procedures
- understanding and awareness of correct watch keeping procedures
- understanding of the way in which machinery units are interdependent
- experience in identifying operational problems and trouble-shooting them
- The ability to make decisions, which promote the safety and efficiency of an operational plant.

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	• familiarization with the use of instrumentation and controls used in the engine rooms of modern merchant ships	5 hour
2	• awareness of the need for proper pre-planning, the use of checklists and of the timescales involved in startup procedures	5 hour
3	• understanding and awareness of correct watch keeping procedures	5 hour
4	• understanding of the way in which machinery units are interdependent	5 hour
5	• experience in identifying operational problems and trouble-shooting them	5 hour
6	• The ability to make decisions, which promote the safety and efficiency of an operational plant.	5 hour

Teaching Methodology:

- **Lecture.**
- **Data how Presentation**
- **Lab simulator**

Evaluation Strategies:

Exams Name	Percentage	**Date**
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Text Books & References:

Engineering Program

Specialization	Marine Engineering
Course Number	207012260
Course Title	Basic of Engineering workshops
Credit Hours	1
Theoretical Hours	0
Practical Hours	2

Brief Course Description:

This course introduces the basic concepts of manufacturing via machining, forming, joining, casting and assembly, enabling the students to develop a basic knowledge of the mechanics, operation and limitations of basic machining tools. The course also introduces the concept of metrology and measurement of parts.

Machining Processes: Principles of metal cutting, cutting tools, cutting tool materials and applications, Geometry of single point cutting tool, Introduction to multi-point machining processes – milling,

drilling and grinding, Tool Life, Introduction to computerized numerical control (CNC) machines, G and M code programming for simple turning and milling operations, introduction of canned cycles.

Metal Casting: Principles of metal casting, Introduction to sand casting, Requisites of a sound casting, Permanent mold casting processes.

Metal Forming: Forging, Rolling, Drawing, Extrusion, Sheet Metal operations. Joining Processes: Electric arc, Resistance welding, Soldering, Brazing.

Basic Electrical Connections

Course Objectives

When completing this course, the student should be able to:

Respect manual work
2. Mastering manual skills related to mechanical, electrical and carpentry work
3. Application of occupational safety standards and requirements in engineering workshops
Vocabulary:
1. Manual skills in mechanical work
Occupational safety conditions to be followed in mechanical workshops?
Using mechanical measuring devices such as ruler, angle, protractor, and lumen?
Perform a simple exercise the following tools and tools are used: radiator, saw, calipers and steel calligrapher?
We will catch the point, hammer, binding and automatic borehole.
A simple exercise in which two pieces of electric arc are sold?
Work a simple exercise for the formation of the sheet, which is used measurements and personnel and cutting and bending and welding resistance and taboos?
2. Manual skills in electrical work:
Conditions and requirements for occupational safety to be followed in electrical workshops
Identify the number and tools used in electrical workshops, such as wire, wire, camouflage, and Avometer
Switches and circuit breakers
Identify types of electrical wiring and how to distinguish them?
Work the lamp extension exercise with a key?
Do a bell exercise?
Did the Neon and its plug-in work?
3. Manual skills in carpentry work
1. Conditions and requirements for occupational safety in workshops and carpentry works
2. Identification of the number of manual used in the work of carpentry such as hummer ball and saws and hummer pin
The keyboard, the mouse, the calligrapher, the binding, the angular ruler and the crypt paper
3. Work T links and the tail of the dove and overload
4. Make elongation links and click the tongue
5. A simple exercise in which the student uses the cat, the laser and the paint

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	Exp No 1	2hour
2	Exp No 2	2hour
3	Exp No 3	2hour
4	Exp No 4	2hour
5	Exp No 5	2hour
6	Exp No 6	2hour
7	Exp No 7	2hour
8	Exp No 8	2hour
9	Exp No 9	2hour
10	Exp No 10	2hour
11	Exp No 11	2hour

Evaluation Strategies:

Exams Name	Percentage	Date
Experiments	40%	…../…../….
Tasks	10%	…../…../….
Med term practical	20%	…../…../….
Final practical	30%	…../…../….

Teaching Methodology:

- **Workshop specialist**
- **Data how Presentation**
- **Workshop**

Text Books & References:
Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd.

Engineering Program

Specialization	Marine Engineering
Course Number	207012250
Course Title	Engineering materials
Credit Hours	2
Theoretical Hours	2
Practical Hours	0

Brief Course Description:

One of the main objectives of the course is to familiarize the students with the fundamental concepts of Materials Science. This course introduces the type of materials, structure, properties, characteristics and applications.

At the end of this course the student should be able to:

- Classify the materials
- Understand the basic properties that characterize the behavior of materials
- Understand the type of loadings/environment that materials should withstand
- Select appropriate type of material for specific application
- Understand the different forming, manufacturing processes and heat treatment

Course Objectives

Theoretical Issue

Materials Classification and Crystalline Structure

Material physical and Mechanical Properties
The practical Uses of Ferrous and Non-Ferrous On-Board Ships
Material Destructive and Non- Destructive Test
Heat Treatment Process
Corrosion
Casting Process
Cold and Hot Working Process
Surface Treatment Finishing Process
The Deformable Body and normal Stress and Strain
Bearing Structure and Safety Factor
Stresses of Tension, Compression and Shear

Practical Issue

By the end of this course, the student will be able to:
1. List and explain applicable experimental methods for characterizing material and component behavior
2. Compare (and quantify differences) measured experimental results and calculated theoretical values.
3. Predict component behavior using experimental test results and engineering formulae
4. Analyze experimental data, theoretical models and their scalability to components
5. Analyze (deduce) the inherent variability of materials subjected to multiple modes of loading and apply the results to component behavior.
6. Formulate a solution path for analyzing an actual multi-component structure using experimental, theoretical, and numerical tools/methods.
7. Evaluate the limits of structures by extending the experimental measurements using theoretical and numerical methods

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Needed Time
1	Materials Classification and Crystalline Structure	• Proper Selection of Material • Properties of materials • Materials Classification Structure of the Material	3 hour
2	Material physical and Mechanical Properties	• Properties of Materials • Stress-Strain Diagram	3 hour
3	The practical Uses of Ferrous and Non-Ferrous On-Board Ships	• Ferrous Materials • Non - Ferrous Materials • Classification of Steels • Heat Treatment of Carbon Steels • Alloys of Copper and Aluminum	3 hour
4	Material Destructive and Non- Destructive Test	• Destructive Testing (DT) • Non-Destructive Testing • Basic Destructive Testing and Non-Destructive Testing Methods	3 hour
5	Heat Treatment Process	• Heat Treatment Theory • Types of Heat-Treating Processes	3 hour
6	Corrosion	• Corrosion definitions, what is Corrosion • Classification and Types of Corrosion • Corrosion Prevention Methods	3 hour
7	Casting Process	• Explanation of metal casting process • Patterns Types and Pattern Allowances • Molding Sand and Its Properties • Molds and their types • Die Casting	3 hour
9	Cold and Hot Working Process	• Overview of Hot and Cold Working Processes • Difference Between Hot and Cold Working.	3 hour

		• Recrystallization temperature. • Advantages and Disadvantages of Cold and Hot Working Processes	
10	Surface Treatment Finishing Process	• Treating the surfaces of metals • Method of Surface Treatment Finishing • Factors in Selecting a Method of Surface Treatment Finishing • Thermal & Mechanical Coating • Surface and Case Hardening	3 hour
11	The Deformable Body and normal Stress and Strain	• Hooke's Experiment • Stretching of Rods • Multi-Axial State of Stress and Strain	3 hour
12	Bearing Structure and Safety Factor	Safety Criteria and Standards for Bearing Capacity of Foundation.	3 hour
13	Stresses of Tension, Compression and Shear	• Normal Stress and Strain • Uniaxial Stress and Strain • Mechanical Properties of Materials • Elasticity, Plasticity and Creep • Shear Stress and Strain	3 hours
1	Lab: Materials Classification and Crystalline Structure Material physical and Mechanical Properties The practical Uses of Ferrous and Non-Ferrous On-Board Ships		2hour
2	Lab: Material Destructive and Non- Destructive Test Heat Treatment Process		2hour
3	Lab: Corrosion Casting Process Cold and Hot Working		2hour

	Process		
4	Lab: Surface Treatment Finishing Process The Deformable Body and normal Stress and Strain Bearing Structure and Safety Factor		2hour
5	Lab: Stresses of Tension, Compression and Shear		2hour

Evaluation Strategies:

Exams Date	Percentage	Date
Home work-theoretical	10%	…../…../….
Med term exam-theoretical	40%	…../…../….
Final exam-theoretical	50%	…../…../….

Teaching Methodology:

- **Lecture.**
- **Data how Presentation**
- **Lab**

Text Books & References:

- Sridhar Krishnaswamy
- ME362: Stress Analysis
- ocw.nthu.edu.tw/ocw
- https://www.bcci.bg/projects/we_een/Surface_treatment.pdf
- Surface Treatment finishing Process (EUROPEAN COMMISSION)
- The Corrosion Technology Laboratory (NASA) https://corrosion.ksc.nasa.gov/index.htm
- Jagdish Pampania (https://vk.cc/818RFv) Weiler, Tech Service
- Manufacturing Processes by H.N Gupta (Second Edition)
- Introduction to Basic Manufacturing Processes by Rajender Si

Engineering Program

Specialization	Marine Engineering
Course Number	020701222
Course Title	Engineering Mechanics
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

Mass and Volume
Statics
Dynamics
Energy, work and power
Friction

Course Objectives

When completing this course, the student should be able to:

1- Mass and volume defines: volume, mass, center of gravity, density as mass/volume – units are kg/m3 relative density, explains that for homogeneous masses, the center of gravity lies at the center of volume and solves simple problems involving the above objectives measures density of liquids, using a hydrometer.

2- Statics: defines scalar and vector quantities, giving examples, e.g. mass and weight defines force , shows force as a graphic representation uses the parallelogram of forces to obtain the resultant of two forces acting as a Common point , states the principle of equilibrium ,defines the equilibrant, states the necessary conditions for three forces to be in equilibrium ,defines the

triangle of forces, describes the polygon of forces, defines the condition for equilibrium in the polygon of forces, defines the net effect of a number of forces acting at a common point as the resultant, defines the moment of a force about a point, determines the moment produced by a couple, describes the conditions required for equilibrium when a number of forces and moments act on a body, balances moments, resolves a force into a force and a couple, defines the factors which govern the stability and overturning of a box, states that the center of gravity of a mass suspended from a single point lies vertically below the point of suspension, states that the center of gravity of a mass supported by a single point lies vertically above the point of support, solves simple numerical and graphical problems related to the elements in the above objectives.

3- Dynamics: The relationship between speed, acceleration, mass, force and resistance distance travelled; defines speed as units are m/s or km/ time, calculates mean speeds, given time and distance , defines acceleration (for motion in a straight line) as change of speed time, plots speed-time graphs for straight-line motion, defines free fall acceleration as 9.8 m/s2, solves problems using distance = speed × time uses the equation v = u + at to solve problems, states that, in order to accelerate a mass, a force has to be applied states that the unit of force is the newton (n), states that one Newton is the force which causes a mass of one kilogram to accelerate at the rate of 1 m/s2, states newton's first law, states newton's second law, defines weight as a force caused by gravitational attraction towards the center of the earth uses the equation F = ma to solve simple problems, identifies practical examples of the effect of friction, defines friction, states that force is required to overcome the effects of friction, explains in general terms the factors which affect frictional resistance to motion., Velocity and the effect of change of direction, defines velocity as a vector quantity, plots graphs of velocity against time, defines relative velocity, determines average velocity from initial and final values of velocity, states that the area enclosed by a velocity-time curve is distance, defines acceleration in terms of initial and final values of velocity, solves simple problems, using the equations, defines velocity as a graphic representation, uses the parallelogram and the triangle of velocities to obtain resultant velocity.

4- Energy, work and power: The relationship between forms of energy, work and power, states that common fuels such as hydrocarbons are sources of energy, defines work as force × distance travelled (newtons × meters); unit is the joule (J),defines the relationship between energy and work, defines potential energy, defines kinetic energy and derives the equation, solves simple problems involving force, distance and work, relates the work done to accelerate an object to its change of kinetic energy, defines inertia, using given data, draws graphs of force and distance moved and relates the area under the graphs to work done, gives examples of the conversion of energy from one form to another, defines efficiency in terms of input and output, defines power as the rate of transferor energy or the rate of doing work, i.e., energy transfer (joules),time taken (seconds) states that the unit of power is the watt (W), solves simple problems relating to the above objectives

5- Friction: defines friction in the horizontal plane, defines the force required to overcome friction in the horizontal plane as F = μn, where: F = force in newtons N = normal (i.e. 90°) reaction force between contact surfaces μ = coefficient of friction solves simple numerical problems related to the elements in the above objectives.

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	Mass and volume	5 hour
2	Static	10 hour
3	Dynamic	10 hour
4	Energy, work and power	10 hour
5	friction	10 hour

Evaluation Strategies:

Exams Name	Percentage	Date
Med term	40%	…../…../….
Final	50%	…../…../….
HomeWorks	10%	…../…../….

Text Books & References:
Reeds Vol 2: Marine Applied Mechanics ISBN 9781472910578

Engineering Program

Specialization	Marine Engineering
Course Number	020701328
Course Title	Hydro Static and Ship stability
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

General principles of ship stability:
Force and moments
Centroids and the center of gravity
Density and specific gravity
Law of flotation
Effect of density on draft and displacement
Transverse statically stability
Transverse statically stability
Effect of free surface of liquids on stability
TPC and displacement curve,
Form coefficients
Final KG
Calculating KB, BM and metacentric diagram
list
Moment of statically stability
Trim
Stability and hydrostatic curves

Course Objectives

To allow the student to deal with ship in general without jeopardize the safety of vessel in all respect:

Force, mass, moment of mass, working examples. Centre of gravity, effect of removing or discharging mass, effect of adding or loading mass, effect of shifting weights, effect of suspended weights, working examples. Defined of density, specific gravity, relative density and working examples.
Archimedes principle, force of buoyancy, center of buoyancy, center of gravity, hydrometer, TPC, TPC in dock water, reserve buoyancy, working example. Effect of change of density when the displacement is constant, FWA, load line mark, effect of density on displacement when the draft is constant, working example, Definition, the metacenter, stable equilibrium, unstable equilibrium, neutral equilibrium ,correcting unstable and neutral equilibrium, stiff and tender ship , negative GM and angle of loll ,working example, Virtual loss of GM, correcting an angle of loll TPC curve, displacement curve, KM curve, working example Cw, Cb, Cm and Cp working example,
Working example To find KB, to find BM transverse, metacentric diagrams, working examples
Moment about Keel, moment about center line, working examples M.O.S.S at small angle of heel, M.O.S.S at large angle of heel Trim, MCTC ,C.O.T , Change of Draft fwd and aft, effect of shifting weights already on board, of loading and or discharging weights, using trim to find the position of center of flotation, loading weight to keep the aft draft constant, loading weight to produce a required draft ,W.EX. Stability cross curve, GZ curve, KN curve, curve of statically stability, hydrostatic curve ,working example.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Needed Time
1	Force and moments	Force, mass, moment of mass, working examples.	3 hours
2	Centroids and the center of gravity	Centre of gravity, effect of removing or discharging mass, effect of adding or loading mass, effect of shifting weights, effect of suspended weights, working examples.	6 hours
3	Density and specific gravity	Defined of density, specific gravity, relative density and working examples.	2 hours
4	Law of flotation	Archimedes principle, force of buoyancy, center of buoyancy, center of gravity, hydrometer, TPC, TPC in dock water, reserve buoyancy,	3 hours

		working example.	
5	Effect of density on draft and displacement	Effect of change of density when the displacement is constant, FWA, load line mark, effect of density on displacement when the draft is constant, working example,	4 hours
6	Transverse statically stability	Definition, the metacenter, stable equilibrium, unstable equilibrium, neutral equilibrium ,correcting unstable and neutral equilibrium, stiff and tender ship , negative GM and angle of loll ,working example,	4 hours
7	Effect of free surface of liquids on stability	Virtual loss of GM, correcting an angle of loll	3 hours
8	TPC and displacement curve,	TPC curve, displacement curve, KM curve, working example	2 hours
9	Form coefficients	Cw, Cb, Cm and Cp working example,	2 hours
10	Final KG	Working example	1 hour
11	Calculating KB, BM and metacentric diagram	To find KB,to find BM transverse ,metacentric diagrams, working examples	3 hours
12	list	Moment about Keel, moment about center line, working examples	4 hours
13	Moment of statically stability	M.O.S.S at small angle of heel, M.O.S.S at large angle of heel	2 hours
14	Trim	Trim, MCTC ,C.O.T , Change of Draft fwd and aft, effect of shifting weights already on board, of loading and or discharging weights, using trim to find the position of center of flotation, loading weight to keep the aft draft constant, loading weight to produce a required draft ,W.EX.	8 hours
15	Stability and hydrostatic curves	Stability cross curve, GZ curve , KN curve, curve of statically stability , hydrostatic curve , working example.	

Evaluation Strategies:

Exams	Percentage	Date
Home Works	**10%**	…../…../….
Med exam	**40%**	…../…../….
Final Exam	**50%**	…../…../….

Text Books & References:

Reeds Vol 13: ships stability powering and resistance,
ISBN:9781408176139

Engineering Program

Specialization	Marine Engineering
Course Number	020701313
Course Title	English for special purposes
Credit Hours	3
Theoretical Hours	0
Practical Hours	6

Brief Course Description:

The student must apply practically the following concepts according to IMO module course 3.17 section I:
1- A new vessel with comparing size, speed, using communication equipment and discussing.
2- A visitor with describing people, comparing physical appearance, describing personalities and asking for descriptive information
3-Weather with identifying and describing current and future weather conditions.
4- Past voyages, Incidents at sea with reporting and asking information.
5- Personal injuries.
6- Machine checking
7- Telex and right a message
8- This course tackles different seafarers' day work situations which are vitally needed by the students in their future work. The book is self-contained in which students listen and practice what they listen to in real life situations. It focuses on conversation pieces, reading and listening as well as on vital vocabulary and word formation.

Course Objectives

- English for Seafarers ESP1course will cover some fundamental principles of general English, and will stress the four skills of English.
- Grammar exercises will be used to enhance writing skill.
- Students are required to read the texts and answer the questions provided.

Students are required to listen and watch videos to practice the exercise in and out the classroom

Upon the completion of this course students will be able to:

- Demonstrate various invention practices: brainstorming,
- , Demonstrate ability to write in various simple modes,
- The ability to introduce themselves and others.
- The ability to listen and practice listening exercise

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Needed Time
1	• Introduction	• Reviews basic rules	6 hour
2	• Unit 1 –The Seafarer	• The Seafarer	6 hour
3	• Unit 2 The job	• The job	6 hour
4	• Unit 3 The Vessel	• The Vessel	6 hour
5	• Unit 4 Where are the Life Jackets?	• Where are the Life Jackets?	6 hour

6	• Unit 5 Maps and Charts	• Maps and Charts	6 hour
7	• Revision	• Revision	6 hour
8	• Unit 6 How do I get there?	• How do I get there	6 hour
9	• Unit 7 Free time	• Free time	6 hour
10	• Unit 8 What happening on board?	• What happening on board?	6 hour
11	• Unit 9 In the mess room • Unit 10 Emergency	• In the mess room • Emergency	6 hour
12	Final exam		

Evaluation Strategies:

Exams Name	Percentage	**Date**
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Teaching Methodology:

- **Laboratory**

Text Books & References:

Marlins English for Seafarers (ESP 1) - Corse

Engineering Program

Specialization	Maritime Science- Marine Engineer diploma
Course Number	020701252
Course Title	Marine Diesel Engines1
Credit Hours	(3)
Theoretical Hours	(3)
Practical Hours	(0)

Brief Course Description:

The course description has been designed in accordance to the IMO model course (7.04) (2014 edition) **Function 1 and the STCW conventions as amended in Manila to prepare a marine Engineering student with the requirements for knowledge, understanding and proficiency in table** A-III/1 of the STCW**. related to maritime sciences.**

This course introduces the main concepts that are concerned with selecting, implementing and discusses.

1- Principle of the 4-stroke engine
2- Principle of the 2-stroke engine
3- The 2-stroke crosshead engine
4- Power calculation
5- UNI flow, loop, scavenging and cross scavenging

Course Objectives

This course covers the requirements of STCW code, chapter III, Section A-III/1. This functional element provides the detailed knowledge to support the training outcomes related to Marin Engineering at the Operational Level. This course description provides the background knowledge and practical work to support.
- Maintaining the seaworthiness of the ship

- Maintaining a safe engineering watch
- Operating main and auxiliary machinery and associated control systems
- Operating fuel, lubrication, ballast and other pumping systems and associated control systems

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
19.	**Principle of 4 stroke diesel engines**	- Introduction to 4 stroke diesel engine - State the 4 stroke diesel engine fundamentals - Draw and explain timing diagram, indicator card - Explain engine cycle - Define overlap period and show it on timing diagram - Explain the effect of overlap period.	**Week 1,2,3**
20.	**Principle of 2 stroke diesel engine**	- Introduction to 2 stroke diesel engine. - Explain two stroke diesel engine cycle. - Explain and draw 2 stroke timing diagram and power card. - Explain engine cycles - Explain why cross head fitted.	**Week 4,5,6**
21.	**Compare between cross head engine and trunk piston**	- Explain cross head and trunk piston engine - Compare between 2 stroke engine and 4 stroke engine - Explain why over lap period more effective in 4-stroke. - State the advantages and disadvantages of 2 stroke engines - State the advantages and disadvantages of 4 stroke engines	**Week 7,8,9**
22.	**Power calculation for 2 stroke and 4**	- Explain how the indicated card taken. - Explain the engine indicator. - State the types of indicated cards. - Explain how power is calculated.	**Week 10,11,12**

	stroke engines	- Solve some examples on power calculation.	
23.	**Type of scavenging (loop, uniflow, cross)**	- Define scavenge efficiency. - Explain the scavenging process. -Explain the types of scavenge uniflow, cross and loop in 2- stroke cross head engine. -Compare between all type of scavenging. - State the advantages and disadvantages of all type of scavenging. - State the advantages of turbo-charging system. - Explain T/C pulse system. - State the advantages and disadvantages of T/C pulse system. - Explain T/C constant pressure system. - State the advantages and disadvantages of T/C constant pressure system. - Explain the construction of turbo charger.	**Week 13,14,15**

Evaluation Strategies:

Exams Name	Percentage	**Date**
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Teaching Methodology:

This module will be taught using available resources including: lectures, data show and materials uploaded to the e-learning system.

Text Books & References:

Text Books

- Motor Engineering Knowledge for Marine Engineer reeds 12 & AMETC Notes Prepared by Lecture Engineer.

REFERENCE BOOKS

- Motor engineering knowledge for marine engineer reeds 12 by Thomas D. Morton & Leslie Jackson, revised by Anthony S. prince
  Published By: Thomas reed publication, reprint 1999
- Marine low speed diesel engines by Dr. Denis Griffiths
  Published by: IMarEST, 2004
- Marine medium speed diesel engine by Dr. Denis Griffiths
  Published by: IMarEST, 2004

Engineering Program

Specialization	Maritime Science- Marine Engineer diploma
Course Number	020701353
Course Title	Marine Diesel Engines2
Credit Hours	(3)
Theoretical Hours	(3)
Practical Hours	(0)

Brief Course Description:

The course description has been designed in accordance to the IMO model course (7.04) (2014 edition) **Function 1 and the STCW conventions as amended in Manila to prepare a marine Engineering student with the requirements for knowledge, understanding and proficiency in table** A-III/1 of the STCW**. related to maritime sciences.**

This course introduces the main concepts that are concerned with selecting, implementing and discusses.

1- Cooling water system
2- Fuel oil system
3- Lubricating oil system
4- Air starting system
5- Engine parts
6- Engine safety (scavenge fire, crank case explosion
7- Air compressor

Course Objectives

This course covers the requirements of STCW code, chapter III, Section A-III/1. This functional element provides the detailed knowledge to support the training outcomes related to Marin

Engineering at the Operational Level. This course description provides the background knowledge and practical work to support.
- Maintaining the seaworthiness of the ship
- Maintaining a safe engineering watch
- Operating main and auxiliary machinery and associated control systems
- Operating fuel, lubrication, ballast and other pumping systems and associated control systems

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
24.	**Cooling water system**	- Draw and explain jacket water cooling system. - Find out why marine diesels engine cooled. - Explain the use of each item in the circuit. - State the alarms fitted on system	**Week 2و1**
25.	**Fuel oil system**	- Draw and explain fuel oil system for engine using H.F.O. & D.O. - Explain the use of each item in the circuits. - Explain some of fuel specification	**Week 4و3**
26.	**Lubricating oil system**	- Draw and explain L.O system. - Explain the lubricating oil system for tow stroke cross head engine. - Explain the lubricating oil system for 4- stroke engine (trunk piston).	**Week 6و5**
27.	**Air starting system and engine operation**	- State the methods of starting any diesel engine. - Sketch & describe an air starting system for marine diesel engine using compressed air. - Explain the methods of reversing any diesel engine. - Apply the theoretical lecture in the work shop	**Week 9و8و7**
10.	**Engine parts**	- Describe the main diesel engine construction. **Bed plate:** - Define the bed plate. - State the purpose of bed plate. - Explain the types of bed plate.	**Week 12و11و10**

		Chocks: - Define the chocks. - Explain the types of chocks. **holding down bolts:** - Define the holding down bolts. - Explain the purpose of holding down bolts. **Bearing:** - State the purpose of bearing. - Describe the types of bearing. - Describe the bearing material. - State the excessive clearance for bearing. - State the insufficient clearance for bearing. **Tie Bolts:** - Define the tie bolts. - State the purpose of tie bolts. - State the re-tightening check for bearing. **A-Frame:** - Define the A-Frame. **Jacket:** - Define the jacket. **Cylinder liner:** - Define the cylinder liner. - State the object of cylinder liner lubrication. - explain how the cylinder liner lubricates for Trunk Engine. - explain how the cylinder liner lubricates for cross head Engine. - State the condition of fitting the cylinder lubricator Quills in the. cylinder liner for cross head Engine. - State the effects of insufficient lubrication. - State the effects of excessive lubrication. - State why cylinder liner lubrication should be increased when liner is. new - State which causes of cylinder liner wear. - State where and why the maximum wear occurs. - State how to minimize cylinder liner wear. **Piston:** - Define the piston. - State the piston Function.	

		- Describe the piston in trunk engine. - Explain how the piston is lubricated and cooled in trunk engine. - State the advantages of piston skirt in trunk engine. - Describe the piston in crosshead engine. - State the advantages of piston skirt in crosshead engine. - Explain how the piston is cooled in crosshead engine. - State the purpose of piston cooling in crosshead engine. - State the advantages of piston oil cooling in crosshead engine. - State the disadvantages of piston oil cooling in crosshead engine. - State the advantages of piston water cooling in crosshead engine. - State the disadvantages of piston water cooling in crosshead engine. - Explain the crosshead. - State the methods of crosshead lubricating. - Explain the piston gland (stuffing box). - State the purpose of piston gland (stuffing box). - State the advantages of diaphragm plate. - State the type of connecting rods. - State the methods of fitting the connecting rods in V- type engine. - State the advantages of piston rings. - State the types of piston rings. - State the methods of manufacturing the piston rings. - State the material used in piston rings. - State the type of piston rings closing shapes. - State the type of piston rings clearances. - State the indication of piston rings defects. **Crankshaft:** - Describe the crankshaft. - State crankshaft types regarding their	

		construction. - State the object of crankshaft deflection. - State when crankshaft deflection can be taken. - Explain how is the crankshaft deflection taken. **cylinder head:** - Define the cylinder head. - State the indication of cylinder head cracks. - Explain air starting valve. - Explain cylinder relief valve. - Explain and state fuel valves types (Injectors). **Exhaust valve:** - State exhaust valve function. - State types of exhaust valves. - Explain exhaust valve cooling. - State the of exhaust valve cooling. - Explain the exhaust valve tappet clearance. - State the methods of exhaust valve spindle rotation. - State the advantages of exhaust valve rotation. - State the indications of exhaust valve leaking (blow by). **Camshaft:** - Explain the camshaft. - State the methods of camshaft drive. - State the camshaft speed compared crankshaft for 2-stroke & 4- stroke	
11.	**Engine safety (scavenge, crank case explosion)**	**Crank case explosion:** - Explain crank case explosion & how to avoid and causes of hot spot. - State the indication of hot spot. - Explain the procedures taken if hot spot detected. - Explain crank case explosion oil mist detector. - Explain crank case relief valve. **Scavenge fire:**	**Week 13و14**

		- Explain scavenge fire & how to avoid and causes. - State the indication if scavenge fire. - State the procedures taken when scavenge fire detected. - State the types of safety devices are fitted on scavenge manifold.	
12.	**Air compressor**	**- Air compressor:** - Explain isothermal, adiabatic and polytypic compression. - State the types of air compressor. - Explain P-V diagram for one stage air compressor. - Explain actual air compressor cycle 1st and multi stage. - Define volume clearance (pumping clearance) and its purpose. - State how the volume clearance it can be measured by. - State Advantage of multi stage air compressor. - State the Safety devices fitted on air compressor. - Define volumetric efficiency. - State the factors affecting volumetric efficiency. - State the difference between rotary and reciprocating air compressor. - Explain the different fittings on air receiver. - Explain why we are using air receiver. - Explain how you start and stop the air compressor manually. - Explain how the compressor run auto using pressure switch**.**	**Week 16&15**

Evaluation Strategies:

Exams Name	Percentage	Date
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Teaching Methodology:

This module will be taught using available resources including: lectures, data show and materials uploaded to the e-learning system.

Text Books & References:

Text Books

- Motor Engineering Knowledge for Marine Engineer reeds 12 & AMETC Notes Prepared by Lecture Engineer.

REFERENCE BOOKS

- Motor engineering knowledge for marine engineer reeds 12 by Thomas D. Morton & Leslie Jackson, revised by Anthony S. prince
  Published By: Thomas reed publication, reprint 1999
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  Published by: IMarEST, 2004
- Marine medium speed diesel engine by Dr. Denis Griffiths
  Published by: IMarEST, 2004

Engineering Program

Specialization	Maritime Science- Marine Engineer diploma
Course Number	207013440
Course Title	Marine auxiliary's equipment workshop
Credit Hours	1
Theoretical Hours	0
Practical Hours	2

Brief Course Description:

The course description has been designed in accordance to the IMO model course (7.04) (2014 edition) **Function 3 and the STCW conventions as amended in Manila to provide a marine Engineering student with the requirements for practical knowledge, understanding and proficiency in table** A-III/1 of the STCW**. related to maritime sciences.**

1. Preparation for Work on Machinery & General Maintenance Procedure
2. Pumps
3. valves
4. Heat Exchangers
5. Marine fuel and lubricating Oil Purifiers
6. Boilers
7. Steering Gears CBT. / Hydraulic systems & valves
8. Refrigeration and air conditioning
9. Shaft bearings & seals.
10. Safety: Portable fire extinguishers, Hydrants, hoses & nozzles.
11. Pollution prevention: Oily water separator, oil record book & SOPEP.

Course Objectives

This course covers the requirements of being competence on the above-mentioned proficiencies as per STCW code, chapter III, Section A-III/1. This functional element provides the detailed knowledge to support the training outcomes related to Marin Engineering at the Operational Level. This course description provides the background knowledge and practical work to support.

- Auxiliary essential systems onboard
- Basic principles steering gears and ship propulsion.
- Maintaining the seaworthiness of the ship
- Maintaining a safe engineering watch
- Operating main and auxiliary machinery and associated control systems
- Operating fuel, lubrication, cooling water systems
-

For training outcome for Auxiliary Machinery ideally this will be give experience similar to that which will be repeated at sea. Correct lifting techniques will be essential. Trainees should be encouraged to use the Auxiliary Machinery builders' instruction manual.

Bearing clearances should be checked by using a lead wire and a micrometer, and particular reference made to manufacturers' instruction manuals.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
28.	**Preparation for Work on Machinery & General Maintenance Procedure**	**- Preparation for Work on Machinery** The following sections involve supervised student activity on items of machinery together with their principal components which are included so that trainees may gain further experience in a similar manner to that covered by the above theoretical subjects ensures that the unit is isolated from its power supply pressure brake, gas etc. and from the system within which it is installed - identifies the nature of any fluid in the unit/system secures warning notices and fits blanking plates as appropriate makes an appropriate entry in the "log book" safely relieves the unit of residual pressure confirms that pressure has been relieved from the unit drains the unit of fluid having taken precautions according to the above objective ensures that any spillages do not present a hazard **- General Maintenance Procedure** dismantles the unit according to instructions erects staging to provide access and a safe working platform selects and uses correct spanners, to	**Week 1&2**

		include: ring socket open-jaw -box adjustable selects and uses correct screwdrivers breaks seals and joints, using: wedges drifts jacking screws ascertains that all lifting gear is certified for use and properly maintained estimates or obtains the weight of components to be filled ensures that the lifting gear is of adequate capacity lifts machinery and components, employing correct techniques, using: eye bolts shackles slings chain blocks pull lifts hydraulic jacks cranes lifts components manually, using safe postures and techniques transports machinery, using: rollers trolleys cradles examines components, taking measurements as appropriate, and reports on their condition referring to: wear corrosion erosion clearances	

		cleanliness marine growth scale silt other deposits carbon damage failure lubrication cooling passages glands and seals anodes protective coatings renews components as appropriate corrects any malfunctioning lubricates as appropriate reassembles components checks and adjusts running clearances cuts new joints or gaskets fits seals packs glands locates screws applies jointing compound as appropriate correctly lines up covers - uses fit bolts or dowels for correct location tightens cover bolts in correct sequence applies correct tightening torque to nuts applies pressure tests as appropriate opens air vents charges with working fluid replaces guards, shields, etc. checks free movement of moving parts by hand runs unit off-load	

		runs unit on-load makes unit available for use, removing blanks, notices, etc. makes appropriate entry in the "log book"	
29.	**Main Air compressor**	dismantles, examines and replaces or repairs as found necessary: - suction and delivery valves and seats - piston and rings - glands/seals - relief valves and bursting discs - coolers and cooling passages - lubricating oil system - drains	**Week 3&4**
30.	**Pumps & piping systems &Valves**	- Dismantling and assembling of a centrifugal pump showing all parts & components (Volute casing, shaft, impeller, wear & seal ring, clearances, sleeve, gland packing or mechanical seals, …. etc.) - Assembling & dismantling of a multi-stage pump showing impeller diffusers and all other parts. - Practice the disassembling and assembling of piston, gear, screw & vane positive displacement pumps; showing principle of operation, bushes, side plates casing, valves & clearances. - Show how suction may be failed in a centrifugal pump; when (-Hss) is high as the effect of N.P.S.H. and when reversing direction of rotation. ***<u>Centrifugal Pumps</u> (Fitted with a Means of Air Extraction)*** *(Supervised Student Activity)* – dismantles - casing - impeller - wear rings - shaft - bearings	**Week 5&6**

		- gland/seal - air pump - float chamber – examines and measures all parts for wear and deterioration - re-fits, checking, clearances – replaces and adjusts seals ***<u>ReciprocatingPumps</u>*** *(Supervised Student Activity)* *R1* – dismantles: - cylinders - piston buckets – - rings - valves – joins - glands - relief valves – measures wear in cylinders, neck rings and rods; checks ring gaps – machines and/or grinds in valves and seats – removes gland packing – selects and fits new gland packing ***<u>Screw And Gear Pumps</u>*** *(Supervised Student Activity)* – dismantles: - rotors and gears - seals - bearings - relief valve – examines for wear and deterioration - re-fits, checking end clearances and backlash	

		- replaces and adjusts seals **<u>Pipes</u>** (Supervised Student Activity) - Dismantling and assembling flanges of pipe connection with many types of gaskets. - Assembling of valve body into a piping system either with gaskets and studs or threaded type. - Show expansion joints fitted on a pipe. - Stripping out of strainers & filters fitted on a system (simplex & duplex) showing the vent & drain cocks. - Assembling (T), elbow & spectacle flange connections. - Dismantle and assemble glob, gate, butter-fly, ball & non-return valves. - Repacking of valve gland seal different types. - Lapping of valve disc & seat - Show the size and type of valves by the letters written on the body. - identifies contents of pipe - isolates a section of pipe - relieves pressure and drains the section - dismantles flanges, screwed connections, etc. - cleans and inspects intemally - cleans and prepares joint faces for reassembly - selects and applies appropriate jointing material - reassembles - tests hydraulically - checks pipe supports - ensures adequate - checks lagging	

		- checks shrouding - identifies correct colour coding on pipe ***Valves (Supervised Student Activity)*** (To include all types, including safety valves, water level gauges and other boiler mountings, steam traps, drains, quick-closing valves, relief valves) - examines seats, valves, spindles, glands - machine valves and seats - beds in valves on seats, using grinding paste - removes old gland packing - selects correct gland packing - repacks glands tests	
31.	**Marine Boilers**	13. Show students where the boiler specifications written on name plate & what each means. 14. Show students the boiler construction of any fire or water tube. 15. Show how automatic firing control logic / boiler safety alarms & shut down devices. 16. Show boiler mountings (fittings) at shell. 17. Show how test & setting of safety valve: 10% press accumulation test, 3% set opening pressure test. 18. Burner dismantling showing nozzles, dampers, servo-motors, spark, photo-cell…etc. 19. Show students the gas & water sides and if accumulative fouling present. 20. Show & practice the water treatments importance: External & internal treatment helping the idea about boiler water tests. 21. Show the steam service system.	**Week 7&8**

32.	**Refrigeration and air condition**	14. Show students the main components on a refrigeration system (split units out-door & in-door): Function & definition of each. 15. Show compressor hermetic type as a sample. 16. Show expansion valve several types. 17. Condensers & evaporators are covered in the training section for heat exchangers. 18. Show other accessories in the plant; Filter/dryer, solenoid valves, sight glass, thermostat, thermo-bulb, and pressure switches (LP, HP, diff. press.). 19. Show how to apply the main methods for refrigerant Leak detection (Soap with sponge, propane gas, and electronic device). 20. Show how the plant is charged by Freon gas and the effect of overcharging & air in the system. 21. Just show safety devices that prevent carryover of liquid. 22. Show air condition system components (Air Handling Unit) similar to fridge unit (Filters, heater, evaporator, humidifier, fan, diffuser louvers & dampers.	**Week 9&10**
33.	**Steering Gears**	6. Show the students all steering gear components & operation using CBT. 7. Show the function & use of each system component where applicable : • Telemeter (Transmitter & receiver) model hydraulic jack or cylinder; any available type: completely hydraulic, Electro-hydraulic& completely electric. • Hunting gear or floating lever as a model: idea & function. • Actuators Hydraulic cylinder connected to rudder model. • Hydraulic valves several types (example:	**Week 11**

		4-potrs/Two positions).	
34.	**Heat Exchangers & Fresh water generator**	**Heat Exchangers (Supervised Student Activity)** – dismantles and examines: - for leakage – - for corrosion - for erosion - for fouling – checks provision for tube expansion: - descales - replaces tubes - plugs tubes - secures tube tightness in tube plates - checks means of reducing corrosion – fills and tests - Show the differences between both types of heat exchangers; Tube & Shell, Plate types from the appearance externally. - Dismantling & assembling of tube/shell type HE showing the construction & parts (shell, tube plates, tubes, stack, baffles, side covers, zinc anodes, tell-tale expansion joint, vent & drain cocks…etc.) - Dismantling & assembling of plate type HE showing the construction & parts (pairs of titanium plates, seals, frames, collecting studs, zinc anodes, tell-tale , vent & drain cocks, variable capacity…etc.) - Practice the cleaning methods (Mechanical and chemical) for both types. - Show how leak is detected & how remedy is conducted & carried out by conical plugs.	**Week 12**
35.	**Marine fuel and lubricating oil**	- Show fuel & lubricating oil treatment methods: 1. Gravitation in a settling tank; usage, function & its fittings. 2. Filtration via auto-clean filter.	**Week 13**

		3. Purification via purifier : operating & displacement water and de-sluddging procedure - Operation schedule for Clarification & purification by dynamic means. - Dismantling and assembling of purifier showing main components (Bowl & its hood, distributer, discs, tip plate disc cover, operating water, displacement water, worm & worm wheel, bearings and seals, attached pumps, clutch, break friction pads, sheer pin….etc.	
36.	**Shafting and propellers**	10. Show screw propeller concept and its individual expressions. 11. Show fixed propellers controllable pitch propellers models. 12. Conduct shaft alignment between two flanges. 13. Dismantle and assemble shaft bearing of a small shaft, showing its lip seals, shell or ball/roller bearings.	**Week 14**
37.	**Fire and Safety**	11. Show Portable fire extinguishers all types (Water, foam, dry powder & CO2). 12. Show Fire detecting equipment, types of fire detectors & horn/buzzer. 13. Show hydrants, hoses & nozzles on a hose reel cabinet.	**Week 15**
11.	**Pollution Prevention**	11. Filling of oil record book as marpol document as per codes, location and dates. 12. Dismantling and assembling Oily water separator, showing filters, capacitance probe, solenoid valves, data logger, tapping valves & oil content monitoring device.	**Week 16**

Evaluation Strategies:

	Percentage	Date
Experiments	**20%**	…../…../….
Midterm exam	**30%**	…../…../….
Final exam	**50%**	…../…../….

Teaching Methodology:

This module will be taught using available resources including: A classroom equipped with an overhead projector and a blackboard, lectures, data show, materials uploaded to the e-learning system and A workshop is required equipped with an overhead crane and a range of maintenance tools. Services such as Main Air compressor, Pumps, pumping system &Valves , Marine Boilers, Refrigeration and air condition, Steering Gears, Heat Exchangers, fresh water generator, main shafting and propeller, marine fuel and lubrication oil, safety and pollution prevention, Marine auxiliaries systems .

Teaching aids (A)

A1 Instructor Guidance

A2 Manufacturer's Manuals

Manufacturers' instruction manuals and handbooks are the main source of information in instructing the correct procedures in dismantling, inspection and assembly of the specific items of machinery listed.

A3 Video cassette player

Text Books & References:

Text Books

- General Engineering Knowledge Vol-8

REFERENCE BOOKS

- Introduction to Marine Engineering

Engineering Program

Specialization	Marine Engineering
Course Number	020701235
Course Title	Marine Control Workshop
Credit Hours	1
Theoretical Hours	0
Practical Hours	2

Brief Course Description:

Actuating a hose reel (hydraulic motor) Developing an energy-saving circuit (bypass circuit) Lifting heavy loads (flow divider) Optimizing the lift (flow divider and pressure-relief valves) Increasing advancing speed (bypass circuit) Reducing manufacturing time (rapid traversing circuit) Moving a cylinder in the event of a pump failure (hydraulic reservoir) Clamping a gear-unit housing (clamping with reservoir) Compensating increased volumetric flow requirements (rapid traversing with reservoir) Using a flow control valve for the forward and return strokes (rectifier circuit) Adjusting clamping force (pressure regulator) Comparing various pressure limiting valves (comparison: pressure-relief valve versus pressure regulator) Milling material from cylinder heads (pressure sequence control) Switching a cylinder's working pressure (pressure step circuit) Securing a boom arm against inadvertent sinking (pulling load) Pneumatic Symbols Directional Valves Non-Return Valves Actuators, Direct & Indirect Actuation of Cylinder Speed Regulation Logic Control Pressure Control Time Delay Sequential Operation General concept Principle of DC and AC Electronics Batteries Measuring Instruments Air Conditioning Electric circuit and fields Signals and systems Electrical Machines Power systems Protection and switch gears Control systems Electrical and electronic measurements Analogue and digital electronics Power electronic and drives Electronic and control system

Course Objectives

When completing this course, the student should be able to:

1- Practical hydraulic systems: Introduction to hydraulics, Pressure and flow, Hydraulic pumps Hydraulic motors, Hydraulic cylinders, Control components in a hydraulic system, Hydraulic accessories, Hydraulic fluids, Applications of hydraulic systems, Hydraulic circuit design and analysis, Maintenance and troubleshooting, Practical problems, Practical solutions, Valves

2- understand the fundamental concepts of hydraulics. Recognize component symbols and their construction, functioning and applications. identify symbols, trace and analyze circuit diagrams and troubleshoot hydraulic systems logically. learn through sharing of experiences amongst participants. Introduction to concepts of hydraulics and pneumatics Components of hydraulic and pneumatic systems and their representative symbols (ISO 1219) in circuit drawings. Hydraulic pumps - types, working principles and common problems. Pressure, Direction and Flow Control valves and their applications Cartridge Valves Servo / Proportional valves Accumulators -various types, care of, assembling and charging procedure Hydraulic actuators -cylinders / motors - types and working principles Hydraulic oil, reservoirs and filters - functions and importance, ISO 4406 / 11171 contaminant code Study, tracing and analysis of drawings of actual systems on board

3- Troubleshooting hydraulic systems Safety precautions and good watchkeeping practices Practical demonstration of various hydraulic equipment -Direction / Pressure & Flow control valves, Pumps, Filters and Accumulators etc. Extensive practical exercises on the Trainer Panel- use of various components to form working circuits and locate faults induced therein.

4- understand the need for safe isolation and be able to apply safe working practices when working with pneumatic and electro-pneumatic systems understand schematics demonstrate relevant underpinning knowledge (units, pressure, forces, etc.) identify, inspect, adjust and replace: sensors (pneumatic valves and electrical switches, proximity sensors and switches) valves (air and solenoid operated, sequence, directional control) actuators (cylinders and rotary) AND / OR elements, relays, timers, flow controls and quick exhausts use visual indicators and manual overrides to check operation of components carry out repairs to pneumatic systems, replace fittings, plastic pipe-work, etc. use pneumatic circuit drawings as an aid to systematic fault-finding understand how PLCs are interfaced and used to control pneumatic systems. understanding of pneumatics diagrams (diesel engine pneumatics, watertight doors)

When completing this course, the student should be able to:

1- **General**
- Concept of Electricity-generation, Transmission, Distribution and utilization, Electronics and communication.

2- **Principle of direct and alternating current and circuits**
- Production of direct and alternating current, concept of frequency and wave form, instantaneous maximum and average values, form factor for sinusoidal wave.
  Concept of phase and phase difference.
- Re-presentation of alternating quantities by phasors. D.C. and A.C. Circuits, concept of resistance, inductance, capacitance. Power and power factor. Alternating voltage applied to resistance and inductance in series and RLC series/parallel circuits, practical importance of power factor. Simple problems on A.C. Circuits. Concept of three phase system, star delta connection, voltage and current relationship. Simple problems.

3- **Electronics**
- Principle of working of electronic rectifier, full wave and half wave, rectifiers, coarse and fine controls, relationship between D.C. output and A.C. input voltage, ripple, effect of capacitor/inductor input filters on the ripple, voltage stabilization by Zener diode.

4- **Batteries**
- Arrangement of cells, construction of lead acid batteries and S.M.F. batteries, Ampere hour and watt. hour efficiency, simple problems. Battery charging and necessary precautions.

5- **Measuring Instruments**
- Electrical properties and instruments for their measurement. Working principles and construction of following measuring instruments including their errors and accuracy. Simple problems Ammeters, volt meters (moving coil and moving iron type) different between volt meter and Ammeter. Extension of range of A.C. & D.C. instruments.

Watt meters and energy Meter. Difference between watt meter and energy meter. Use of multi-meter, ohm meter, megger, earth tester etc.

6- **Air-conditioning** and Reefers
- Principle of A.C., Refrigerating, Refrigeration components and controls.

7- **Electric Circuits and Fields**
- Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's, Norton's and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits.
- Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

8- **Signals and Systems**
- Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and casual systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

9- **Electrical Machines**
Single Phase transformer equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers connections, parallel operation; auto-transformer; energy conversion principles; DC machines types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors principles, types, performance characteristics, starting and speed control; Single phase induction motors; synchronous machines performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

10- **Power Systems**
- Basic power generation concepts; transmission line models and performance; cable performance insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis.

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	Task No 1	5 hour
2	Task No 2	5 hour
3	Task No 3	5 hour
4	Task No 4	4 hour
5	Task No 5	4 hour
6	Task No 6	4 hour
7	Task No 7	4 hour
8	Task No 8	4 hour
9	Task No 9	5 hour
10	Task No 10	5 hour

Evaluation Strategies:

Exams Name	Percentage	Date
Tasks	20%	…../…../….
Med term practical	30%	…../…../….
Final Exam	50%	…../…../….

Teaching Methodology:

- **Simulator Engineer**
- **Data how Presentation**
- **Workshop**
- **Full Motion Engine Room Simulator**

Text Books & References:

Hydraulics and Pneumatics: A Technician's and Engineer's Guide 3rd Edition, Kindle Edition

Engineering Program

Specialization	Maritime Science- Marine Engineer diploma
Course Number	207013540
Course Title	Marine Diesel Engines Workshop
Credit Hours	1
Theoretical Hours	0
Practical Hours	2

Brief Course Description:

The course description has been designed in accordance to the IMO model course (7.04) (2014 edition) **Function 3 and the STCW conventions as amended in Manila to provide a marine Engineering student with the requirements for practical knowledge, understanding and proficiency in table** A-III/1 of the STCW**. related to maritime sciences.**

1. Preparation for Work on Machinery & General Maintenance Procedure
2. Overhauling the main engine parts
3. To find any defects in engine components
4. How to use the required and different tools for the required job
5. How to do different components calibrations
6. How to do the job according to manuals
7. Over hall main engine cylinder head
8. Over hall main engine piston
9. Crank case inspections, fuel injection pump, T/C and air compressor

Course Objectives

This course covers the requirements of being competence on the above mentioned proficiencies as per

STCW code, chapter III, Section A-III/1. This functional element provides the detailed knowledge to support the training outcomes related to Marin Engineering at the Operational Level. This course description provides the background knowledge and practical work to support.

For training outcome for Diesel Engines ideally this will be a large multi-cylinder four-stroke engine which would give experience similar to that which will be repeated at sea. Correct lifting techniques will be essential. Trainees should be encouraged to use the engine builders' instruction manual. Diesel engine cylinder liner wear should be determined by measuring the diameter of the cylinder at the position the piston rings take up when the piston is at top dead centre, using an inside micrometer and a specially made guide or jig to ensure that repeated measurements are taken at a similar position.

Bearing clearances should be checked by using a lead wire and a micrometer, and particular reference made to manufacturers' instruction manuals.
Trainees should check the crankshaft alignment by taking deflection readings, using a special micrometer dial comparator. The readings should be taken when the crank webs are vertical and horizontal.

- Maintaining the seaworthiness of the ship
- Maintaining a safe engineering watch
- Operating main and auxiliary machinery and associated control systems
- Operating fuel, lubrication, cooling water systems

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
38.	**Preparation for Work on Machinery & General Maintenance Procedure**	**- Preparation for Work on Machinery** The following sections involve supervised student activity on items of machinery together with their principal components which are included so that trainees may gain further experience in a similar manner to that covered by the above theoretical subjects ensures that the unit is isolated from its power supply pressure brake, gas etc. and from the system within which it is installed – identifies the nature of any fluid in the unit/system secures warning notices and fits	**Week 1&2**

		blanking plates as appropriate makes an appropriate entry in the "log book" safely relieves the unit of residual pressure confirms that pressure has been relieved from the unit drains the unit of fluid having taken precautions according to the above objective ensures that any spillages do not present a hazard **- General Maintenance Procedure** dismantles the unit according to instructions erects staging to provide access and a safe working platform selects and uses correct spanners, to include: ring socket open-jaw -box adjustable selects and uses correct screwdrivers breaks seals and joints, using: wedges drifts jacking screws ascertains that all lifting gear is certified for use and properly maintained estimates or obtains the weight of components to be filled ensures that the lifting gear is of adequate capacity lifts machinery and components,	

		employing correct techniques, using: eye bolts shackles slings chain blocks pull lifts hydraulic jacks cranes lifts components manually, using safe postures and techniques transports machinery, using: rollers trolleys cradles examines components, taking measurements as appropriate, and reports on their condition referring to: wear corrosion erosion clearances cleanliness marine growth scale silt other deposits carbon damage failure lubrication cooling passages glands and seals anodes protective coatings renews components as appropriate corrects any malfunctioning lubricates as appropriate reassembles components	

		checks and adjusts running clearances cuts new joints or gaskets fits seals packs glands locates screws applies jointing compound as appropriate correctly lines up covers - uses fit bolts or dowels for correct location tightens cover bolts in correct sequence applies correct tightening torque to nuts applies pressure tests as appropriate opens air vents charges with working fluid replaces guards, shields, etc. checks free movement of moving parts by hand runs unit off-load runs unit on-load makes unit available for use, removing blanks, notices, etc. makes appropriate entry in the "log book"	
39.	**Know all engine parts name & Over hall main**	- Know all engine parts name -Shut and drain cooling water, shut fuel on the unit -Disconnect all cylinder head connections to cylinder head	**Week 3,4&5**

	engine cylinder head	-Dismantle rocker arms and push rods -Remove all cylinder head bolts -Dismantle cylinder head -Dismantle all cylinder head fittings (exhaust, air inlet valves, relief valve, fuel valve -Clean all exhaust, air water passages -Check cylinder head for cracks -Strip exhaust and air inlet valves, check and clean all valves parts Make lapping for seats and spindles, check them for wear and then Re-assemble the valves, over hall relief valve -Strip fuel valve, clean all valve parts, check needle valve ,check atomizer holes for wear, test the valve for opening pressure and leakage, lap the valve pocket in the cylinder head - Re-assemble the cylinder head, tight the cylinder head bolts according to the tightening pressure, fit the fuel valve, push rod, rocker arms, check exhaust, and air inlet valves tappet clearance -Connect all cylinder head connections -Open water, fuel and check for any leaks	
40.	**Over hall main engine piston**	-Shut drain cooling water, shut L.O, fuel -Dismantle all the connections to cylinder head -Dismantle rocker arms, push rods, remove cylinder head bolts And dismantle cylinder head -Clean the liner top side for any carbon -Turn the engine to T.D.C -Fix the piston lifting tool and connect it to the chain block	**Week 6&7**

		-Dismantle the bottom end bearing and lift the piston -Put the piston on its stand -Remove and clean piston rings -Clean and inspect piston groove -Remove piston pin and check top end bearing -Check the bottom end bearing for any wear and scratches -Check piston for wear and any cracks -Check piston rings clearances with piston grooves -Check the condition of cylinder liner -Check the cylinder liner wear	
41.	**fuel injection pump**	-Dismantle fuel injection pump -Strip the pump and check the plunger, helix , barrel, seal -Check these parts for wear, erosion	**Week 8**
42.	**Turbocharger**	– dismantles: - air filter - air casing - inducer (if fitted) - impeller - volute - diffuser - gas inlet grid - nozzle ring - rotor - bearings – examines all parts for wear and deterioration, paying particular attention to: - erosion in the air side - erosion in the turbine nozzles and in the blades - corrosion of the gas casing - hard deposits	**Week 9&10**

		- damage to blading - condition of bearings - condition of labyrinths - obstructions in the bleed and sealing passages - lubrication system – reassembles and checks clearances	
43.	**Cooling water system Maintenance**	- Draw and explain jacket water cooling system. - Find out why marine diesels engine cooled. - Explain the use of each item in the circuit. - State the alarms fitted on system	**Week 11**
44.	**Fuel oil system Maintenance**	- filters - purifiers - bearings - settling-tanks - tank contents gauges	**Week 12**
45.	**Lubricating oil system Maintenance**	- filters - purifiers - bearings - settling-tanks - tank contents gauges	**Week 13**
46.	**Crank case inspection**	-Stop main L.O pump -Open crank case doors for ventilations -Make work permit -Make hammer test -Remove main bearing -Check bearing clearances -Check cam shaft cams for any wear and timing -Check driving gears for any wear -Take crank shaft deflection	**Week 14**
12.	**Air compressor**	dismantles, examines and replaces or repairs as found necessary: - suction and delivery valves and seats	**Week 15&16**

		- piston and rings - glands/seals - relief valves and bursting discs - coolers and cooling passages - lubricating oil system - drains	

Evaluation Strategies:

	Percentage	Date
Experiments	**20%**	…../…../….
Midterm exam	**30%**	…../…../….
Final exam	**50%**	…../…../….

Teaching Methodology:

This module will be taught using available resources including: A classroom equipped with an overhead projector and a blackboard, lectures, data show, materials uploaded to the e-learning system and A workshop is required equipped with an overhead crane and a range of maintenance tools. Services such as Marine Diesel Engine large four stroke, diesel engine cylinder heads, complete with fittings, fuel injection pump, T/C, compressed air, Lubricating oil system, fuel oil system and cooling water system.

Teaching aids (A)

A1 Instructor Guidance

A2 Manufacturer's Manuals

Manufacturers' instruction manuals and handbooks are the main source of information in instructing the correct procedures in dismantling, inspection and assembly of the specific items of machinery listed.

A3 Video cassette player

Text Books & References:

Text Books

- Motor Engineering Knowledge for Marine Engineer reeds 12 & AMETC Notes Prepared by Lecture Engineer.

REFERENCE BOOKS

- Motor engineering knowledge for marine engineer reeds 12 by Thomas D. Morton & Leslie Jackson , revised by Anthony S. prince
  Published By: Thomas reed publication, reprint 1999
- Marine low speed diesel engines by Dr. Denis Griffiths
  Published by: IMarEST, 2004
- Marine medium speed diesel engine by Dr. Denis Griffiths

Engineering Program

Specialization	Marine Engineering
Course Number	207012410
Course Title	Introduction to marine chemistry
Credit Hours	3
Theoretical Hours	2
Practical Hours	2

Brief Course Description:

Chemistry for Marine Engineering detail syllabus for Marine Engineering (Marine), The knowledge gained on various aspects of water chemistry, energy sources and nano chemistry will provide a strong platform to understand concepts on these subjects for further learning.

Course Objectives

On Completion of the course the Students are expected to

- Have a thorough knowledge of Boiler Chemistry and Feed Water Treatment methods.
- Have a knowledge of various Water Hardness analysis procedures
- Have a basic concept on Nano chemistry.

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	Water Treatment Processes Lime and Soda treatment, zeolites process and ion exchange (demineralization) – pH treatment, salinometer, use of litmus paper, test for partial, total alkalinity, chloride, sulphatic, phosphate test, caustic soda treatment, condensate lime treatment. Desalination of water, reverse osmosis and electro dialysis, and control, effects of salts and gases in feed water.	15 hour
2	Boiler Chemistry Purpose of water treatment in boilers, scale and sludge formation and prevention, priming and foaming- Boiler corrosion – fretting, pitting corrosion, corrosion fatigue, atoms and ions, electro chemical corrosion, hydrogen and hydroxyl ions, types and causes of corrosion and its control; chemical and mechanical deareation, methods of chemical deareation, dezincification, stress corrosion.	15 hour
3	Energy Sources and Nano chemistry Introduction – Properties (Electrical, Mechanical and vibration) – carbon nano tubes -Applications in fuel cells, catalysis and use of gold nanoparticles – batteries -secondary batteries – alkaline batteries - lead acid, Ni – Cd and Li batteries, principles and applications of solar cells, fuels cells – Hydrogen and methanol.	15 hour

Teaching Methodology:

- **Lecture.**
- **Data how Presentation**
- **Lab**

Evaluation Strategies:

Exams Name	Percentage	**Date**
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Text Books & References:

1. Jain. P.C. and Monika Jain, Engineering Chemistry, 4th Edition, Dhanpat Rai and Sons, New Delhi, 2002.
2. Milton and Leech, Marine Boilers, Butter Worth Publishers, UK.
3. Shikha Agarwal, Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, 2015.

Engineering Program

Specialization	Marine Engineering
Course Number	207011240
Course Title	Fluid Mechanics
Credit Hours	3
Theoretical Hours	2
Practical Hours	1

Brief Course Description:

Fluids
Hydrostatics
Hydraulics

Course Objectives

When completing this course, the student should be able to:

1- Fluids: The effect of pressure, its relationship to depth of liquid and force, defines a fluid force (newtons) defines pressure, i.e., area (metres2), states that the unit of pressure is the pascal (Pa), states that a practical unit of pressure is 105 newton/m2 and is 1 bar, states that atmospheric pressure is approximately 1 bar, solves problems involving force, area and pressure, states that the pressure at any level in a fluid is equal in all directions, states that pressure acts in a direction normal to a surface, states that the pressure at any level in a liquid depends upon the vertical height to the liquid, surface (its head) and the density of the liquid, explains in simple terms what is meant by: atmospheric pressure, vacuum, partial vacuum, absolute zero pressure, gauge pressure, draws a simple diagram of a: piezometer ,manometer, simple barometer, bourdon pressure gauge, solves simple problems involving 9.8 × head × density.

2- Hydrostatics: states the formulae for the pressure exerted by a liquid at any given vertical depth,

deduce equation F = 9.81 × head × density × area, to give the force on the surfaces of rectangular tank when filled with liquid, defines the effect of 'sounding pipes', 'air release pipes' or other 'standpipes' when containing liquid, defines, with the aid of sketches, a hydraulic lifting machine, applies simple numerical calculations related to the elements in the above objectives

3- Hydraulics: describes the different energies stored in a liquid when in motion as potential energy, pressure energy and kinetic energy, defines the "head of a liquid", states the energy components in a moving liquid in terms of its head, states the expression to give the volumetric flow of liquid as its velocity × cross-sectional area, measured in m3/second, states the expression to give the mass flow of liquid as its velocity × cross-sectional area × density, measured in kilogram/second, solves simple problems concerning the above objectives.

Detailed Course Description:

Unit Number	Unit Name	Needed Time
6	Fluids	15 hour
7	Hydrostatic	15 hour
8	Hydraulic	20 hour

Evaluation Strategies:

Exams Name	Percentage	Date
Med term	40%	…../…../….
Final	50%	…../…../….
HomeWorks	10%	…../…../….

Text Books & References:
Reeds Vol 2: Marine Applied Mechanics ISBN 9781472910578

Engineering Program

Specialization	Marine Engineering
Course Number	207012270
Course Title	Naval Architecture and Ships Construction
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

Theoretical Issue

This course shall discover the following:
Ship dimensions and form
Ship stresses
Ship construction arrangements - Bottom Structure
Ship construction arrangements - Shell Plating and Framing
Ship construction arrangements - Bulkheads and Pillars construction
Ship construction arrangements - Aft End Structure
Ship construction arrangements - Hatch covers
Ship construction arrangements - Structural fire protection
Watertight integrity and watertight doors
Rudder and propellers
Load lines and draught marks

Course Objectives

Theoretical Issue

When completing this course, the student should be able to:

1- Ship stresses: describes in qualitative terms shear force and bending moments, explains what is meant by 'hogging' and by 'sagging' and distinguishes between them describes the loading conditions which give rise to hogging and sagging stresses, describes how hogging and sagging stresses are caused by the sea state, explains how hogging and sagging stresses result in tensile or compressive forces in the deck and bottom structure, describes water pressure loads on the ship's hull, describes liquid pressure loading on the tank structures, calculates the pressure at any depth below the liquid surface, given the density of the liquid, describes qualitatively the stresses set up by liquid sloshing in a partly filled tank, describes racking stress and its causes, explains what is meant by 'pounding' or 'slamming' and states which part of the ship is affected, explains what is meant by 'panting' and states which part of the ship is affected, describes stresses caused by localized loading, describes corrosion, describes the causes of corrosion on board, describes the various methods that are being used to minimize the effect of corrosion.

2- Hull structure: identifies structural components on ships' plans and drawings: frames, floors, transverse frames, deck beams, knees, brackets, shell plating, decks, tank top, stringers, hatch girders and beams, coamings, bulwarks, bow and stern framing, cant beams, breast hooks describes the types of materials that are used in the construction of a ship, describes and illustrates standard steel sections: flat plate, offset bulb plate, equal angle, unequal angle, channel, tee, describes with aids of sketches the longitudinal, transverse and combined systems of framing on transverse sections of the ships, sketches the arrangement of frames, webs and transverse members for each system, illustrates double-bottom structure for longitudinal and transverse framing, illustrates hold drainage systems and related structure, illustrates a duct keel, sketches the deck edge, showing attachment of sheer strake and stringer plate, sketches a radiuses sheer strake and attached structure, describes the stress concentration in the deck round hatch openings, explains compensation for loss of strength at hatch openings, sketches a transverse section through a hatch coaming, showing the arrangement of coamings and deep webs, sketches a hatch corner in plain view, showing the structural arrangements sketches deck-freeing arrangements, scuppers, freeing ports, open rails, illustrates the connection of superstructures to the hull at the ship's side, sketches a plane bulkhead, showing connections to deck, sides and double bottom and the arrangement of stiffeners, sketches a corrugated bulkhead, explains why transverse bulkheads have vertical corrugations and for-and-aft bulkheads have horizontal ones

describes the purpose of bilge keels and how they are attached to the ship's side,

3- Ship dimensions and form: illustrates the general arrangement of the following ship types: general cargo oil, chemical and gas tankers, bulk carriers, combination carriers, container, RO-RO, passenger sketches an elevation and plan views of various ship types such as a general cargo ship, crude oil carrier, and bulker showing the arrangement and illustrate a general knowledge of the primary structural members and indicate the proper names for the various parts to include holds, engine-room, peak tanks, double-bottom tanks, hatchway, tween deck and position of bulkheads, cofferdams, pump-room, cargo tanks, slop tank and permanent ballast tanks, parallel middle body,

4- Rudder and propellers: describes the action of the rudder in steering a ship, reproduces drawings of modern rudders: semi-balanced, balanced and spade, explains the purpose of the rudder carrier and pintles, explains how the weight of the rudder is supported by the rudder carrier, describes the rudder trunk, describes the arrangement of a watertight gland round the rudder stock,

explains the principle of screw propulsion, describes a propeller and defines, compares fixed-pitch with controllable-pitch propellers, sketches the arrangement of an oil-lubricated stern tube and tail shaft, describes how the propeller is attached to the tail shaft, sketches a cross-section of a shaft tunnel for water cooled and oil cooled type, explains why the shaft tunnel must be of watertight construction and how, water is prevented from entering the engine-room if the tunnel becomes flooded.

5- Fitting: describes and sketches an arrangement of modern weather-deck mechanical steel hatches, describes how water tightness is achieved at the coamings and cross joints, describes the cleating arrangements for the hatch covers, describes the arrangement of portable beams, wooden hatch covers and tarpaulins, sketches an oil tight hatch cover, describes roller, multi-angle, pedestal and Panama fairleads, sketches mooring bitts, showing their attachment to the deck, sketches typical forecastle mooring and anchoring arrangements, showing the leads of moorings, describes the construction and attachment to the deck of tension winches and explains how they are used, describes the anchor handling arrangements from hawse pipe to Spurling pipe ,describes the construction of chain lockers and how the bitter-ends are secured in the lockers, explains how to secure anchors and make Spurling pipes watertight in preparation for a sea passage, describes the construction and use of a cable stopper, describes the construction of masts and Sampson posts and how they are supported at the base, describes the construction of derricks and deck cranes describes the bilge piping system of a cargo ship, states that each section is fitted with a screw-down non-return suction valve, describes and sketches a bilge strum box, describes a ballast system in a cargo ship, describes the arrangement of a fire main and states what pumps may be used to pressurize it, describes the provision of sounding pipes and sketches a sounding pipe arrangement, describes the fitting of air pipes to ballast tanks or fuel oil tanks, describes the arrangement of fittings and lashings for the carriage of containers on deck.

6- Bow and stern regions: describes the provisions of additional structural strength to withstand pounding, describes and illustrates the structural arrangements forward to withstand panting, describes the function of the stern frame, describes and sketches a stern frame for a single-screw ship, describes and illustrates the construction of a transom stern, showing the connections to the stern frame.

7- Load lines and draught marks: explains where the deck line is marked, defines 'freeboard', explains what is meant by 'assigned summer freeboard', draws to scale the load line mark and the load lines for a ship of a given, summer molded draught, displacement and tones per centimeter immersion in salt water, explains how the chart of zones, areas and seasonal periods is used to find the applicable load line, demonstrates how to read draughts, explains that the freeboard, measured from the upper edge of the deck line to the water on each side, is used to check that the ship is within its permitted limits of loading, lists the items in the conditions of assignment of freeboard, describes why the height of sill varies between different type of vessels based on Load Line Rules,

Detailed Course Description:

Unit Number	Unit Name	Needed Time
1	Ship stresses	7 hour
2	Hull structure	6 hour
3	Ship dimensions and form	6 hour
4	Rudder and propellers	8 hour
5	Fitting	8 hour
6	Bow and stern regions	6 hour
7	Load lines and draught marks	6 hour

Teaching Methodology:

- **Lecture.**
- **Data how Presentation**

Evaluation Strategies:

Exams Name	Percentage	Date
HomeWorks	10 %	…../…../….
Med term exam theoretical	40 %	…../…../….
Final exam theoretical	50 %	…../…../….

Text Books & References:

3- Ship Construction7th Edition

ISBN: 9780080972398

4- Ships construction 1st edition
Anwar Mahadeen