

# BE (Marine Engineering) Curriculum & Syllabus for the Academic Year 2024-2025

SEMESTER I												
S.No	Course code	Categ ory	Course Title	Contact Hours	L	Т	Р	С	Remar ks			
	THI	EORY		L	1							
1	246EN1A12TC	HS	English and Communication	3	3	0	0	3				
2	246MA1A11TA	BS	Ordinary Differential Equations and Difference Equations	3	2	1	0	2				
3	246PH1A01TB	BS	Material Physics	3	2	1	0	2				
4	241ME1A11TC	BS	Basics of Electrical and Electronics Engineering	3	3	0	0	2				
5	241ME1A11TD	BS	Engineering Mechanics	4	3	1	0	3				
6	241ME1A11TE	BS	Workshop Technology	4	1	1	2	3				
7	241ME1A19TA	VAC	Aptitude and Personality development training-I	2	2	0	0	0				
8	241ME1A18PA	MC	Universal Human Values (	3 Weeks)								
	PRAG	TICAL										
9	246EN1A12PC	HS	English and Communication Laboratory	2	0	0	2	1				
10	246PH1A01PB	BS	Material Physics Laboratory	2	0	0	2	1				
11	241ME1A23PA	ES	Engineering Graphics	4	0	1	3	2				
12	241ME1A11PC	BS	Basics of Electrical and Electronics Engineering Laboratory	2	0	0	2	1				
13	241ME1A18PB	МС	PT/PARADE/GAMES - I	2	0	0	0	0				
		Tota	al	32	16	5	11	20				



		Cata	SEMESTER II						Danala		
S.No	Course code	gory	Course Title	Contact Hours	L	Т	Р	С	Remarks		
			THEORY					-			
1	241MA1A21TE	BS	Calculus	3	3	0	0	2			
2	241ME1A23TA	ES	Marine Electronics	3	2	1	0	3			
3	241ME1A23TB	ES	Marine Electrical Machines - I	3	2	1	0	3			
4	241ME1A21TF	BS	Marine Thermodynamics	3	2	1	0	3			
5	241CH1A21TG	BS	Engineering Chemistry	2	2	0	0	2			
6	242CS1A53TK	ES	Fundamental of Computer and Python Programming	3	2	1	0	2			
			PRACTICAL								
7	241CH1A21PB	BS	Engineering Chemistry Laboratory	2	0	0	2	1			
8	241ME1A23PB	ES	Marine Electronics lab	2	0	0	2	1			
9	241ME1A23PC	ES	Marine Electrical Machines Laboratory	4	0	0	4	2			
10	241ME1A24PA	PC	Marine Workshop – I	6	0	1	5	3			
11	242CS1A53PK	ES	Python Program Laboratory	2	0	0	2	1			
12	241ME1A28PA	МС	PT/PARADE/GAMES - II	2	0	0	0	0			
	Total 33 13 5 15 23										



### SEMESTER III

S.No	Course code	Category	Course Title	Contact Hours	L	Т	Р	С	Remar ks	
			THEORY							
1	241ME1A34TB	РС	Marine Deck Machinery and Equipment	3	3	0	0	2		
2	241ME1A34TD	РС	Marine Refrigeration & Air Conditioning	3	2	1	0	3		
3	241ME1A31TH	BS	Basic Ship Construction	3	3	0	0	2		
4	241ME1A33TC	ES	Marine Electrical Machines - II	3	2	1	0	3		
5	241ME1A33TD	ES	Marine Thermal Engineering	3	2	1	0	3		
6	241ME1A31TI	BS	Fluid Mechanics and Marine Hydraulics	3	2	1	0	2		
7	241ME1A32TB	МС	Gender Sensitivity	2	2	0	0	0		
8	241ME1A34TE	РС	Marine Pumping and piping systems	3	2	1	0	3		
			PRACTICAL							
9	241ME1A33PE	РС	Marine Refrigeration & Air Conditioning Laboratory	2	0	0	2	1		
10	241ME1A33PD	ES	Marine Thermal Engineering Lab	2	0	0	2	1		
11	241ME1A31PI	BS	Fluid Mechanics and Marine Hydraulics Laboratory	2	0	0	2	1		
12	241ME1A34PF	РС	Marine Workshop – II	4	0	0	4	2		
13	241ME1A37PA	IP	Internship – I							
14	241ME1A38PA	МС	PT/PARADE/GAMES - III	2	0	0	0	0		
	Total         33         18         5         10         23									



### **SEMESTER IV**

S.No	Course code	Cate gory	Course Title	Contact Hours	L	Т	Р	C	Remarks
			THEORY						
1	241ME1A43TE	ES	Marine Electrical Measurements and Instrumentation	3	2	1	0	3	
2	241ME1A43TF	ES	Marine Materials	3	2	1	0	3	
3	241ME1A43TG	ES	Mechanics of Machines	3	2	1	0	2	
4	241ME1A41TJ	BS	Naval Architecture-I	3	3	0	0	2	
5	241ME1A44TG	PC	Marine Boilers	3	2	1	0	3	
6	241ME1A42TB	HS	Marine Environmental Protection	3	3	0	0	3	
7	241ME1A44TH	РС	Marine Internal Combustion Engine- I	3	3	0	0	3	
8	241ME1A49TA	VAC	Aptitude and Personality development training-2	1	1	0	0	0	
			PRACTICAL						
9	241ME1A44PI	PC	Marine Workshop –III	4	0	0	4	2	
10	241ME1A44PJ	PC	Marine Engineering Equipment Drawing – I	4	0	0	4	2	
11	241ME1A43PF	ES	Marine Materials Laboratory	2	0	0	2	1	
12	241ME1A48PA	PT/PARADE/GAMES - IV	2	0	0	0	0		
			Total	32	18	4	10	24	



### SEMESTER V

S. No	Subject Code	Category	Course Title	Contact Hours	L	Т	Р	С	Remarks
			THEORY						
1	241ME1A53TH	ES	Marine Electrical Technology	3	3	0	0	2	
2	241ME1A54TK	РС	Marine Auxiliary Machinery – I	3	3	0	0	3	
3	241ME1A54TL	РС	Marine Internal Combustion Engines – II	3	2	1	0	3	
4	241ME1A54TM	РС	Ship Fire Prevention and Control	3	2	1	0	3	
5	241ME1A55TA	PE	Professional Elective-I (Marine steam engineering & Turbines)	3	3	0	0	3	
6	241ME1A52TD	HS	Constitution of India and Merchant Shipping Act	1	1	0	0	0	
7	241ME1A59TA	VAC	Aptitude and Personality development training-3	2	2	0	0	0	
8	241ME1A55TB	PE	Professional Elective-II (Marine Power Generation and Distribution)	3	3	0	0	2	
			PRACTICAL						
9	241ME1A53PH	ES	Marine Electrical Technology Laboratory	2	0	0	2	1	
10	241ME1A54PO	PC	Marine Equipment Drawing – II	3	0	0	3	2	
11	241ME1A54PN	РС	Marine steam plant Laboratory	2	0	0	2	1	
12	241ME1A54PL	PC	Marine Internal Combustion Engine Laboratory	3	0	0	3	2	
13	241ME1A57PB	IP	Internship – II	0	0	0	0	0	
14	241ME1A58PA	PT/PARADE/GAMES - V	2	0	0	0	0		
		Тс	otal	31	19	2	10	22	



### **SEMESTER VI**

S. No	Subject Code	Category	Course Title	Contact Hours	L	Т	Р	С	Remar ks
			THEORY						
1	241ME1A64TQ	РС	Marine Electro Technology	3	3	0	0	2	
2	241ME1A64TR	РС	Marine Auxiliary Machinery – II	3	2	1	0	3	
3	241ME1A64TS	РС	Marine Internal Combustion Engines – III	2	1	1	0	2	
4	241ME1A65TA	PE	Professional Elective-III (Marine Pollution Prevention and Safety)	3	3	0	0	3	
5	242CS1A63TI	OEC	Advanced Computing Science	3	3	0	0	3	
6	241ME1A64TP	РС	Power electronics and electrical Propulsion	3	2	1	0	3	
7	241ME1A61TL	BS	Naval Architecture-II	3	3	0	0	2	
8	241ME1A64TT	РС	Marine Safety Emergency Practices – I	3	3	0	0	3	
9	241ME1A69TA	VAC	Aptitude and Personality development training-4	2	2	0	0	0	
			PRACTICAL						
10	241ME1A64PV	РС	Marine high voltage and Automation lab	2	0	0	2	1	
11	241ME1A65PP	РС	Power electronics and electrical Propulsion Lab	2	0	0	2	1	
12	241ME1A64PM	РС	Fire Fighting Laboratory	2	0	0	2	1	
13	13 241ME1A68PA MC PT/PARADE/GAMES - VI				0	0	0	0	
			Total	31	22	3	6	24	



	1		SEMESTER VII		r						
S. No	Subject Code	Category	Course Title	Contact Hours	L	Т	Р	C	Remarks		
			THEORY								
1	241ME1A75TES	PE	Professional Elective-IV(Marine Control Engineering and Automation)	3	2	1	0	3			
2	241ME1A74TW	PC	Marine Safety Emergency Practices - II	3	3	0	0	2			
3	241ME1A79TA	VAC	Aptitude and Personality development training-5	1	1	0	0	0			
		1	PRACTICAL			1	1				
4	241ME1A74PX	PC	Marine Hydraulics, Pneumatics and Electrical Control System Laboratory	1	0	0	1	1			
5	241ME1A77PC	IP	Project work Phase – I	6	0	0	6	3			
6	241ME1A77PD	IP	Ship-in-Campus – I	18	0	0	18	9			
7	241ME1A77PE	IP	Internship – III								
241ME1A78PA     MC     PT/PARADE/GAMES - VII     2     0     0     0											
Total     32     6     1     25     18											



SEMESTER VIII												
S. No	Subject Code	Category	Course Title	Contact Hours	L	Т	Р	С	Remarks			
			THEORY									
1	241ME1A82TE	HS	International Maritime Organization and International Convention	2	2	0	0	2				
2	241ME1A84TY	PC	Marine Alternate Fuels and Energy Sources.	2	2	0	0	2				
3	241MEIA89TA	VAC	Orientation of competency exams	2	2	0	0	0				
	l	1	PRACTICAL		1	1	1	I				
4	241ME1A87PF	IP	Project work Phase - II	6	0	0	6	3				
5	241ME1A87PG	IP	Ship-in-Campus - II	20	0	0	20	10				
241ME1A88PA     MC     PT/PARADE/GAMES - VIII     2     0     0     0												
Total         32         6         0         26         17												



Program							В	.E. – M	arine	Enginee	ring					
Course code			Cou Enc	rse Na dish a	me nd		L			Т		Р		С		
246EN1A12	ТС		Com	nunica	tion		3			0		0		3		
Year / Seme	ster	I	/I								Con	itact hou	irs/Wee	ek 3		
Course categ	gory		Hum Socia	anities al Scier	and ices		Mana cou	gemen irses	t	Profes	ssional	Core	Profes	sional E	lective	
				$\checkmark$												
			1	To im	prove	readii	ıg skill	s of stı	idents	in differ	ent typ	es of tex	ts (K1)			
			2	To en	hance	their c	ommu	nicativ	e skill	s in real l	life situ	ations. (	K2)			
Course obje	tivos		3	To he	lp lear	ners ir	nprove	e their	mariti	me vocal	oulary.	(K2)				
Course objec	lives		4	To en	able le	arners	devel	op thei	r listei	ning skill	ls. (K2)					
			5	To de	velop	studen	ts prof	ession	al writ	ing skills	s. (K2)					
			6	To de	velopt	their la	inguag	e comp	oetenc <u></u>	y (K2)						
			C01	Enun	nerate	good r	eading	and w	riting	skills (K	1)					
			CO2	Outlin prepo	Outline the importance of English in reading and writing with proper tense and prepositions (K1)											
			CO3	Ident	Identify common errors in tenses and sentences (K1)											
Lourse outco	omes		C04	Demo	Demonstrate reading and writing skills for effective presentation. (K3)											
			C05	Acqu	ire goo	od read	ling, w	riting	and lis	stening s	kills (K	3)				
			C06	Apply vario	v the co us life	orrect ] (K3)	pause a	and pro	onunci	ation co	mpeten	ce neces	ssarily r	equired	in	
POs/COs	P0 1	P0 2	P03	P04	P05	P06	P07	P08	P09	P010	P01 1	P012	PSO1	PSO2	PSO3	
C01	-	-	-	-	-	3	3	-	3	3	-	3	-	-	-	
CO2	-	-	-	-	-	3	3	-	2	2	-	3	-	-	-	
CO3	-	-	-	-	-	2	2	-	2	2	-	2	-	-	-	
CO4	-	-	-	-	-	2	2	-	3	3	-	3	-	-	-	
C05	-	-	-	-	-	2	2	-	3	3	-	3	-	-	-	
C06	-	-	-	-	-	3	3	-	3	3	-	3	-	-	-	
Average						2.5	2.5		2.7	2.7		2.8				
Correlation level	n 1.Slight (Low) 2. Moderate (Medium) 3. Substantial (High)															



Unit-I	News Article	Hours 10								
<b>Reading</b> – Comprehe Introducing oneself, SW and Suffixes, <b>SMCP</b> : IM	ension: Shipping Industry by Muralikrishnan, <b>Writing</b> : Parts of Analysis, <b>Listening:</b> Types of Listening. <b>Grammar</b> : Parts of O Standard Maritime Communication Phrases – General: Proce	aragraph Writing, <b>Speaking</b> : f speech, <b>Vocabulary</b> : Prefixes edure - Ambiguous words.								
Competency Numbers	2.1									
Unit-II	Motivation	Hours 11								
Reading: Skimming: Balasubramanian, Wri Speaking: Asking ques SMCP – IMO Standard	Marine Pilot Reshma: A Chennai Ponnu is India's First M ting: Description, Process description Listening: Identifying stions, Grammar: Tense Forms - WH/Yes or No Questions, V Maritime Communication Phrases - General Terms.	Iarine River Pilot by Roshne g main and secondary Points, ocabulary: Maritime phrases,								
Competency Numbers	2.1									
Unit-III	Poem	Hours 11								
Reading: Scanning: Sea notes from a discussion compounds, SMCP – IM Competency	a Fever by John Masefield, <b>Writing:</b> Narration, Technical Report A, <b>Speaking:</b> Critical appreciation, <b>Grammar:</b> Subject-Verb Age AD Standard Maritime Communication Phrases – VTS Special T 2.1	rt Writing <b>Listening:</b> Taking reement <b>Vocabulary:</b> Nominal erms.								
Numbers	Movie Poview	Hours 11								
Competency Numbers	<b>rammar</b> : Articles, <b>Vocabulary:</b> Idiomatic expressions, <b>SMO</b> es – External Communication Phrases – Fire, Explosion, Floodin 2.1	CP – IMO Standard Maritime ng, Collision.								
Unit-V	Case Study	Hours 11								
Reading: Analysing: Ca Gadget review, Listenin Grammar: Modals, Voo Capsizing, Adrift, Pirac	ise Study: The Indian Ocean Observing System by Juliet Herme ng: Listening to a documentary and making notes, <b>Speaking:</b> E c <b>abulary:</b> Connectives, <b>SMCP:</b> IMO Standard Maritime Commu y, Abandoning.	s and Roxy Mathew, <b>Writing:</b> Expressing preferences, Inication Phrases – Grounding,								
Tout Doolse		lotal nours:54								
M. Subha et al. (Ed). A G	General English Course Book for the Maritime Learners. (2023)	). Cape Comorin Publishers:								
References:										
1. Practical English Usage – Michael Swan. Oxford University Press, 1980.										
2. S.P.Dhanavel, E	nglish and Communication Skills, Chennai: Orient Blackswan, 2	2010.								
3. Essential Gram	mar in Use- Raymond Murphy, London: Cambridge, 2007.									
4. <u>https://www.u</u>	usingenglish.com/									
5. https://learnenglish.britishcouncil.org/grammar										



Program		B.E. (Marine)														
Course cod	e		C Ordin	ourse	Name	stial		L		Т			Р		(	2
246MA 11TA	1A	E	quatio	ons and Equat	d Diffe	erence		3		1			0		2	2
Year / Seme	ester	I / I										Co	ntact ho	ours/We	eek 4	
Course este		Hu	maniti Sc	es and iences	Socia	1	Mana cou	gemer urses	nt	Profe	essic	onal	Core	Р	rofessio Electiv	nal e
	.gory		Basic	: Scien	ice		Engii Sci	neering ience	5	Op	en E	Elec	tive	]	Mandato	ory
			1	To s	tate the	e basic	relati	ons of	differe	ence op	erat	ors.				
			2	To in	o introduce the method which involves interpolation formula which is appropriate differentiation and integration									oplied		
Course obje	ectives		3	To in equa	troduc tions.	e the fu	nction	s of dif	ferenti	al deriva	itive	s an	d to solv	ve ordin	ary diffe	rential
			4	To in	ntrodu	ce the t	techni	ques ir	1 solvi	ng first	ord	er a	nd high	er orde	r differe	ential
			5	To in symr	itroduc netrica	e metho l form.	od of v	ariatio	n of pa	rameters	and	l sin	nultaneo	us equa	tions in	
		C	201	Cons	struct th	e form	ation a	nd rela	tionshi	ip of fini	te d	iffer	ence op	erators a	and diffe	rence
Course out	comes	C	CO2	Inter	Interpret Newton's Forward & Backward Interpolation formula, Sterling Interpolation formula and Lagrange's Interpolation										olation	
(On completed of the course	etion se.	C	203	Ident	Identify homogeneous equations with constant coefficients, exact and linear differential equations and solve them											
Learners w	ill be	0	204	Deve	elop the	solutio	ons of :	first or	der and	l higher	orde	r dif	fferentia	l equati	ons.	
		C	205	Inter	pret me	thod of	f varia	tion of	paramo	eters and	l sin	nulta	ineous e	quation	s in symr	netrical
		0	CO6	Appl	y diffe	rential e	equatio	on and	differe	nce equa	tion	tecl	hniques	in their	marine s	ubjects.
POs/COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PC	011	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	1	-	-	-	-	-	-	-		-	-	1	-
CO2	3	2	-	2	-	-	-	-	-	-	-		-	-	1	-
CO3	1	1	-	1	-	-	-	-	-	-	-		-	-	1	-
CO4	2	1	-	1	-	-	-	-	-	-	-		-	-	1	-
CO5	3	2	-	2	-	-	-	-	-	1 -						-
CO6	2	1	-	1	-	-	-	-	-	-	-		-	-	1	-
Average	2.2	1.2	-	1.2	-	-	-	-	-	-	-		-	-	1	-
Correlation level	1.Slight (Low)     2. Moderate (Medium)     3. Substantial (High)									)						



Unit-I	Finite Differences Equations	9 Hours								
Finite difference operated equation: formation and	ators - Relation between operators – Algebra of finite difference operators – I ad solution – linear difference equation with constant coefficients	Difference								
Competency Numbers	4									
Unit-II	Interpolations Numerical Differentiations and Integrations	9 Hours								
Newton's forward and interpolation formula. integration: trapezildal	Newton's backward interpolation formulae –Sterling interpolation formula- Numerical differentiation: First derivative and second derivative-Numerical I, Simpson's 1/3 and ,Simpson's 3/8.	Lagrange's								
Competency Numbers	4									
Unit-III	<b>Basics of Ordinary Differential Equations</b>	12 Hours								
Formation differential equations: variable sep homogeneous and exa equations.	equation by eliminating arbitrary constant –Solution of first order first degre barable and homogeneous equations other substitutions – Equation reducible ct differential equations (First two type)- Equations reducible to exact Differential	e to ential								
Competency Numbers	4									
Unit-IV	Applications of Ordinary Differential Equations	12 Hours								
reducible to linear-Sec Trigonometric, Polyno orthogonal trajectories Competency Numbers	<ul> <li>and order Linear differential equation with constant coefficients (Exponential equation) – Application in deflection of beam, struts and column electrical circuits.</li> <li>4</li> <li>Linear Differential Equations with Variable Coefficients</li> </ul>	12 Hours								
	Linear Differential Equations with variable Coefficients	12 Hours								
(Exponential) –System	of an ordinary differential equation RHS is Zero)	quation								
Competency Numbers	4									
	Total hours:	54								
Text Books:										
1. B.S. Grewal, "High	er Engineering Mathematics", Khanna Publishers, 44 <sup>th</sup> Edition, 2016.									
Unit-I: Chapter 29 Secti Unit-II: Chapter 29 Sec Unit –III: Chapter 11 Se Unit-IV: Chapter 11 Se Unit-V: Chapter 13 Sect	Unit-I: Chapter 29 Section 1-5; Chapter 31 Section 1-6. Unit-II: Chapter 29 Section 6, 7, 9, 10; Chapter 30 Section 1,2,4,5,6,7,8. Unit –III: Chapter 11 Section 1-8, 11. Unit- IV: Chapter 11 Section 9-10; Chapter 12 Section 3, 5; Chapter 13 Section 1-6. Unit-V: Chapter 13 Section 8,9,11.									
<ol> <li>Veerarajan T., "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2016.</li> </ol>										
Reference Books:										
1. Erwin k 2006.	creyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & S	Sons,								
2000. 2.Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th										



# Reprint, 2010.

3.H.I	K.DAS	S "Advanced	d Engi	neering N	lathe	matics	", 15 <sup>t</sup>	<sup>h</sup> Revise	d Edition,	S.Chai	nd &	Co. 1	Ltd., N	ew
Ι	Delhi, 2	006	_	-										
4 TZ	1	TT1 '1	.1	10	.1	(A) T	•	1 1 1 1	1 12 0 01	1.0	C	T ( 1 )	т	

4. Kandaswamy, Thilagavathy and Gunavathy, "Numerical Methods", S.Chand & Co. Ltd., New Delhi, 2008

PROGE	RAM		B.E, Ma	rine Eng	gineerin	g															
Course	e Code:		Course	Name:					L		Т		Р		С						
246PF	H1A017	ГВ	Materi	al Physi	cs				2		1		0		2						
Year a	nd Seme	ester	I Year (	I Semest	ter)			Con	tact hou	ırs per w	veek		P       C         0       2         orry       2         f Materials (K1)       4         (K1)       4         aterials (K2)       4         d characterization (K3)         4       PSO         PSO       PSO								
Prereq	uisite co	ourse	Nil					3 H	łrs												
			Basic So	cience	E So	ngineeri cience	ng	Оре	en Electi	ve	Ма	andatory	,								
				✓																	
Course	e Objecti	ne	1. 2. 3. 4. 5. After su 1. 2. 3. 4. 5. 6.	To und To und To Atta To Atta To Ider Iccessful Summa Illustra Compa Explair Infer th To app	erstand erstand ain a bas ain the k ntity the l comple arize the arize the the the p re the d n the An ne know ly postu	the cond the med sic idea a nowledge testing tetion of t postula ropertie ifferent s nealing a ledge of lates of	cepts of hanical bout str ge of diff methodo he cours tes of at s of mat structur and harc nondest physics of	atomic s properti uctural erent tro ology of se, the st omic str erials (K al mater lening co ructive of mater	tructure les of ma material eatment material udents s ucture a (2) ials and oncepts testing r ials for o	e and dif aterials ( s (K3) of meta ls (K1) should b and type their pr of the m nethods device a	ferent ty [K1] ls (K2) e able to s of mat operties aterials for vari oplicatio	pes of N erials (K (K2) (K2) ous mate	1aterials 1) erials (K characte	(K1) (K1) (Z) rization	(K3)						
POs / COs	P01	PO2	P03	P04	P05	P06	P07	PO8	P09	P01 0	P01 1	P01 2	PSO 1	PSO 2	PSO 3						
C01	2	2	2	1	2	-	-	-	-	-	-	2	2	2	3						
CO2	2	2	2	2	2	-	-	-	-	-	-	2	2	3	3						
CO3	2	2	2	1	2	-	-	-	-	-	-	-	2	1	1						
CO4	2	2	2	1	2	-	-	-	-	-	-	2	2	2	2						



<b>-</b>		1		-								1			I
CO5	3	2	2	2	3	-	-	-	-	-	-	2	2	3	2
C06	3	3	3	3	3	-	-	-	-	-	-	3	2	3	2
Avg	2.3	2.2	2.2	1.7	2.3							2.2	2.0	2.3	2.2
8															
COF	RELAT	ION LE	VELS	1	. SLIGH	T (LOW	)	2. M(	DERAT	'E (MED	IUM)	3. SU	JBSTAN	TIAL (H	I <b>IGH)</b>
UNIT I	- Funda	amenta	als of Ma	terials									[12 Ho	ours]	
Atomi	c bond	<b>ling</b> -At	omic St	ructure-	The io	nic bo	nd-The	covaler	it bond	-Metalli	c bond	l-Vander	waals	bond-Bo	onding.
Classif	ication	Туре	s of	Materia	ls-Metal	ls-Ceran	nics-Glas	ses-Poly	mers-Co	omposit	es-Semi	conduct	ors-Nan	omateria	als-2-D
materi	als-meta	amateri	als-Prop	erties ar	id applic	cations -	Selectio	n of mat	erials fo	r differe	ent engir	ieering a	applicati	ons	
UNITI	I- Mech	anical	propert	les of m	aterials							[12 H	ours	,	1. C
Нооке	s law- b	ending	moment	and two	sting m	oment-	lorsion	pendulu	m; Mom	ient curv	vature r	elations	hip for p	ure ben	ding of
beams	- Canti	lever; 1	non unif	orm ber	aing ar	id unifo	rm ben	ling- th	eory an	a exper	iment. S	stress v	ersus st	rain-in	metals,
Electio	cs, and g	glasses,	polymer	S-Elasti Strongt	c and Pla	astic der	ormatioi	lS.	Mallook	silitar II.	ndonina	- ability	anoon or	ad fation	
	IL The	Ctruct	ral Mat	strengt	ii, Tougi	mess, st	inness, i	Juctifity	, Manear	лицу, па	ardening	g ability,		lu laugu	le
Floctro	n- me	uction	Fron old	erron th	oory of	motale	Thormal	l conduc	tivity of	fact of t	omnora	turo and	impuri	tu on olu	octrical
resisti	vity of 1	netals-	high resi	stivity r	netals a	ind allo	vs Mag	i conduct	rameter	s- Bohr	magnet	ton- clas	sificatio	in of m	agnetic
materi	als-appl	ication	s. Allovs-	-Ferrous	. allovs-	Carbon	steels-lo	ow allow	steels	-High al	llov stee	els-Cast	Iron-Ra	pidly so	lidified
ferrou	s alloys-	Applica	itions in l	Marine e	ngineer	ing.				0	- ,			[]	
UNIT I	V - Trea	atment	of Meta	ls	U	0							[9 Hou	s]	
Diffusi	onal tra	ansforn	nation-Di	ffusion	less tra	insforma	ation-Te	mpering	-Anneal	ing-Nor	malizing	g-Case ł	nardenir	ig- cem	enting-
cyanid	ing -Niti	riding-A	Aging-str	ess relie	ving- ca	rburizat	ion-Purp	oose of h	eat treat	tments					
UNIT	/ - Mate	rial Te	sting									[	9 Hours	]	
Impact	energy	- Fract	ure Toug	hness-F	atigue -	Tensile	testing, o	compres	sion test	ting, Imp	pact Tes	ting, Haı	dness to	est, Jomi	ny end
quencl	n test fo	or hard	en ability	v of stee	l. Non-c	lestructi	ve testi	ng meth	ods - X-	Ray Ra	diograpl	ny - Ultı	asonic '	Testing-	Failure
analys	is and p	reventi	on.												
TOTAL	ι: 54 Ho	urs													
*Innov	vation							• .							
Debate	e/group	discuss	sion of po	ssibilitie	es novel	materia	ls-video	making	/animat	ion					
Text B	00K:		. 1.0 .	C	<b>.</b> .	T			00h 1	D	201	10			
1. Intro	oduction	to Mat	erial Scie	ence for	Enginee	rs, Jame	s S Shaci	kelford,		on, Pear	son, 202	22. . ll I		J	
Z.The Wile	racture v-Ameri	ican Cei	tie Mater	iais: Tes riety 201	ting and 9	l Analys	s, by <u>ste</u>	<u>epnen w</u>	<u>. Freima</u>	<u>n</u> , <u>Jonn</u>	<u>j. Mecno</u>	<u>DISKY Jr.</u> S	secona e	edition,	
3 Com	nosite N	laterial	s Design	and Tes	ting hv	Stenhen	W Tsai	Iose Da	niel D M	lelo Firs	t edition	12015			
4. Phys	sics of M	aterials	s: Essenti	all Conce	entg, by	olid-Stat	e Physic	s, Prata	o Harido	ss, Wile	v, 2019.	1,2010.			
Refere	ences:				<b>F</b>		- <b>j</b>	-,,		,	<i>,</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
1. Ma	erial Sci	ience, V	' Rajendr	an, Tata	McGRav	w Hill Ed	lucation	Private	Limited,	2012.					
2. Phy	sics of N	<b>I</b> ateria	ls: Éssent	ial Conc	epts of S	Solid-Sta	te Physi	cs, Wile	y, 2015.						
3. The	Fractur	re of Br	ittle Mate	erials: Te	esting an	d Analy	sis, by <u>St</u>	tephen V	V. Freim	<u>an</u> , <u>Joh</u> ı	n J. Mech	olsky Jr.	second	edition,	Wiley-
Amerio	can Cera	mic So	ciety, 201			<b>a</b> 1									
4. Cor	nposite	Materia	us Desigr	n and Te	sting, by	Stepher	n W. Tsa	1, <u>Jose D</u>	aniel D.	<u>Melo</u> ,Fir	st editio	on, 2015			
	Source:	montal	s of mato	rial proc	Accina D	Prof Sha	chank Cl	hekhar I	Denartm	ent of n	notallur	tical and	matori	als angir	poring
IIT Kar	nur ht	tns·//n	ntel ac in	1/course	s/11316	101. 311a )4073	SHAHK SI	icnial,	bepai till			sicai allu	materia	ais eligii	icering
2. NO	C: Nati	ire an	d Prone	rties of	Materi	ials. Pro	of. Bish	akh. De	epartme	nt of r	nechani	cal eng	ineering	. ПТ К	anpur.
https:/	/archiv	e.nptel	ac.in/coi	irses/11	2/104/	112104	203	, DC	Partition			6		, 1	puii

3. NOC: Basics of Material Engineering, Prof. Rathan Kumar, Department of mechanical engineering, IIT Madras. https://archive.nptel.ac.in/courses/112/106/112106293.

4. NOC – Principles of Physical Metallurgy, Prof. N.R. Ghosh, Department of metallurgical and materials engineering IIT Kharagpur. https://archive.nptel.ac.in/courses/113/105/113105024

E-books:

1. https://drive.google.com/file/d/1LzdR6HsKPV8gAcYFiHfTsmzLyovXIo2L/view



2. https://drive.google.com/file/d/1CY5hEyhUUmJQKjUWPs6rhq8NVu6QlnBy/view

JOURNAL

1. Nadeem Baig et al, Nanomaterials: A review of synthesis methods, properties, recent progress, and challenges, Mater. Adv., 2021,2, 1821-1871

2. N. Suresh Kumar et al A Review on Metamaterials for Device Applications, *Crystals* 2021, *11*(5), 518



Course code 241ME1A11TC       Course Name Basics of Electrical and Electronics       L       T       P       C         Year / Semester       I year / I Semester       I gear / I Semester       Contact hours/Week       3 Hrs         Year / Semester       I year / I Semester       Contact hours/Week       3 Hrs         Vear / Semester       Enginee ring Science       Open Elective       Mandatory         V       V       V       V       V         Course objectives       1       Explain the importance of Electrical Engineering in everyday life. (K2)       V         Course objectives       2       Apply Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) equations in circuit analysis. (K3)         3       Analyze single-phase AC circuits using phasor diagrams and power calculations. (K3)         4       Analyze three-phase AC circuits with balanced and unbalanced voltage sources. (K3)         1       Understand the characteristics and applications of semiconductor devices such as diodes, transistors, and MOSFETs. (K2)         6       Explain of communication devices and modulation techniques in wireless communication systems. (K2)         At the end of the course the students will be able to         CO1       Outline KCL, KVL and related methods to solve DC circuits. (K1)         CO2       Illustrate the operation of single phase AC Circuits. (K2)
241ME1A11TC       Basics of Electrical and Electronics Engineering       3       0       0       2         Year / Semester       I year / I Semester       Contact hours/Week       3 Hrs         Basic Science       Enginee ring Science       Open Elective       Mandatory         V       1       Explain the importance of Electrical Engineering in everyday life. (K2)         Course objectives       2       Apply Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) equations in circuit analysis. (K3)         3       Analyze single-phase AC circuits using phasor diagrams and power calculations. (K3)         4       Analyze three-phase AC circuits with balanced and unbalanced voltage sources. (K3)         5       Understand the characteristics and applications of semiconductor devices such as diodes, transistors, and MOSFETs. (K2)         6       Explain of communication devices and modulation techniques in wireless communication systems. (K2)         At the end of the course the students will be able to       C01         C02       Illustrate the operation of single phase AC circuits. (K2)
Year / Semester       I year / I Semester       Contact hours/Week       3 Hrs         Basic Science       Enginee ring Science       Open Elective       Mandatory         Course objectives       1       Explain the importance of Electrical Engineering in everyday life. (K2)         2       Apply Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) equations in circuit analysis. (K3)         3       Analyze single-phase AC circuits using phasor diagrams and power calculations. (K3)         4       Analyze three-phase AC circuits with balanced and unbalanced voltage sources. (K3)         5       Understand the characteristics and applications of semiconductor devices such as diodes, transistors, and MOSFETs. (K2)         6       Explain of communication devices and modulation techniques in wireless communication systems. (K2)         At the end of the course the students will be able to       C01         C02       Illustrate the operation of single phase AC Circuits. (K2)         C03       Explain the principle of operation of three mase AC Circuits. (K2)
Basic Science       Enginee ring Science       Open Elective       Mandatory         Course objectives       1       Explain the importance of Electrical Engineering in everyday life. (K2)         2       Apply Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) equations in circuit analysis. (K3)         3       Analyze single-phase AC circuits using phasor diagrams and power calculations. (K3)         4       Analyze three-phase AC circuits with balanced and unbalanced voltage sources. (K3)         5       Understand the characteristics and applications of semiconductor devices such as diodes, transistors, and MOSFETS. (K2)         6       Explain of communication devices and modulation techniques in wireless communication systems. (K2)         At the end of the course the students will be able to       C01         C02       Illustrate the operation of single phase AC circuits. (K2)         C03       Explain the principle of operation of three phase AC Circuits. (K2)
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CO2Illustrate the operation of single phase AC Circuits. (K2)CO3Explain the principle of operation of three phase AC Circuits. (K2)
L. CO3 Explain the principle of operation of three phase AC Circuits (K2)
Course outcomes
CO4         Infer the performance characteristics of Semiconductor Devices. (K2)           CO5         Demonstrate the working principle of Communication system. (K2)
COS         Demonstrate the working principle of communication system. (K2)           Apply the knowledge of electric circuits and electronic devices for Marine engineering.
CO6 Apply the knowledge of electric circuits and electronic devices for Marine engineering applications. (K3)
POs/COs PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02 PS0
CO1 2 3 2 3 3 2 3 3
CO2         3         2         2         3         -         -         3         2         2         2
CO3       3       3       2       2       -       -       2       2       3       2
CO4         3         2         2         2         -         -         3         2         2         3
Average         2.7         2.5         2.2         -         -         3         3         2         2.50
Correlation level1.Slight (Low)2. Moderate (Medium)3. Substantial (High)
UNIT-I DC CIRCUITS 11 Hours
Importance of Electrical Engineering in day-to-day life - Electrical elements and their classifications - KCL and KVL
equations - Loop current and node voltage method - Steady state analysis with independent and dependent sources -
Competency 611e
Numbers
UNIT-II ANALYSING SINGLE PHASE AC CIRCUITS 11 Hours



Common Signals - Wave Form - RMS Value - Average Value - Form Factor and Peak Factor - Single Phase A.C Series Circuits										
- Phasor Diagram - Po	ower Factor – Impedance - Power Triangle - Single Phas	e A.C Parallel Circuits- Phasor Diagram -								
Power Factor - Power	Triangle.									
Competency	6.1.1.e									
Numbers										
UNIT-III	ANALYSING THREE PHASE AC CIRCUITS	11 Hours								
Three Phase Balance	d and Unbalanced Voltage Sources – Analysis of Three P	hase 3-Wire and 4-Wire Circuits with Star								
and Delta Connected	Loads- Phasor Diagram of Voltages and Currents - Pow	er and Power Factor Measurements in Three								
Phase Circuits.										
Competency	6.1.1.a									
Numbers										
UNIT-IV	SEMICONDUCTOR DEVICES	11 Hours								
Characteristics of PN	Junction Diode - Zener Diode and its Characteristics - V	oltage regulation- Bipolar Junction Transistor								
- CB, CE ,CC Configura	ations and Characteristics- Basic Construction of 'N' ch	annel & 'P' channel JFET-MOSFET - Half wave								
and Full wave rectifie	rs - Cathode Ray Oscilloscope.									
Competency	6.1.2a, , 6.1.3.a									
Numbers										
UNIT-V	COMMUNICATION ENGINEERING	10 Hours								
Communication devi	ces -Modulation and Demodulation - circuit explanation	on. AM, FM, Wireless communication - Radio								
Transmitters and Rec	ceivers - Radar Communication - GPS - Inmarsat - Intro	duction to ECDIS- Satellite communication as								
applicable to GMDSS.										
Competency	6.1.2a, 6.1.3.a									
Numbers										
		Total hours: 54								
Text Books:										
1.	Arumugam and Prem Kumar, Electric Circuit Theory, K	hanna Publishers, 2002.								
n	William H. Hayt Jr, Jack E. Kemmerly and Steven M. Du	rbin, "Engineering Circuits Analysis", Tata								
Ζ.	McGraw Hill publishers, 6 th edition, New Delhi, 2003									
3.	R.S.Sedha, A Textbook of Applied Electronics, 3rd revis	ed Edition, 2008.								
Λ	A.K.Sawhney-A Course in Electrical and Electronics Me	easurements and Instrumentation, 19th								
4	Revised Edition 2011									
Reference Books:										
1	Joseph A. Edminister, Mahmood Nahri, "Electric circuit	s", Schaum's series, Tata McGraw-Hill, New								
1.	Delhi, 2001.									
2	Sudhakar A and Shyam Mohan SP, "Circuits and Netwo	rk Analysis and Synthesis", Tata McGraw-Hill,								
۷.	2007.									
2	Charles K. Alexander, Mathew N.O. Sadiku, "Fundamen	tals of Electric Circuits", Second Edition,								
3.	McGraw Hill, 2008									



Program								B.E. –	Marir	ne Engi	neerin	g			
Course code		Cou	rse Na	me						L		Т	Р		С
241ME1A11TI	)	Eng	ineerir	ng Mecł	nanics					3		1	0		3
Year / Semeste	er	I Ye	ar / I S	emeste	r					Conta	ct hour	s/Week	4		
		]	Human Social S	ities an Science	d s	M	lanag cour	ement ses	-	Profe	essiona	l Core	Prof	essional	Elective
Course catego	rv														
	' y		Basic S	Science	<u>.</u>	Engiı	neerir	ıg Scie	ence	Ope	en Elec	ctive		Mandato	ory
				✓											
		1	To str	Explai uctures	in the s (K1)	analy	/tical	techn	iques	for a	nalyzir	ig force	s in stat	tically de	eterminate
Course objecti	WAG	2	To cor sta	unders nposite ndard	stand e shap and co	the im es and mposi	nporta d met ite sha	nce o hods apes. (	of cent of fin (K1)	troids a ding ce	and cen ntroid	nter of g s and m	gravity o oment o	f curves, f inertia	areas and of various
Course objecti	ves	3	То	unders	tand t	he app	olicati	ons of	f varic	ous type	es of lif	ting mad	chines. (F	(1)	
		4	To adv	Under vantage	stand e, veloo	the fr city ra	iction tio, an	in pl d effio	ane a ciency	nd lad v. (K1)	der, th	e relatio	onship bo	etween n	nechanical
		5	To Kir	under netic en	stand	the b	asic p	oaram ns. Ne	eters wton'	of SHN	A, Virt	ual wor on. (K1)	k, Energ	y-Potent	ial energy,
		On	comple	tion of	the co	urse t	he stu	idents	will ł	be able	to				
		CO		istrate	the an	alytic	al tec	hniqu	es for	resolv	ing sys	tem of f	orces an	d static S	Structures.
		CO	2 Cal	lculate	center	of ma	iss, ce	nter o	f grav	ity and	the pr	operties	of distri	buted for	ces. (K3)
Course outcon	าคร	CO	3 Ex	plain th	e laws	of lift	ting, r	eversi	ble m	achines	s and in	reversit	le machi	ines. (K1)	
	100	CO	4 De	termin	e the f	rictior	and	the eff	ects b	v the la	aws of	friction.	(K2)		
			Ex	olain t	he ph	enome	ena o	f Virti	ual w	ork. Er	nergy-l	Potentia	energy.	Kinetic	energy of
		CO	5 tra	nslatio	ns, Ne	wton's	s Law	of mo	tion. (	(K1)	05		0,0		0,
		CO	6 An	alyze tl	ne rigi	d bodi	es in e	equilil	orium	, distrik	outed f	orces an	d determ	nine fricti	on. (K3)
POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	3	3	3	2	2							2	2	1	
CO2	3	3	2	2	2							2	2	1	
CO3	3	2	2	2	2							2	2	1	
CO4	3	3	2	2	2							2	2	1	
CO5	3	3	2	2	2							2	2	1	
C06	3	3	2	2	2							2	2	1	
Average	3	2.83	2.16	2	2							2	2	1	
Correlati	on leve	el		1.Slight	(Low)		2	. Mod	erate	(Mediu	m)		3. Subst	antial (Hi	igh)
UNIT-I					ST	ATICS	S OF P	ARTI	CLES					12 H	lours
Introduction t	o static	cs – sys	tem of	forces ·	- resol	ution	and c	ompo	sition	of forc	es, For	ces in S	oace Tru	ss, types	of trusses,
assumptions f	or trus	s analys	sis, Ana	lysis of	truss	(meth	od of	joints	).						



Competency Nur	nbers	4.5, 9.5	
UNIT-II		DISTRIBUTED FORCES	15 Hours
Centroid, center Guldinus theorer parallel axis theo	of mass and ce ms, second mo orem, moment o	nter of gravity, analytical expressions of centroids, centroids of compo ment of area, radius of gyration, perpendicular axis theorem for seco of inertia of composite sections.	site shapes, Pappus- ond moment of area,
Competency Nur	nbers	4.5, 9.5	
UNIT-III		SIMPLE LIFTING MACHINES	15 Hours
Introduction to mechanical adva	Simple machir ntage and their	nes- law of lifting machine– Graphics of load effort and load efficient relationship, reversible machines, irreversible machines.	ency– velocity ratio,
Competency Nur	nbers	4.5	
UNIT-IV		FRICTION AND ITS APPLICATION	15 Hours
Friction, Coeffici following machin screw, worm-dri	ent of friction, nes: Wheel and ven chain blocl	Friction in inclined plane, Ladder friction, mechanical advantages a Axle, Differential Wheel and Axle, Rope Pulley blocks, Differential Pu of and single and double purchase crab winches.	and efficiency of the lley blocks, Warwick
Competency Nur	nbers	4.5, 9.5	
UNIT-V		DYNAMICS OF PARTICLES	15 Hours
Virtual work, E Momentum. Co parameters of SH Competency Nur	nergy-Potentia entrifugal forco 1M, beats, reson nbers	l energy, Kinetic energy of translations, Newton's Law of motio e and its application to conical pendulum, Unloaded governor ( W nance, simple pendulum, compound pendulum. 4.5, 9.5	on, Conservation of <sup>7</sup> att governor) Basic
		Total hours: 72	
Text Books:			
1. I B Prasad, " A	pplied Mechani	ics" , Khanna Publishers, 14 <sup>th</sup> Edition, 2018	
2. R.S Khurmi , "A Delhi, 2016	A textbook of E	ngineering Mechanics", S.Chand & Co. Ltd., New	
3. Dr. R. K Bansal	, "A textbook o	of Engineering Mechanics", Lakshmi Publishers, 18th Edition, 2019.	
Reference Book	<b>(S:</b>		
1.Reed Volume 2 J.T. Gunn; Publisl	: Applied Mech her Sunderland	anics for Engineers; By William Embleton; Revised by Tyne and Wear) Thomas Reed.1983: ISBN0900335874.	
2. Applied Mecha	anics, J. Hannah	and M.J. Hiller, Longman,1998, ISBN:9780582256323	
3. Engineering M	lechanics Static	rs and Dynamics by Rajasekaran S and Sankarasubramanian G.	



Program								B.E	. – Marii	ne Engi	neeri	ng								
Course cod	e		Cour	se Nan	ne						L	Т		Р		С				
241ME1A1	1TE		Wor	k Shoj	) Techr	ology	7				1	1		2		3				
Year/Seme	ster		I Yea	r/Ise	mester					Conta	act ho	urs/Wee	k	04 hi	S					
Course cate	egory		H So	umani ocial S	ties and ciences		Ν	lanageı cours	nent es	Prof	ession	al Core		Profes	sional	Elective	•			
												?								
			1	. [	To sum	nariz	e meta	ıl joinin	g proces	ses. (K	1)									
			2	2	To ider	tify ca	asting	process	es. (K2)											
Course obj	ectives	5	3	3	To sum	nariz	e surfa	ice finis	hing tec	hnique	s. (K2)									
			4	ł	To ana	/ze n	netal fo	rming t	echniqu	es. (K3)										
			5	5	To sele	t mae	chining	proces	sses. (K2	)										
			CO	1	Identify	meta	al joinir	ng techi	niques e	ffective	y. (K1	)				-				
			CO	2	Examir proces:	e ł es. (K	igh-qua (1)	ality	casting	s thro	ough	profici	ent	applicat	tion	of ca	sting			
			CO	3	Demon finishir	strate g tec	maste hnique	ery in a es. (K2)	achieving	g desire	ed sur	face fini	shes 1	using aj	opropria	ate surf	ace			
Course out	comes		CO4	4	Summa proper	rize n ies. (	netal fo K2)	rming t	echniqu	es to pr	oduce	compon	ents v	vith pred	cision ai	nd desir	·ed			
			CO:	5	Identify technic	mac ues. (	hining K2)	operat	ions thr	ough th	ne app	olication	of adv	vanced	skills a	nd				
			CO	6	Examir methoo	e the s (K2	quality )	y of we	lded join	ts and	castin	gs throu	gh pro	ficient	inspecti	on				
POs/COs	P01	L	P02	PO3	PO	P	05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3			
C01	2		2	2	2		-	-	-	3	-	-	-	2	2	-	-			
CO2	2		2	2	-		-	-	-	3	-	-	-	3	3	3	-			
CO3	3		2	2	-		-	-	-	3	-	-	-	3	3	3	-			
CO4	3		3	3	2		-	-	-	3	-	-	-	3	3	3	-			
CO5	3		3	3	3		-	-	-	2	-	-	-	3	3	3	-			
C06	3		3	3	3		3	-	-	3	-	-	-	3 3 3 3						
Average	2.67		2.50	2.50       2.50       3.00       2.83       2.83       2.83       3.00       3.00																
Correlation lo	evel			1.Slig	nt (Low				2. Moo	lerate (	Mediu	ım)		3. Sul	ostantia	l (High	)			



UNIT-I	USE OF HANI	D TOOLS AND POWER TOOLS AND MEASURING INSTRUMENTS	14 Hours								
Familiarization with Scorners d) dividers types of power, Den powered hand drill Marking table, Tri S Purpose ammeter, H	n following, enu s e) odd leg cali nonstrate the u and state the c quare, Dial gau KW meter, freq	imerate types available. Describe the care necessary for a) surface plates b) verifiers. List the processes for which powered hand tools can be used and name se of powered tools. State the practical maximum and minimum capacities of are necessary for supply cable of powered hand tools Use of Micrometer, Verr ge. Use of appropriate specialized tools and measuring instruments_ 24 V bate uncy meter etc.	e blocks c) the different an electric nier caliper, tery testing,								
Competency Number	ers	8.1									
UNIT-II	METAL JOIN	ING PROCESS	10 Hours								
Metal joining proces welding, gas weldin solid phase welding GMAW, PAW, electr	sses – flexible a g, gas cutting a and sub classi o gas welding a	and permanent, Principles of welding – Fundamentals of arc welding,safety pr nd Under water welding, Brazing and Soldering. Classification plastic welding fication. Study of power sources, electrodes, processes and applications: SMAN and Electro Slag, resistance welding. Defects and Inspection of welded joints.	ecautions before , fusion welding, W, SAWM, GTAW,								
Competency Number	ers	8.2									
UNIT-III	FINISHING P	ROCESS, FITTING AND PLUMBING	10 Hours								
Surface finishing processes: grinding processes, various types of grinders, work holding devices, grinding wheels and specification, selection of grinding wheels for specific applications –Fine Finishing Process: Lapping, honing, and super finishing process, ship hull finishing. Fitting-tools and operations. Plumbing tools and applications.											
Competency Number	ers	8.3									
UNIT-IV	METAL FORM	MING PROCESS	10 Hours								
Hot and cold workin wire drawing, cold f progressive, compo	ng processes – Forming, shot p und and combi	rolling, forging, drawing and extrusion processes, bending, hot spinning, shea eening. Sheet metal working – blanking, piercing, punching, trimming, bendin nation dies. High-energy rate forming processes.	ring, tube and g – types of dies –								
Competency Number	ers	8.5									
UNIT-V	MACHINING	PROCESS	10 Hour <b>s</b>								
Lathe: working prin of taper turning ma Slotting Machines-s classification, princi milling processes an	Lathe: working principle, classification, specification accessories, lathe and tool holders, different operations on a lathe, methods of taper turning machining time and power required for cutting, Drilling and boring - classification, specification. Shaper and Slotting Machines-simple operations-boring machines- jig borer – description, types and hole location procedures – milling - classification, principle, parts- specification milling cutters indexing, selection of milling m/c fundamentals of inches processes, milling processes and operations– CNC machines.										
Competency Number	ers	8.3									
Total: 54 Hours	1										
Text Books:											
1. Jeffus, Weld	ing and Metal	fabrication",1st Ed. Cengage, Indian reprint-Yesdee Publishings Pvt. Ltd. 201	2								



2. Rao.P.N., "Manufacturing Technology, Metal Cutting and Machine Tools", Tata McGraw-Hill, 2000.

#### **Reference Books:**

1. Venugopal K., Basic Mechanical Engineering, Fourth Edition, Anuradha Agencies, Chennai, Year 1994

2. Jain K.C. Agarwal, L.N. "Metal Cutting Science and Production Technology",1st edition, Khanna Publishers, 1986.

3. Chapman W.A.J., "Workshop Technology", Vol. II, Arnold Publishers,1972

4. H.M.T., "Production Technology", Tata McGraw-Hill, New Delhi, 2000

5. Serope Kalpakjian , Steven,R. Schmid, "Manufacturing Engineering and Technology,"4th Ed.

Pearson, 2011

6. Timings, "Fabrication and Welding Engineering', Elsevier, Indian Reprint -Yesdee Publishings Pvt. Ltd. 2011

7. Kemp & Young, " Ship construction : Sketches and Notes", 1st Ed. Standfor Maritime Limited, 1982

Program			B.E. Marine	e Engin	eering			
Course code	Cou <b>En</b>	ırse Name <b>glish and</b>	L		Т	Р		С
246EN1A12PC	Com: La	munication boratory	0		0	2		1
Year / Semester					Со	ntact hours/V	Veek:	2
Course estadore	Human	ties and Social Sciences	Management cou	rses	Professio	onal Core	Pro E	fessional lective
Course category		$\checkmark$						
	1	To listen conve	rsation and motivation	onal sp	eeches. (K1)			
	2	To enable stude	ents speaking effectiv	vely in	real life situat	ions and soft	skills	. (K1)
Course abiestings	3	To equip them (K2)	with employability s	kills to	enhance their	r prospect of j	placer	nents.
Course objectives	4	To enable learn	er speak effortlessly	in forn	nal situations	. (K2)		
	5	To develop stud	dents professional sp	eaking	skills. (K1)			
	6	To enable learn	ers acquire English.	(K2)				
	C01	Communicate	with others in praction	cal, bus	iness-oriente	d situations (I	K3)	
C	C02	Identify the pro communication	oper tone of language n. (K2)	e requi	red in writing	and speaking	g in bı	isiness
Course outcomes	C03	Relate between (K2)	letters and memos a	and var	rious forms of	Business Cor	nmun	ication.
	C04	Display knowle forms of busine	edge on grammar and ess communication. (	d other [K3)	linguistic feat	tures in writin	ng var	ious



	CO5 Write business reports, minutes, proposals etc., (K3)														
			CO	6	Present	the rep	port an	d mem	os in fi	ont of a	n audier	nce. (K3)			
POs/COs	P01	PO2	P03	P04	PO5	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO 2	PSO3
C01	-	-	-	-	-	3	2	2	3	3	-	3	-	-	-
CO2	-	-	-	-	-	2	2	2	3	3	-	3	-	-	-
CO3	-	-	-	-	-	3	2	2	3	3	-	3	-	-	-
CO4	-				-	2	2	2	3	3		3	-	-	-
C05	-	-	-	-	-	3	2	2	3	3	-	3	-	-	-
C06	-	-	_	_	-	2	2	2	3	3	-	3	-	-	-
Average						2.5	2.0	2.0	3.0	3.0		3.0			
Correlation level1.Slight (Low)2. Moderate (Medium)3. Substantial (High)													gh)		
Unit-I         Fundamentals of Communication         Hours 7												ours 7			
Communicatio communicatio	on Proc on; Com	ess, typ imunic	bes of c ation n	ommu ietwor	unicatio rks; Gen	n; Verb eral an	al and d Tech	Non-ve nical C	erbal co ommui	ommuni nication	cation - – barrie	Levels o rs to cor	f comm nmunic	unicati ation.	on; Flow of
Competency N	lumber	S													
Unit	t-II						Listen	ing an	d Spea	king				Н	ours 7
Process of List TV/radio/Pod	ening - cast – 1	- listen motiva	ing ver tional ទ	sus he speech	earing; I hes – Sel	3arrier f-intro	s to lis ductio	tening 1 – JAM	- types [.	of lister	ing - Lis	tening t	o lecture	es, dial	ogues from
Competency N	lumber	S													
Unit	:-III						Read	ling an	d Writ	ting				Н	ours 7
Reading Comp - summarize a	rehens text. W	ion tes Vriting	ts rang – the p	ging fro	om mag s of writ	azine a ting – F	ind nev Resume	vspape writin	rs – str g.	ategies	of readii	ng – read	ling spee	ed – rea	ading types
Competency N	lumber	'S													
Unit	:-IV							Soft S	kills					Н	ours 7
Human values	– inter	cultura	al com	munic	ation – l	learnin	g strat	egies –	lateral	thinkin	g - caree	r planni	ng.		
Competency N	lumber	`S								_					
Uni	t-V						In	terviev	W SKIII	S				Н	ours 8
Kinds of interv Video samples	inds of interviews – Required Key Skills – Corporate culture – Mock interviews- FAQ- Online Interview- Panel Interview - ideo samples.														
Competency N	lumber	S													
												Γotal hoι	ırs:36		
Software: ORI	ELL TA	LK & E	nglish	Words	sworth I	Lab. (E	WL)								
References:	References:														



6. Business English Certificate Materials, Cambridge University Press

7. Communication Skills. Sanjay Kumar and Pushpa Latha, Oxford University Press, 2011

8. Exercises in Spoken English Part – I – III, Hyderabad, Oxford University Press.

9. http://www.oxforddictionaries.com/words/writing-job-applications

10. https://www.esl-lab.com/

Program	B.E. – Marin	B.E. – Marine Engineering											
Course code	Course Name	9		L	Т	Р	С						
241ME1A23PA	Engineering	g Graphics		0	1	3	2						
Year / Semester	I Year / II Se	mester		Contact h	ours/We	ek 4 Hou	irs						
	Humanities a Sciences	and Social	Management courses	Profession	nal Core	Professio Elective	onal						
Course category													
	Basic Science	ç	Engineering Science	Open Elec	tive	Mandatory							
			✓										
	This course's	s primary obje	ctive for learning is to	prepare st	udents fo	r:							
	1	Drawing eng	ineering curves. (K2)										
Course objectives	2	Drawing free	hand sketch of simple	e objects. (I	(2)								
	3	Drawing orth	nographic projection	of solids an	d section	of solids. (	(K2)						
	4	Drawing dev	elopment of solids(KZ	2)									
	5	Drawing isor	netric and perspectiv	e projectio	ns of simp	ole solids.	(K2)						
	Upon comple	etion of the cou	urse the cadets will be	e able to:									
	C01	Construct the	e conic curves, involu	tes and cyc	loid. (K2)								
Course outcomes	C02	Solve practic	al problems involving	g projection	of lines.	(K2)							
	CO3	Draw the ort solids. (K2)	hographic, isometric	and perspe	ctive proj	ections of	simple						
	CO4	Draw the dev	velopment of simple s	olids. (K2)									



	C05				Draw the projection of sectioned solids and development of surfaces in various position. (K2)											
		Develop student's imagination and ability to represent the shape size and specifications of physical objects. (K3)										and				
POs/COs	PO	1 P	02	P03	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PSO1	PSO2	PSO3
C01	3	2		2		2					3		2			2
CO2	3	2		2		2					3		2			2
CO3	3	2		2		2					3		2			2
CO4	3	2		2		2					3		2			2
C05	3	2		2		2					3		2			2
C06	3	2		2		2					3		2			2
Average	3	2		2		2					3		2			2
Correlation level 1.Sli			1.Slig	ght (Lo	w)	2. Mo	2. Moderate (Medium)				3. Substantial (High)					

### **CONCEPTS AND CONVENTIONS**

2 Hours

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT-I	UNIT I PLA	NE CURVES AND LIMIT ,FITS ,TOLERENCE	10 Hours			
Dimensioning – lettering-Basic Geometrical constructions, Curves used in engineering practices: Conics —         Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid construct of involutes of square and circle — Drawing of tangents and normal to the above curves Limts and their ty – Types of fits – Tolerances         Competency Numbers       9.6						
Competency Number	9.6					
UNIT-II	PROJECTIO	ON OF POINTS, LINES AND PLANE SURFACE	15 Hours			
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true length and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.						
Competency Numbers     9.6						



UNIT-III	PROJECTIO	N OF SOLIDS AND FREEHAND SKETCHING	15 Hours						
Projection of simple s to one of the principa multiple views from p Software (Not for exa	olids like pris l planes and p pictorial views mination) - vi	ms, pyramids, cylinder, cone and truncated solids when the axis is parallel to the other by rotating object method Freehand sketching of objects. Practicing three dimensional modeling of simple object news of flange coupling and machine vice	inclined ng of ts by CAD						
Competency Number	S	9.6							
UNIT-IV	PROJECTIO	ROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES Hours							
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)									
Competency Number	Competency Numbers 9.6								
UNIT-V	ISOMETRIC	SOMETRIC AND ASEMMPLY DRAWING 15 Hours							
Principles of isometri solids - Prisms, pyran simple objects by CAI stock	c projection - nids, cylinders O Software (N	<ul> <li>isometric scale - isometric projections of simple solids and trunc s, cones. Practicing three dimensional modeling of isometric projec ot for examination) Screw jack – Gib and cotter joint –Knuckle join</li> </ul>	ated tion of t – Tail						
Competency Number	S	9.6 <b>Total : 72 Hours</b>							
Text Books:									
1. Bhatt N.D. and Pan	chal V.M., "En	gineering Drawing", Charotar Publishing House, 53rd Edition, 2019	).						
2. Natrajan K.V., "A Te	ext Book of En	gineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.							
3. Parthasarathy, N. S	. and Vela Mu	rali, "Engineering Drawing", Oxford University Press, 2015							
Reference Books:									
1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.									
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore,27 <sup>th</sup> Edition,2017.									
3. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi,2015.									



PROG	RAM		B.E, ( Al	l Course	s)												
Course	e Code:		Course	name:					L		Т		Р		С		
241PH	1A11PA	L .	Materia	l physics	labora	tory			0		0		2		1		
Year a	nd Seme	ester	I Year (	I Semest	er)			Con	itact hou	irs per w	reek						
Prereq	uisite co	ourse	Nil					2 H	2 Hrs								
			Basic So	cience	E S	ngineer cience	ing	Оре	en Elect	ive	Ма	Mandatory					
				<b>√</b>													
Course	e Object	ne	<ol> <li>To ap</li> <li>To un</li> <li>To exp</li> <li>To un</li> <li>To un</li> <li>To exp</li> <li>To un</li> <li>To exp</li> <li>To exp</li> <li>Interp</li> <li>Apply</li> <li>Justify</li> <li>Deterp</li> </ol>	prehend derstand plain abo derstand <u>plain abo</u> ccessful oret and v the bas y the val mine the	the effe d the eff out varie d the ele <u>out ther</u> comple validate ic conce ues of m	ect of tor fect of be ous mate ectrical p <u>mal prop</u> tion of th e the mea epts of ph neasuren ity and s	sional st nding m erial test propertie <u>perties o</u> ne cours asured p nysics to nents an urface te	tress in solid wire (K1) noments solid rod (K1) ting techniques. (K2) es of materials(K1) of materials (K1) se, the students should be able to parameters. (K2) o find the stress and strain in materials (K3) nd wear and tear (K3)									
		1	5. Use o	f screw ខ្ល	gauge, v	ernier ca	alliper ar	nd trave	lling mic	roscope	(K3)	<b>DO1</b>	DCO	DCO	DCO		
POs /	P01	P02	P03	P04	PO5	P06	P07	P08	P09	PUI	PUI	PUI	P30	P30	P30		
COs										0	1	2	1	2	3		
C01	2	2	2	1	2	-	-	-	-	-	-	2	2	2	3		
CO2	2	2	2	2	2	-	-	-	2 2					3	3		
CO3	2	2	2	1	2	-	-	-	-	-	-	-	2	1	1		
CO4	2	2	2	1	2	-	-	-	-	-	-	2	2	2	2		
C05	3	2	2	2	3	-	-	-	-	-	-	2	2	3	2		
C06	3	3	3	3	3	-	-	-	-	-	-	3	2	3	2		
Avg	2.3	2.2	2.2	1.7	2.3							2.2	2.0	2.3	2.2		



(	CORRELATION LEVELS	1. SLIGHT (LOW)	2. MODERATE (MEDIUM)	3. SUBSTANTIAL (HIGH)
Co	urse contents:			
	<ol> <li>Torsion pendulum - R</li> <li>Joules law of heating-J</li> <li>Air wedge - Thickness</li> <li>Material testing using</li> <li>Determination of cond</li> <li>Determination of ther</li> <li>Characteristics of Junc</li> <li>Newton's rings - Dete</li> <li>Non uniform bending</li> </ol>	igidity modulus of a given wire Determination of thermal condu s of a given wire screw gauge and vernier callipe luctivity of given wire using Ohi mal conductivity using Lees Dis ction diode rmine the thickness of a thin fili – Young's modulus of elasticity	nctivity er ms Law c m of a bar	
	10. Uniform bending - You	ang's modulus of elasticity of a b	bar	
				TOTAL: 36 PERIODS
Te	xt Books:			
1. 2. 3. 4.	D.S. Mathur, P.S.Hemne, 20 Ghatak, 2017, Optics, McG R. Murugesan, Electricity & H.S. Hans, S.P. Puri, 2009,	)00, Mechanics, S. Chand & Com raw Hill Education, 6 <sup>th</sup> Edition, l & Magnetism, 2017, S. Chand & c Mechanics, Tata McGraw Hill Pi	pany Ltd, New Edition, New Delh New Delhi, 1-632. company Ltd, 10 <sup>th</sup> edition, New D ublishing Company Ltd, 2 <sup>nd</sup> editio	i, 1-848 elhi, 1-478. n, New Delhi, 1-551.
Re	ference Books:			
1.	M. Narayanamurthi and edition.	N. Lakshminarayan, 1997, Elec	ctricity and Magnetism, The Nat	ional Publishing Company, 3 <sup>rd</sup>
2.	Hugh D. Young and Roger II, Pearson Education Lim	<sup>•</sup> A. Freedman, 2011, Sears and aited, 12 <sup>th</sup> edition, Chennai, Dell	Zemansky's University Physics: I ni, 1-452.	Electricity and Magnetism, Vol-

- 3. Halliday, Resnick and Walker, 2009, Fundamentals of Physics, Wiley India, extended 8<sup>th</sup> edition, New Delhi, 1-1279.
- 4. Brijlal & Subramanian, 2001, Principles of Physics, S. Chand & company Ltd, revised edition.

### **Reference Videos:**

- 1. <u>https://www.youtube.com/watch?v=0GAdMAm1-3o</u>
- 2. <u>https://www.youtube.com/watch?v=XuXUtGN928U</u>

### Website:

- 1. <u>https://www.gopracticals.com/physics/physics-calibrate-voltmeter-potentiometer/</u>
- 2. <u>https://www.brainkart.com/article/Newton-s-rings---Experiment,-Theory 566/</u>

## E-books:

- 1. <u>https://www.kopykitab.com/Engineering-Physics-Practicals-ebook</u>
- 2. <u>https://www.amazon.in/Engineering-Physics-Practicals-Srinivasa-Rao-ebook/dp/B075R377VW</u>
- 3. <u>https://www.kobo.com/in/en/ebook/engineering-physics-practicals</u>



Course ( 241ME1	Code A11PC		Course Nan Basics Elect	ne rical and Ele	ectronics E	ngineering	Laborator	у			L 0		T 0	Р 2	C 1	
Year	/ Semeste	r	I Year / I Se	mester							Conta	act hours	per we	eek	2Hrs	
			Basic Scien	ce			Engi	neering Sc	ience		Open	Elective	Man	dator	y	
		F	✓													
Course (	Objective	_	1		To sun practio	nmarize th ces.(K3)	e students	with hand	s on ex	perience	on vario	us electri	cal en	gineer	ing	
			2		To sun device	nmarize th s.(K3)	e students	with the d	esign, a	inalyze a	nd applie	application of electronic				
			At the end o	of the course	the studer	nt will be a	ble to:									
Course (	Jutcome	-	C01		Demoi	nstrate Ohi	m's law, Ki	rchhoff's la	w (K3	)						
		Ļ	CO2		Make o	Make different soldering circuits (K2)										
		-	CO3		Measu	re the vari	ous electri	cal quantit	ties (Ka	5)						
		-	C04		Inspec	t Earth res	istance (K	3)								
		-	COC		Design	a prototy	pe of a cha	rger (K3)	1.	(1/2)						
			0.06		Inspec	t the faults	s in various	electrical	machir	ies. (K3)				r		
POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	P010	P011	P012	PSO 1	PSO 2	PSO3	
C01	3	2	3	3 3 <u>-</u> <u>-</u> 2 <u>3</u> 2						3	2					
CO2	3	3	2	3	3	-	-	2	3	2	2	2				
CO3	3	3	2	3	2	-	-	2	2	2	3	2				
CO4	2	3	2	3	2	-	-	2	3	2	2	3				
CO5	-	3	3	3	2	-	-	2	3	3	3	3				
CO6	3	2	3	2	2	-	-	2	3	3	3	3				
Average	3	3	3	2	2	-	-	2	3	3	2	3				
	Correlatio	on Levels			1. Sligl	nt (Low)				2. Modera	ate (Medium)			:	3. Substantial (High)	
List of Ex           1.         Veri           2.         Veri           3.         Mea           4.         Pow           5.         Mea           6.         Cha           7.         Cha           8.         Cha           9.         Study	<b>cperiment</b> ification of asurement ver measur asurement racteristic: racteristic: racteristic: dy of Half v	s: Ohm's Kirchl of elec rement of ene s of PN s of Zel s of JFE vave a	a law noff's laws trical quanti in single ph rgy (using si Junction Dio ner Diode T nd Full wave	ty using RLC ase circuits u ngle phase e ode. Rectifiers	Total F C circuit (se using two v energy mete	Hours : 36 eries and pa vattmeter : er)	arallel) method.									
10. Stuc 11. Stuc 12. Stuc	dy of Earth dy of troub dy of CRO a	ing and le shoo and me	d Measurem oting of elect asurement of	ent of Earth rical equipm of AC signals.	resistance. 1ents (fan, 1	iron box, n	ixer grind	er, etc.)								
Text Books	ext Books:															

1.	Arumugam and Prem Kumar, Electric Circuit Theory, Khanna Publishers, 2002.					
2.	William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6 th edition, New Delhi, 2003					
3.	R.S.Sedha, A Textbook of Applied Electronics, 3rd revised Edition, 2008.					
4	A.K.Sawhney-A Course in Electrical and Electronics Measurements and Instrumentation, 19th Revised Edition 2011					
Reference Books: Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi, 2001.						



Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw-Hill, 2007. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2008

V Program		B.E. (Marine)													
Course code		Cours	se Nar	ne		L	,		Т		Р		С		
240MA TA 21TD		Ca	lculus			3			1		0		4		
Year / Semester	I / II								Contact hours/Week 4						
	H S	Human Social	nities : Scien	and ces		Mana cou	gemei irses	nt	Professional Core			Pro E	Professional Elective		
Course category		Basic Science				Engir Sci	neering ence	g	Op	en Elec	etive	Mandatory		у	
	1				To Su	introd	uce th ive di	e diff	erent n tiation	nethod	for dif	ferentia	ation an	d	
	2	2 To know the concepts and application of Functions of Several Variables.													
Course objectives	3	To apply integration techniques in area and volume by single integrals.													
	4	To apply double and triple integration techniques in area and volume.													
	5	<sup>5</sup> To apply integration in Physical Quantities of Marine Engineering.													
	CO	1 I	Differe	entiate	some	stand	ard fu	nction	n and S	uccess	ive der	rivative.			
Course outcomes	СО	$2 \begin{bmatrix} 0 \\ n \end{bmatrix}$	Calculate the limit of a function by L'Hospitals rule and application of maxima and minima.								f				
(On completion of the	CO	3 I	Determine the evaluation of single integrals and its applications.												
course, Learners will be able to)	CO	4 I	Determ	nine th	ne eval	luatio	n of m	ultipl	e integ	rals and	d its ap	plicati	ons.		
	CO	5 0	Calcula	ate the	e Mon	nent of	f inert	ia and	centro	oid.					
	СО	6 F	ind th robler	e solu ns.	ition f	or dif	ferenti	al cal	culus a	nd Inte	gral ca	lculus	related		
POs/COs PO1	PO2	PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11							PO12	PSO1	PSO2	PSO			
CO1 2	1	-	1	-	-	-	-	-	-	-	-	-	1	-	
CO2 3	2	-	2	-	-	-	-	-	-	-	-	-	1	-	
CO3 1	1	-	1	-	-	-	-	-	-	-	-	-	1	-	
CO4 2	1	-	1 - 1 -			-	-	-	-	-	-	-	1	-	



CO5	3	2	-	2	-	-	-	-	-	-	-	-	-	1	-
CO6	2	1	-	1	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	1.2	-	1.2	-	-	-	-	-	-	-	-	-	1	-
Correlation level	1.Slight (Low)					2. N	Iodera	ate (Me	edium)		3. Sub	stantial	(High)		

Unit-I	Differentiation	11 Hours							
Differentiation: Algeb	praic, circular, exponential and logarithmic function, products, quotien	ts							
functions and simple	implicit functions- Successive differentiation- nth order derivative: trig	onometric							
Identities, standard fu	nctions, partial fractions, Leibnitz's Theorem-Maclaurin's Theorem, 7	Taylor's							
theorem for standard functions (sinx ,cosx, tanx. $log(1-x)$ , $log(1+x)$ )-Curve tracing of Cartesian and									
Polar curves.									
Competency	4								
Numbers	ers								
Unit-II	it-II Functions of Several Variables 12 Hours								
Indeterminate forms a	and L'Hospital rule- Limits and continuity- Partial derivatives-Geomet	trical							
interpretation and rules of partial differentiation-Higher order partial derivatives-Homogeneous									
functions and Euler's theorem-Total derivative and chain rules-implicit function and composite									
functions- Errors and approximations-Maxima and minima using Lagrange's multipliers.									
Competency	4								
Numbers									
Unit-III	Integration	10 Hours							
Basic of integration-I	ntegration of standard functions by substitution and by parts-Definite	integral as							
the limits of a sum- A	pplication of integration to the area under curve and volume of revolu	tion.							
Competency	4								
Numbers									
Unit-IV	Applications of Multiple Integrals	12 Hours							
Double and Triple int	egrals- Region of integration-Change of order of integration: spherical	and polar							
coordinates-Applications in area and volume-Mass of wire and solid-Centre of gravity of wire,									
Lamina-Moment of in	nertia using multiple integrals.								
Competency	4								
Numbers									
Unit-V	Applications of Integration in Physical Quantities	9 Hours							



First moment of area and the position of a centroid of an area- work done by variable force- mean values and									
RMS values of sin nx and Cos nx -Rules of Guldinus- Parallel and perpendicular axis theorem-Second moment									
of area and M.I of recta	ngular and circular laminas.								
Competency	4 Total								
Numbers	hours: 54								
Text Books:									
1. Grewal B.S, "Higher	Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2014.								
<ul> <li>Unit I: Chapter 4 Section 1-4.</li> <li>Unit-II: Chapter 4 Section 5, 15; Chapter 5 Section 1-5, 11, 12.</li> <li>Unit-III: Chapter 6 Section 8-10, 12.</li> <li>Unit-IV: Chapter 7 Section 1-10, 12.</li> <li>2. Statics-Engineering Mechanics-I, Dietmar Gross, Wolfgang Ehlers, Peter Wriggers, Jorg Schroder, Ralf Muller, Springer-2017.</li> </ul>									
Unit V: Chapter 2,7,9.									
<b>Reference Books:</b>									
1.Embleton, W. and Ja	ackson, L., "Mathematics for Engineers", Vol - I, 7th Edition, Reed's Marine								
Engineering Series,									
2. Thomas Reed Publications, 1997. 2. Jain R.K and Iyengar S.R.K, "Advanced Engineering									
Mathematics", 3 rd E	dition,								
3. Narosa Publishing House Pvt. Ltd., 2007. 3. James, G., "Advanced Engineering Mathematics", 7									
th Edition, Pearson									
4. Education, 2007.	4. Ramana, B.V, "Higher Engineering Mathematics", McGraw Hill Education								

Dut	I td	New	Delhi	2016
PVI.	Lu.	INEW	Demi.	2010.

Program	B.E. – Marine Engineering										
Course code	Course	Name		L T			Р	С			
241ME1A23TA	Marine	Electronics		2	1		0	3			
Year / Semester	I year Il	Semester		Contact hours	/Week	3 Hrs					
	Basic So	cience	Engineering Science			Open Elective Mandatory		tory			
			$\checkmark$								
	1	To explain the fundamental principles of Boolean algebra and combinational circuits, including logic gates, truth tables, and Boolean expressions. (K1)									
	2	Explain the number of clock cycles and enable timing and sequencing functions. (K1)									
Course objectives	3	To classify and differentiate the instruction sets and addressing modes of the 8085 microprocessor (K2)									
	4	Analyze the various types of interfacing in the 8085 microprocessor, including their characteristics, applications, and challenges. (K3)									



	5	Discuss f	Discuss functional block diagram, addressing modes, and data transfer operations of the 8085 microprocessor (K2)													
	On com	pletion of t	the court	se. stu	dents	will be ab	le to									
	C01	Explain the fabrication of IC's and op-Amp. (K1)														
	CO2	Illustrate	Illustrate the concept of counter, flip flop and Memory (K2)													
	CO3	Solve the	Solve the concept of Boolean algebra and combinational circuits. (K3)													
Course outcomes	CO4	Discuss t micropro	Discuss the functional block diagram, Addressing modes and data transfer of 8085 nicroprocessor (K2)													
	C05	Compare (K3)	Compare the functions of various advanced microprocessor and microcontroller architecture. K3)													
	C06	Apply the (K3)	Apply the programming knowledge of microprocessor and control the speed of stepper motor. (K3)													
POs/ COs	P01	PO2	P03	P04	P05	P06	PO7	P08	P09	PO 10	P0 11	P0 12	PSO 1	PS 02	PSO3	
C01	2	2	2	2	2	-	-	2	2	-	-	-				
CO2	2	2	2	2	2	-	-	2	2	-	-	-				
CO3	3	2	2	2	2	-	-	2	3	-	-	-				
CO4	3	3	2	2	2	-		3	2		-	-				
CO5	3	3	2	2	2	-		2	2		-	-				
C06	3	2	1	1	2	-		2	2		-					
Average	3	2	2	2	2	-		2	2		-	-				
Correlation level			1.Sligh	nt (Low	)		2. Moderate (Medium) 3. Substantial (High)						)			

UNIT-I	INTEGRATED CIRCUITS 11 Hours								
IC classification - fundamental of monolithic IC technology - Ideal OP-AMP characteristics - feedback amplifiers - differential amplifier - Power Amplifiers circuit diagram and explanation - Class A, B amplifier - Basic applications of OP-AMP – summer and Subtractor - Instrumentation amplifier - PCB design.									
Competency Numbers 6.1.2.									
UNIT-II		DIGITAL CIRCUITS	11 Hours						
Logic Systems and Gates – Number systems – Boolean algebra – Simplifications – Flip – flops - SR, D, JK and T – Counters-2 bit Asynchronous up,down– Registers and multiplexers Semiconductor memories – ROM – RAM and PROM.									
Competency Numb	ers	6.1.2.							
UNIT-III	INDUSTRIAL ELECT	TRONICS	11 Hours						
Power rectification –Structure - operation and characteristics of SCR – TRIAC - power transistor - MOSFET - Photoelectric devices - regulated power supply and application of Power electronics circuits.									
Competency Numb	ers	6.1.2.							
UNIT-IV	UNIT-IV MICROPROCESSORS BASED SYSTEMS DESIGN 11 Hours								
Architecture of 8085 – Instruction set- addressing modes– Interfacing and Control of motors -Temperature/Speed control - Closed loop control of servo motor - stepper motor control.									
Competency Numb	ers	6.1.2.							



UNIT-V MICROCONTROLLER AND ITS APPLICATION 10 Hours									
Architecture of 8051 — Special Function Registers (SFRs) — I/O Pins Ports and Circuits — Instruction set — Addressing modes —									
Comparison of Microcontroller, PIC and ARM processors									
Competency Numbers 6.1.2.									
	Total hours: 54 Hours.								
Text Books:									
Ramakant.A. Geakwad, "Linear integrat	ed circuits", 3rd edition, Prentice – Hall of India, New Delhi, 2001								
Malvino Leach, "Digital principles and applications", 5th edition, Tata McGraw-Hill, Publishing co., New Delhi, 1995.									
Hofmann, "Global Positioning System",	5th Ed.,Springer, Indian reprint 2007 (Yesdee Publishings Pvt. ltd	.)							
Reference Books:									
P.S.Bimbhra, "Power Electronics", 3rd edition, Khanna Publisher, New Delhi, 2001.									
Ramesh Gaonkar, "Microprocessors and Microcomputers", 4th edition, lhasthatak, India, 1999.									
Ray choudhary & Shail B Jain, "Linear Integrated Circuits", New Age International publisher, 2015									
Rashid, " Power Electronics Handbook",3rd Ed. Elsevier, Indian Reprint 2013(Yesdee Publishings Pvt. Ltd.)									

Course code	Course Name	al Machinos I	L	Т	Р	С				
Z41ME1AZ51D	Marine Electric	ai Machines – i	2	1	0	3				
Year / Semester		I Year/ II semester		Contact hou	rs/Week –	3 hrs				
	Humanities and Social Sciences	Management courses	F	Professional Core	Professional Elective					
Course category										
	Basic Science	Engineering Science		Open Elective	Mandatory					
		Х								
	1	To describe the electromechanical energy conversion in electrical apparatus. (K1)								
	2	To demonstrate an understanding of the constructional details of DC generators. (K2)								
Course chiesting	3	To Explain the basic principles and characteristics of DC motors and their operation. (K1)								
Course objectives	4	To Create an informative description of the physical components and design features of transformers. (K3)								
	5	To describe the key performance parameters of motors and their significance in practical applications. (K1)								
	6	To apply knowledge of electrical machines and control systems to design an efficient and reliable ship propulsion system. (K1)								
Course outcomes	On completion of the course, students will be able to									
Course outcomes	C01	Identify the construction and characteristics of D.C. Machines in general. (K2)								



			C02		Expla	Explain the constructional details of DC Generators (K1)									
CC			)3	Expla	Explain the Operation and characteristics of DC Motors (K1)										
C04			)4	Expla	Explain the Constructional Details of Transformers (K1)										
C05			Ident	Identify the fault finding techniques in electrical apparatus. (K2)											
			CC	06	Describe the structure and functioning of electrical generation and distribution systems with safety precautions. (K2)						ion				
POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	3	3	2	2	2	3	3	3	3				3	2	
CO2	3	2	2	2	2	3	3	3	3				3	2	
CO3	3	3	2	2	2	3	3	3	3				3	2	
CO4	3	2	2	2	2	3	3	3	3				3	2	
C05	3	2	2	2	2	3	3	3	3				3	2	
C06	3	2	2	2	2	3	3	3	3				3	2	
Average	3	3	2	2	2	3	3	3	3				3	2	
Correlation level 1.Slight (Low)			<i>v</i> )	2. Moderate (Medium)				3. Substantial (High)							



UNIT-I	ELECTROMEC	ELECTROMECHANICAL ENERGY CONVERSION 1							
Fundamentals of Magnetic circuits – Statically and dynamically induced EMF – Principle of electromechanical energy conversion forces and torque in magnetic field systems – co-energy in singly excited and multi excited magnetic field system – Winding Inductances – magnetic fields in rotating machines- magnetic saturation and leakage fluxes.									
Competency Numbers		6.1 , 6.1.1c							
UNIT-II	DC GENERATO	RS	11 Hours						
Principle of operation, constructional details, armature windings and its types, EMF equation – armature reaction – demagnetizing and cross magnetizing ampere turns – compensating winding – commutation – inter poles – OCC and load characteristics of different types of DC Generators. Parallel operation of DC Generators, equalizing connections- applications of DC Generators.									
Competency Numbers		6.1.1.a , 6.1.1c							
UNIT-III	DC MOTORS		11 Hours						
Principle of operation – significance of back e.m.f – torque equations and power developed by armature – speed control of DC motors – starting methods of DC motors – load characteristics –losses and efficiency – condition for maximum efficiency. Testing of DC Machines: Brake test, Swinburne's test, Hopkinson's test, Field test, Retardation test, Separation of core losses-applications of DC motors.									
Competency Numbers		6.1 , 6.1.1c							
UNIT-IV	TRANSFORME	TRANSFORMERS							
Construction and principle of operation – equivalent circuit – phasor diagrams – voltage regulation –losses and efficiency – all day efficiency – applications of single-phase transformer. Construction and working of auto transformer – comparison with two winding transformers – applications of autotransformer. Three Phase Transformer – Construction – types of connections and their comparative features–Scott connection applications of Scott connection									
Competency Numbers		6.1.1b , 6.1.1c							
UNIT-V	FAULT FINDIN	G TECHNIQUES FOR GENERATOR	10 Hours						
Types of fault in main generator, Emergency generator, Fault finding techniques of main generator, Essential requirements for fault prevention and fault location in Generators Fault Rectification and actions to be taken on detection of fault in Main Generator and Emergency Generator.									
Competency Number	ers	7.1 , 7.3							
			Total hours: 54						
Text Books:									
1. Theraja A. K, A Textbook of Electrical Technology: - AC and DC Machines (Volume - 2) Publisher S. Chand;									
2. Edmund GR Kraal, Stanley Buyers, Christopher Lavers, "Basic electro technology for marine engineers", 4th Ed. Reeds Vol 06									
3. I.J Nagrath and D.P Kothari, "Basic Electrical Engineering", 2nd Edition, McGraw Hill Publishing Co., Ltd., New Delhi, 2002.									
Reference Books: 1. Hughes Edward, "Electrical technology", 2nd edition, "ELBS with DP Publications", USA, 1996.									


S. No	COURS	E COD	E	E SUBJECT TITLE L T P C												
1	241CH1	LA21T	G		EN( CH	GINE IEMI:	ERIN( STRY	Ĵ			2		0	0		2
Cc Obj	ourse ectives	1. Lea 2. Un 3. Cla 4. Un 5. Rea	arn th derst issify derst cogni	the pro and t the ty and t ze the	bblem he co ypes o he en e nee	is ass incept of ma iginee d of fi	ociate t of co terial ering uel ar	ed wa prrosi s and mate nd end	iter tr ion ar l thein rials, ergy s	reatm nd its r appl neces sourc	ent m contro licatio ssity a es for	ethod ol (K2 ns (K2 nd its prese	s and boile ) ?) utilization nt and futu	(K2) (K2)	istry (K1)	
Cc Out	ourse tcomes	The S 1. Un 2. Ap 3. Ide 4. Un 5. Re 6.Util	Stude derst prais entify derst cogni lize th	nts w and t e the the p and t ze the	ill be he wa boile proble he en e nee owlec	able ater t r che ems a ginee d of fi dge of	to echno mistr ssocia ering uel ar f engi	ology y and ated y mate nd en neeri	and i l its p with c rials, ergy s ng ch	ts tre rotec corros neces sourc emis	atmer tion (F sion w ssity a es for try in 1	nt imp (2) rith its nd its presen real tin	ortance (K control m utilization nt and futu me engine	2) easures (K1) (K2) ure (K2) ering applicati	ons (K3)	
		Р О 1	Р О 2	Р О З	Р О 4	Р О 5	Р О 6	Р О 7	Р О 8	Р О 9	PO 10	P0 11	P012	PS01	PSO2	PSO3
	C01	2	-	-	-	-	-	2	-	-	-	-	2	1	2	3
	CO2	2	2	-	-	-	-	3	-	-	-	-	2	2	2	2
	CO3	2	2	-	-	-	-	3	-	-	-	-	2	-	-	-
	CO4	2	2	-	-	-	-	3	-	-	-	-	2	-	-	-
	C05	3	2	-	-	2	-	-	-	-	-	-	2	-	-	-
	C06	3	2	3	-	2	-	3	-	-	-	-	2	2	2	2
AV	ERAGE	2.     3     2     3     -     2     -     -     -     -     2     2     2     2								3						

Enter correlation levels as 1,2,3

1

- Slight (Low)
- 2 Moderate (Medium)
- 3 Substantial (High)

### **UNIT I WATER TECHNOLOGY**

Water and it's impurities - Domestic Water treatment - Purification – Sterilization and disinfection: UV treatment- Ozone treatment-Chlorination, Break point chlorination Introduction to boiler feed water-Requirements of boiler feed water- Purpose of water treatment in boilers, scale and sludge formation and prevention, priming and foaming- chemical and mechanical deareation – methods of chemical and mechanical deareation – Boiler treatment methods. Zeolite process and ion exchange (demineralization) - caustic soda treatment - condensate lime treatment - Desalination of water - reverse osmosis and electrodialysis.

Competency No. : 4.1.9

### UNIT-II CORROSION SCIENCE

Corrosion:- Definition – Theories of Corrosion (chemical & electrochemical) – concentration cell corrosion, differential aeration and waterline corrosion – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating).

Competency No.: 4.1.9

# UNIT III LUBRICATION & ENERGY SOURCES

Lubricants – Mechanism and Classification of lubricants - Solid, semisolid and liquid lubricants with examples- Type of lubrications – hydrodynamic and boundary lubrication with illustrative diagrams. Properties of lubricants: Physical properties- viscosity, viscosity index, cloud and pour point, flash and fire point, oiliness. Chemical properties - TAN, emulsification, aniline point and iodine value.

Greases, graphite, cooling liquids and cutting fluids and their applications. Alternative and non-conventional sources of energy – solar, wind, geo, hydro-power and biomass. Advantages and disadvantages. Nuclear energy, reactors and nuclear waste disposal. Safety measures for nuclear reactors. Primary and secondary batteries - Battery technology. Rechargeable batteries - Alkaline batteries – Lead acid, Ni – Cd and Li ion batteries, Sodium and Zinc based batteries Fuel cells – Hydrogen, Photovoltaics.

Competency No.: 4.1.9

### UNIT IV POLYMER ENGINEERING MATERIALS

Introduction – Classification of polymerization –addition, condensation polymerization – Plastics as engineering materials: advantages and limitations – Thermoplastics and Thermosetting plastics – Preparation, properties and applications of polyethylene, PVC, Bakelite, Teflon and Polycarbonates – Elastomers: Natural rubber and Synthetic rubbers – compounding and vulcanization – Reinforced plastics – Biodegradable polymers – Conducting polymers – Applications

Competency No. : 4.1.9

# UNIT V NANOCHEMISTRY

Introduction, Types- Nanoparticle, nanocluster, nanorod, nano wire and nano tube, particulate (metal/metal oxide), tubular/fiber (CNT/CNF), layered (Nanoclays, Graphene Oxide) and its properties. Preparation of

### Rev 04-06-2024

10 Hrs

12Hrs

10 Hrs

# 12 Hrs

# 10Hrs





nanomaterials – Ball milling, CVD, Self-assembly, sol–gel, solvothermal and laser ablation. Characterization of nanomaterials. Applications- electronics, medicine, agriculture and catalysis.

Competency No.: 4.1.9

## REFERENCE

### **Text Books:**

- 1. V. Balasubramanian, G. Ramachandran, S. Sreedevi, Engineering Chemsitry, Cars Publishers, 2010.
- 2. A Textbook of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
- 3. Engineering Chemistry by Jain and Jain, 17th Edition, Dhanpat Rai Publishing Company, New Delhi, 2021.
- 4. Milton and Leech, "Marine Boilers", Butter Worth Publishers, UK
- 5. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2021

### **Reference Books:**

- 1. L. Jackson and T.D. Morton, "Reed's General Engineering Knowledge for Marine Engineers", Vol. 8, 2020.
- 2. Jain & Jain, Engineering Chemistry, Dhanpat rai Publishing company, 16th Edition, 2015
- 3. Vairam S., Murugavel S.C. and Chelladurai C, "Engineering Chemsitry-I & II", Gems Publishers, 2021.
- 4. V.K. Ambasta, Engineering Chemistry, Laxmi publication, 2008.

Program			B.E. – Mai	rine Engineer	ing			
Course code	Course N Marine	lame <b>Thermodynam</b>	ics	L	Т	Р	С	
241MLIA2111	Murme	1 Her Houy Hum		2	1	0	3	
Year / Semester	I Year/ I	I semester		Contact hou	rs/Week	3 hr	S	
	Bas	ic Science	Engineering Science	Open E	lective	Mai	ndatory	
	$\checkmark$							
Pre requisite	Fundam	entals of Physics	s, Chemistry and Mather	natics				
	1	Explain the fir specific heats,	rst law of thermodynami , and enthalpy. (K1)	mics to closed and open systems, analyzing internal energy				
Course objectives	2	Illustrate the and availabilit	second law of thermody ty. (K2)	odynamics, including irreversibility, entropy, Carnot cycles,				
	3	Infer principle engineering p	es of gas mixtures and the rocesses. (K2)	d thermodynamics to solve complex problems in chemical				



CO3         3         3         3         3         -         -         2         3         -         -         2	C02	2	2	1	1	1     -     2     3     -     -     2     2     2     -       3     -     -     2     3     -     -     2     2     2     -												
CO4       3       3       3       3       -       -       2       3       -       -       2	CO3	3	3	3	3	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$												
COT333311 <t< td=""><td>C04</td><td>3</td><td>3</td><td>3</td><td>3</td><td></td><td></td><td>2</td><td>3</td><td></td><td></td><td></td><td>2</td><td>2</td><td>2</td><td></td></t<>	C04	3	3	3	3			2	3				2	2	2			
CO5333323222222CO633333-323222222Average3.003.002.502.50-3.002.003.0022222-Average3.003.002.502.50-3.002.003.002.002.002.002222-Correlation level1.Slight (Low)2. Moderate (Medium)3. Substantial (High)UNIT-I12 HouThermodynamic systems, concepts of continuum, thermodynamic properties, equilibrium, processes, cycle, work, hetemperature, Zeroth law of thermodynamics. Thermodynamics and its application to various Processes, Energy Balance, EneChange of a System, Mechanisms of Energy Transfer; Steady-Flow Energy Equation; Non-Flow Energy Equation; Basic ProbletVarious thermodynamic processes P-V Diagram for Work Transfer in Reversible Processes; Steady Flow Process and Non-flProcess; Energy Conversion Efficiencies.4.5UNIT-IIBASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS12 HouThermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Cartheorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat	04	3	3	3	3	-	-	2	3	-	-	-	2	2	2	-		
CO63333-3232222Average3.003.002.502.50-3.002.003.002.002.002.00-Correlation level1.Slight (Low)2. Moderate (Medium)3. Substantial (High)UNIT-IBASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS12 HouThermodynamic systems, concepts of continuum, thermodynamic properties, equilibrium, processes, cycle, work, hetemperature, Zeroth law of thermodynamics. Thermodynamics and its application to various Processes, Energy Balance, EneChange of a System, Mechanisms of Energy Transfer; Steady-Flow Energy Equation; Non-Flow Energy Equation; Basic ProblerVarious thermodynamic processes P-V Diagram for Work Transfer in Reversible Processes; Steady Flow Process and Non-flProcess; Energy Conversion Efficiencies.Competency Numbers4.5UNIT-IIBASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICSThermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Cartheorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to marengineering. Clausius inequality, entropy, available energy. Simple problems.Competency Numbers4.5	C05	3	3	3	3	-	-	2	3	-	-	-	2	2	2	-		
Average3.003.002.502.50-3.002.003.002.002.002.00Correlation level1.Slight (Low)2. Moderate (Medium)3. Substantial (High)UNIT-IBASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS12 HouThermodynamic systems, concepts of continuum, thermodynamic properties, equilibrium, processes, cycle, work, he temperature, Zeroth law of thermodynamics. Thermodynamics and its application to various Processes, Energy Balance, Ener Change of a System, Mechanisms of Energy Transfer; Steady-Flow Energy Equation; Non-Flow Energy Equation; Basic Problet Various thermodynamic processes P-V Diagram for Work Transfer in Reversible Processes; Steady Flow Process and Non-fl Process; Energy Conversion Efficiencies.12 HouCompetency Numbers4.5UNIT-IIBASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS12 HouThermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Car theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.12 HouCompetency Numbers4.5	C06	3	3	3	3	-	3	2	3	-	-	-	2	2	2	-		
Correlation level       1.Slight (Low)       2. Moderate (Medium)       3. Substantial (High)         UNIT-I       BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS       12 Hou         Thermodynamic systems, concepts of continuum, thermodynamic properties, equilibrium, processes, cycle, work, he temperature, Zeroth law of thermodynamics. Thermodynamics and its application to various Processes, Energy Balance, Energ Change of a System, Mechanisms of Energy Transfer; Steady-Flow Energy Equation; Non-Flow Energy Equation; Basic Problet Various thermodynamic processes P-V Diagram for Work Transfer in Reversible Processes; Steady Flow Process and Non-fl Process; Energy Conversion Efficiencies.         Competency Numbers       4.5         UNIT-II       BASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS       12 Hou         Thermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Carr theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.       Competency Numbers       4.5	Average	3.00	3.00	2.50	2.50	-	3.00	2.00	3.00	-	-	-	2.00	2.00	2.00	-		
UNIT-IBASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS12 HouThermodynamic systems, concepts of continuum, thermodynamic properties, equilibrium, processes, cycle, work, he temperature, Zeroth law of thermodynamics. Thermodynamics and its application to various Processes, Energy Balance, Ener Change of a System, Mechanisms of Energy Transfer; Steady-Flow Energy Equation; Non-Flow Energy Equation; Basic Problem Various thermodynamic processes P-V Diagram for Work Transfer in Reversible Processes; Steady Flow Process and Non-fl Process; Energy Conversion Efficiencies.12 HouCompetency Numbers4.5UNIT-IIBASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS12 HouThermodynamic systems - Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Carr theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.12 HouCompetency Numbers4.5	Correlation lev	el		1.	Slight (l	Low)		2. Mo	derate (	Mediun	n)		3. Sı	ıbstantia	al (High)	)		
Thermodynamic systems, concepts of continuum, thermodynamic properties, equilibrium, processes, cycle, work, he temperature, Zeroth law of thermodynamics. Thermodynamics and its application to various Processes, Energy Balance, Energy Change of a System, Mechanisms of Energy Transfer; Steady-Flow Energy Equation; Non-Flow Energy Equation; Basic Problem Various thermodynamic processes P-V Diagram for Work Transfer in Reversible Processes; Steady Flow Process and Non-fl Process; Energy Conversion Efficiencies.Competency Numbers4.5UNIT-IIBASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS12 HouThermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Carr theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.Competency Numbers4.5	UNIT-I			l	BASIC C	ONCEP	TS AND	FIRST	LAW OF	THER	MODYN	AMICS			12	Hours		
Change of a System, Mechanisms of Energy Transfer; Steady-Flow Energy Equation; Non-Flow Energy Equation; Basic Problem         Various thermodynamic processes P-V Diagram for Work Transfer in Reversible Processes; Steady Flow Process and Non-fl         Process; Energy Conversion Efficiencies.         Competency Numbers       4.5         UNIT-II       BASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS       12 Hou         Thermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Carr       12 Hou         Theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar       engineering. Clausius inequality, entropy, available energy. Simple problems.         Competency Numbers       4.5	Thermodynam	nic syst	ems, o	concep	ts of c	ontinuu	m, the	rmodyn	amic pr	opertie	es, equi	librium,	proces	ses, cyc	cle, woi Palanco	rk, heat,		
Various thermodynamic processes P-V Diagram for Work Transfer in Reversible Processes; Steady Flow Process and Non-fl         Process; Energy Conversion Efficiencies.         Competency Numbers       4.5         UNIT-II       BASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS       12 Hou         Thermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Carr theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.         Competency Numbers       4.5	change of a Sy	Zeroth I vstem, N	aw of t Iechan	nermo isms o	dynamı f Energy	cs. Ther 7 Transf	modyna er: Stea	amics ai dv-Flow	nd its ap Energy	plicatio Equation	on to vai	-ious Pro -Flow Ei	ocesses, nergy Eq	Energy	Balance Basic P	e, Energy roblems.		
Process; Energy Conversion Efficiencies.         Competency Numbers       4.5         UNIT-II       BASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS       12 Hou         Thermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Carr theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.         Competency Numbers       4.5	Various therm	odvnan	nic pro	cesses	P-V Dia	gram fo	or Work	Transf	er in Rev	versible	e Proces	ses: Ste	ady Flov	v Proces	ss and N	Non-flow		
Competency Numbers       4.5         UNIT-II       BASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS       12 Hou         Thermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Cart theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.       Competency Numbers       4.5	Process; Ener	gy Conv	ersion	Efficie	ncies.	.gruin it		Transi			. 110000	565, 566	uuy 1101	110000	jo unu i			
UNIT-II       BASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS       12 Hou         Thermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Car       theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar         engineering. Clausius inequality, entropy, available energy. Simple problems.       Competency Numbers       4.5	Competency N	Jumbers	3		4.5													
UNIT-II       BASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS       12 Hour         Thermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Cart theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.       12 Hour         Competency Numbers       4.5			,															
Thermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Cart theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.         Competency Numbers       4.5	UNIT-II			F	BASIC C	ONCEP	rs of si	ECOND	LAW OF	THER	MODYN	AMICS			12	Hours		
theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to mar engineering. Clausius inequality, entropy, available energy. Simple problems.Competency Numbers4.5	Thermodynam	nic syste	ms – S	econd	law of th	nermody	mamics	, Statem	ents, T-s	diagra	ms, Reve	ersibility	, causes	ofirrev	ersibilit	y, Carnot		
engineering. Clausius inequality, entropy, available energy. Simple problems.Competency Numbers4.5	theorem, Carr	ot cycle	, Rever	sed Ca	rnot cyc	le, diffe	rence b	etween	heat eng	ine, ref	rigerato	r and he	eat pump	o, applic	ations to	o marine		
Competency Numbers 4.5	engineering. (	lausius	inequa	lity, en	itropy, a	vailable	energy.	Simple	problem	15.								
	Competency N	lumbers	5		4.5													
UNIT-III PROPERTIES OF GAS MIXTURES AND THERMODYMIC RELATIONS 10 Hour	IINIT-III			4.5 PROPERTIES OF CAS MIXTURES AND THERMODYMIC RELATIONS 10 Hours														



Mole and Mass	fraction Dalt	on's and Amagat's Law D	conarties of ass mixture M	lolar mass . car	constant d	ancity chang	e in					
internal energy	, enthalpy, entr	opy and Gibbs function - Si	mple calculations. Maxwell r	elations, Tds E	quations, Dif	ference and r	atio					
of heat capaciti	ies, Joule-Thom	son Coefficient, Clausius Cl	apeyron equation, Phase Cha	inge Processes	- Simple Calc	ulations.						
Competency N	umbers	4.5										
UNIT-IV		PROPERTIES OF PURE	SUBSTANCE AND STEAM PC	WER CYCLE		10 Hou	irs					
Formation of st other substanc calculations Ide	team and its th e Calculation o eal and actual R	ermodynamic properties – f steam properties using S Rankine cycles, Cycle - Impro	Flow diagram p-v, p-T, T-v, T team Table and Mollier Char ovement Methods - Reheat ar	-s, h-s diagram t – Dryness fra nd Regenerativ	s. p-v-T surf action detern e cycles – Sin	ace of water nination - Sim nple calculatio	and 1ple ons.					
Competency N	umbers	4.5										
UNIT-V		I	PSYCHROMETRY			10 Hou	ırs					
Psychrometric Psychrometric and adiabatic m Competency Na	cometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions.         cometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling liabatic mixing. Simple Applications.         etency Numbers       4.5         Total: 54 Hours											
	Total: 54 Hours											
lext Books:	300ks:											
1. Nag, I	Nag, P.K., "Engineering Thermodynamics", 6th Edition, Tata McGraw-Hill Publishing Company Limited New Delhi, 2017.											
2. Russe	ssel, "Engineering Thermodynamics", 1st Edition, Oxford University Press, 2007											
Reference Boo	oks:											
1. Holm	ann, "Thermod	ynamics", 4th Edition, McG	raw-Hill Book Company,New	York,1888.								
2. Rao, Y	Y.V.C., "Thermoo	dynamics",4th Edition,Wiley	y Eastern Ltd.,New Delhi,199	3.								
3. Wllia Repri	m Embleton ob nt 1999.	e., "Applied Heat for Engine	eers", Reed's Marine Enginee	ring Series, Vol	.3, Thomas F	Reed Publicati	ion,					
4. Yunus Educa	s. A Cengel and ation, New Delh	Michael A Boles, "Thermoon ni, 2015.	lynamics – An Engineering A	pproach, 8th E	dition", Tata	McGraw Hill-						
5. Sonnt Sons.	tag, R. E, Borgna	akke, C. and Van Wylen, G. J	., Fundamentals of Thermody	namics 2003, 6	th Edition, <i>s</i> ,	John Wiley a	nd					
PROG	RAM		BE -Marine	Engineering								
Course 241ME1	Code A23PB	Course Marine Electro	Name: nics Laboratory	L	Т	Р	(					
			<b>2</b>	0	0	2	1					
Year and S	Semester	II Year ( II	Semester )	Cont	act hours pe	r week	2 Hrs					
		Humanities and Social Sciences	Management courses	Professior	nal Core	Professio	nal Elec					
Course c	ategory			0 7			1.					
1	<u> </u>	Basic Science	Engineering Science	Upen Ele	ective	Man	datorv					

	Du	Sie beienee	Ingineering belence	open meenve	mandatory						
			$\checkmark$								
	1	To apply the Op-	o apply the Op-Amp- Inverting and non-inverting amplifier,								
		Integrator and D	vifferentiator (K3)								
Course Objective	2	To apply the trut	th table of logic gates and verify. (K3)								
	3	To identify the c	characteristics of Triac,SCR (K2)								
	4	To build the prog	rogram to sum of 2 -8 bit nos. using 8085 processor (K1)								



				5	To build	l the pr	ogram to	sum of 2	2 -8 bit no	os. using 80	)51 micro	ocontrolle	r. (K1)			
						After	the succ	essful co	mpletion	of this cou	rse stude	nts shall	be able to			
			C	01	Examin (K2)	e with 1	the Op-A	mp- Inve	rting and	non-inver	ting amp	lifier, Inte	grator and	lDiffer	entiator	
			С	02	Experir	nent wi	th Verifv	of all Lo	gic Gates	(K3)						
Cou	rse Outco	ome	С	03	Experir	nent wi	th the ch	aracteris	tics of Tr	iac.SCR. (K	(3)					
			C	04	Experir	nent wi	th sum o	f 2 8hit u	ising 808	5 micronro	ncessor (]	(3)				
			C	05	Experir	nent wi	th subtra	ction of	2 8bit usi	ng 8051 m	icrocont	coller. (K3	3)			
			C	06	Demon	strate w	vith steni	per moto	r using 8	051 microe	ntroller	(K3)	<i>,</i> )			
POs /	P01	P02	P03	P04	PO5	PO6	P07	PO8	PO9	P010	P011	P012	PSO1	PSO2	PSO3	
COS         COS <thcos< th=""> <thcos< th=""> <thcos< th=""></thcos<></thcos<></thcos<>																
C01	J1     3     3     2     2     2     2     -     2     3     2     -     2       02     3     2     1     1     2     2     -     2     2     -     1															
CO2	2	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$														
CO4	J3     3     3     2     2     2     2     -     2     3     2     -     2       J4     3     3     3     2     2     2     -     2     3     2     -     2															
C05	3	3     3     3     2     2     2     -     2     3     2     -     3       3     2     1     1     2     2     -     2     2     2     -     1														
C06	3	3	3	2	2	2	_	2	3	2	-	3				
verage	3.00	2.67	2.00	1.67	2	2	-	2.00	2.67	2.00	-	2.00	2.67	2.17	3.00	
Cor	relation I	levels		1	1. Slight	(Low)	1	2.	Moderate	e (Medium)	)	3. Si	ubstantial	(High)		
Text Bo	oks															
Ramaka	$\Delta \Delta C \rho$	akwad	"Line	ar inte	orsted	circuit	s" 3rd e	dition 1	Prontico	– Hall of I	ndia Ne	w Delhi	2001			
Namaka	iiit.A. UC	актац	, Line		grateu	circuit	.s , 510 e	uition, i	Tentice		nuia, ne	w Denn,	2001			
Malvino	) Leach, '	"Digita	l princ	iples a	and app	licatio	ns", 5th	edition,	Tata Mc	Graw-Hill	, Publisł	ing co., l	New Delh	i, 1995	5.	
Hofmar	ın, "Glob	al Posi	tioning	g Syste	em", 5th	ı Ed.,Sp	oringer, l	Indian r	eprint 2	007 (Yesd	ee Publi	shings P	vt. ltd.)			
Referen	ce Book	s:							-				-			
P.S.Bimbhra, "Power Electronics", 3rd edition, Khanna Publisher, New Delhi, 2001.																
Ramesł	Ramesh Gaonkar, "Microprocessors and Microcomputers", 4th edition, lhasthatak, India, 1999.															
Ray cho	Ray choudhary & Shail B Jain, "Linear Integrated Circuits", New Age International publisher, 2015															
Rashid,	Rashid. " Power Electronics Handbook".3rd Ed. Elsevier. Indian Reprint 2013(Yesdee Publishings Pvt. Ltd.)															

List of Experiments:

- Competency Number:6.1.1e+6.1.2+6.1.2a
- 1. Application of Op-Amp-I: Inverting and non-inverting amplifier
- 2. Application of Op-Amp-I: Integrator and Differentiator
- 3. Verification of Logic Gates
- 4. Study of JKFF, RS FF, DFF
- 5. Characteristics of TRIAC
- 6. Characteristics of SCR
- 7. Addition of two 8 bit numbers using 8085 processor
- 8. Subtraction of two 8 bit numbers using 8085 processor.
- 9. Addition and Subtraction of two 8 bit numbers using microcontroller 8051.
- 10. Stepper motor control using microcontroller 8051

TOTAL: 36 HOURS



Program	B.E. – Marine Engineering												
Course code	Course Nar	ne		L	Т	Р	С						
241ME1A23PC	Marine Ele	ctrical Machines Laborato	ry	0	0	4	2						
Year/Semester		I Year/ II semeste	r	Con	tact hours	/Week –	4 hrs						
	Humanit	ies and Social Sciences	Management courses	Profes Co	ssional ore	Profe Ele	ssional ctive						
Course category		Basic Science	Engineering	Onen F	Elective	Man	datory						
		busic science	Science	openi	heenve	Man	uutory						
	1	To explain the functioning and key properties of DC generators for understandin their practical application in electrical systems. (K2)											
Course objectives	2	resulting	5										
	3	To analyze the construc principles of operation	transform )	ers, and u	nderstan	d their							
	4	To understand the load under varying load cond	To understand the load characteristics of synchronous motors and its behaviour under varving load conditions. (K1)										
	5	To formulate an unders during no-load and bloc	tanding of induction ked rotor conditions	motor los 5. (K1)	ses and th	eir variat	ions						
	6	Inference of DC and AC	C machines (K2)										
	C01	Analyze the Operation a	nd characteristics of	DC Gener	ators (K3)								
	CO2	Examine various metho	ds of starting of DC N	lotors and	d its chara	cteristics	(K3)						
	CO3	Analyze the Construction	on and working of Tra	ansformer	's (K3)								
Course outcomes	CO4	Analyze load characteri	stics of synchronous	motors (F	(3)								
	CO5	Examine the losses in the blocked rotor. (K2)	the induction motor under the condition of no load and										
	C06	Analyze the various load synchronous motor. (K3	oad characteristics and improve the performance of K3)										

POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	3	3		2	2	3	3	3	3				3		
CO2	3	2		2	2	3	3	3	3				3		
CO3	3	3		2	2	3	3	3	3				3		
CO4	CO4         3         2         2         2         3         3         3												3		
CO5         3         2         2         2         3         3         3         3												3			
C06	3	2		2	2	3	3	3	3				3		
Average         3         3         2         2         3         3         3													3		
Correlation level1.Slight (Low)2. Moderate (Medium)3. Substantia												stantial	(High)		
					I	List of I	Experir	nents					1	Total Ho	urs : 54



6.1, 6.1.1c

- 1. Load Test on D.C. Shunt Motor
- 2. Load Test on D.C. Series Motor
- 3. O.C.C. & load characteristic of self/separately excited D.C. Generator.
- 4. Speed control of D.C. Shunt Motor.
- 5. Load O.C. & S.C. test on single-phase transformer.
- 6. To connect similar single-phase transformers in the following ways. Y-Y,  $\Delta$ - $\Delta$ ,  $\Delta$ -Y and Y- $\Delta$ .
- 7. Load Test on Squirrel cage induction motor
- 8. Load Test on Slip ring induction motor
- 9. Synchronization of 3-phase alternator.

10. Trouble shooting in Electric Motors and Transformers. Exercises in Power Wiring and earthing.

Competency Numbers

Text Books:

1. Theraja A. K., A Textbook of Electrical Technology: - AC and DC Machines (Volume - 2) Publisher S. Chand;

2. Edmund GR Kraallavers , "Advanced Electro-technology For Marine Engineers", 2nd Ed. Reeds Vol 07, Adlard Coles Nautical, London, 2010

3. I.J Nagrath and D.P Kothari, "Basic Electrical Engineering", 2nd Edition, McGraw Hill Publishing Co., Ltd., New Delhi, 2002.

4. W. Laws, "Electricity Applied To Marine Engineering", 4th edition, The Institute Of Marine Engineers, London, 1998.

**Reference Books:** 

1. Uppal S.L., "Electrical Power Systems", 13th Edition, Khanna publishers, Mumbai, 2002

2. Berde M.S., "Electric Motor Drives", 1st Edition, Khanna Publishers, Mumbai, 1995.



Program								<b>B.E.</b> –	Marin	e Engi	neering					
Course cod	е		Со	ourse N	lame						L	Т		Р		С
241ME1A2	4PA		Ma	arine	Works	hop - I					0	1		5		3
Year / Sem	ester		ΙY	'ear/ Il	l semes	ter				Con	tact hou	rs /Woo	له ۱۵۵۱	nre		
Prerequisite	e cours	se	NI	L						COII	lact nou	13/ WCC				
				Human	nities a	nd	Ma	anagem	lent	Pro	ofessiona	al Core		Profes	siona	1
				Social	Science	es		course	S					Elec	tive	
Course cate	egory										~					
				Basic	Scienc	е	Eı	ngineeri Science	ng e	(	Open Ele	ctive		Mand	atory	
				1	Perceiv	ve the	safety p	orecaut	ions an	nd proc	edures i	nvolved	in Wor	kshop	(K1)	
				2	Identif	y the v	arious	tools ar	ıd equij	pment	used (K2	:)				
Course obje	ectives			3	Explain	1 the ba	asic ma	nufactı	iring pi	rocesse	es (K2)					
				4	Develo (K2)	p har	nds-on	training	g given	in fitti	ng , plur	nbing aı	nd mach	ninings	sectio	ns
				5	Develo	p han	ds-on ti	raining	given	in arc v	velding	section	s (K2)			
				6	Develo	p han	ds-on t	raining	given	in gas v	welding	section	s (K2)			
			0r	n comp	letion	of the c	ourse, s	student	will be	e able t	0					
			С	01	Demor	istrate	plumbi	ing ope	rations	, joints	and too	ls used	(K2)			
			С	02	Demonstrate fitting operations, various joints and tools used (K2)											
Course out	comes		С	03	Demon	strate	machir	ing op	eration	s perfo	rmed in	lathe (K	(2)			
			С	04	Demor	istrate	Arc we	lding o	peratio	ns and	perform	<b>i joints</b> i	in multi	ple po	sition	s (K2)
			С	05	Demor	istrate	Gas we	lding o	peratio	ns and	perform	i joints i	in multi	ple po	sition	s (K2)
			С	06	Explain machir	n opera nes(K3)	ation o	f vario	us mac	hines,	tools an	d differ	ent typ	es of y	weldi	ng
POs/COs	P01	PC	D2         PO3         PO4         PO5         PO6         PO7         PO						P08	P09	P010	P011	P012	PSO1	PSO 2	PSO 3
C01	3	2	2	2	2	-	2	2	2	3	3	-	2	-	-	-
CO2	2	2	2	-	-	-	2	2	2	3	3	-	2	-	-	-
CO3	3	2	2	2	2	-	2	2	2	3	3	-	2	-	-	-
CO4	3	2	2	2	2	-	2	2	2	3	3	-	2	-	-	-
C05	2	2	2	2	2	-	2	2	2	3	3	-	2	-	-	-
C06	3	3	<u>3 3 3 - 2 2</u> <u>17 220 220 200 200 2</u>					2	3	3	-	2	-	-	-	
Average	2.67	2.1	17	7         2.20         2.00         2.00         2.0           1 </td <td colspan="4">0 3.00 3.00 2.00</td> <td></td>						0 3.00 3.00 2.00						
Correlation	level			1.S	light (L	.0W)		2. Mo	derate	e (Medium) 3. Substantial (High)						



### LIST OF EXPERIMENTS

I) Plumbing	28 Hrs
1) Study of Safety precautions and Safety procedures to be followed	
2) Study of plumbing components of a vessel, Safety aspects, Tools etc.	
3) Study of pipeline joints, its location and functions: valves, taps, couplings, unio reducers, elbows	ons,
4) Study of pipe connections requirements for pumps and turbines.	
II) Fitting	20 Hrs
<ol> <li>Study of Safety precautions and safety procedures to be followed</li> <li>Study of tools and equipment used</li> </ol>	
3) Exercises – Preparation of V fitting	
4) Dove tail fitting models	
III) Machining:	20 Hrs
1) Safety precautions and safety procedures to be followed	
2) Study of lathe and its specifications	
3) Step turning	
4) Taper turning and threading (dies&tap)	
IV) Electric Arc Welding	20 Hrs
1) Safety precautionary measures, tools and accessories	
2) Study of Arc Welding	
3) Striking and maintaining the arc	
4) Straight line bead deposit in flat position	
5) Square butt joint in flat position	
V) Oxy - Acetylene Welding	20 Hrs
1) Safety precautionary measures, tools and accessories	
2) Study of Gas welding	
3) Fusion run without filler rod in flat position	
4) Fusion run with filler rod in flat position	
5) Square butt joint in Flat Position	
Competency Numbers : 8.2, 8.5, 8.6, 9.8	
Text Books:	
1. Workshop Technology V [I], S.K. Hajra Chaudhary. Media promoters & publishers	s Pvt. Ltd.
2. Workshop Technology V [II], S.K. Hajra Chaudhary. Media promoters & publishers	s Pvt. Ltd.
Reference Books:	

- 1. A Text Book of Workshop Technology, R.S. Khurmi& J.K. Gupta. S. Chand& company Pvt. Ltd.
- 2. Workshop Technology, W.A.J. Chapman Vol I & Vol II, Published by Routledge (1972).
- 3. Elements of Manufacturing processes, B.S. Nagendra Parashar& R.K Mittal. PHI Learning Pvt. Ltd.



Progran	1						B.I	E. – Mai	rine E	ngineer	ing				
Course c	ode		Cours	e Name	j					L	Т		Р		С
241ME1	A34TE	3	Marin	e Decl	k Machi	inery A	And Eq	uipme	nt —	2	0		0		n
										3	0		0		Z
Year / Se	emeste	er	II Yea	r/III Se	emester	•			C	ontact h	ours/W	eek		3	Hrs
			Hun	nanities	s and		Manage	ement	1	Professio	nal Cor	ъ Р	rofessio	nal Ele	octive
			Soc	ial Scie	nces		cour	ses		TOICSSI			10103510		
Course c	ategor	У								$\checkmark$					
			Bas	sic Scie	ence		Engine Scier	ering nce		Open 1	Elective		Mai	ndatory	7
			1	To su	mmariz	ze ba <b>s</b>	ic navig	ation a	nd cor	itributic	on to saf	e watch	(K2)		
			2	To ex	plain li	fe sa	ving	applia	ances	(K3)					
			3	To ex	plain la	iyout o	f deck 1	nachin	ery, co	mmunic	ation sy	rstem an	d ship s	security	7 (K3)
Course o	bjectiv	ves	4	To di	scuss m	ooring	g and an	ichors (	K2)						
To summarize life boat davits, d									ck crai	ne and a	ir motoı	rs (K2)			
			6	To su main ladde	ımmari tenance er. (K2)	ze typ e, use o	es of K of moor	nots, pr ring line	ractice es, hea	of knot ving lin	format e, rat gi	ion, Roj iards, ca	pe strei anvas a	ngth ca nd uses	re and s, Pilot
			On co	mpletic	on of th	e cours	se the s	tudent	will b	e able to	:				
			C01	Demo	onstrate	e ba <b>s</b> ic	naviga	tion an	d cont	ributior	ı to safe	watch.	(K2)		
Courseo	utcom		CO2	Expla	in life	savi	ng ap	plian	ces.	(K2)					
Course o	utcom	103	CO3	Expla	in layo	ut of de	eck mac	chinery,	comn	nunicatio	on syste	m and s	hip secı	urity (K	2)
			C04	Discu	ISS MOO	ring ar	id anch	ors. (K2	<u>}</u>		(174)				
			C05	Uses	iss life t	boat da	ole Por	CK Cran	e and a	air moto	rs (KI)	-lz Fauin	mont	נ2ע	
POs/	P01	P02	P03	P04	PO5	PO6	P07	P08	P09	P010	P011	PO12	PS01	PSO2	PSO3
C01	3	2	2	2	3	2	-	-	-	-	-	3	3	3	1
CO2	3	2	2	2	3	2	-	-	-	-	-	3	3	3	1
C03	3	2	2	2	3	2	-	-	-	-	-	3	3	3	1
C04	3	2	2	2	3	2	-	-	-	-	-	3	3	3	1
CO5	3	2	2	2	3	2	-	-	-	-	-	3	3	3	1
C06	3	2	2	2	3	2	-	-	-	-	-	3	3	3	1
Average	3.00	2.00	2.00	2.00 2.00 3.00 2.00							3.00 3.00 1.00				
Correlatio	on leve	el	1	.Slight	(Low)		2.1	Modera	te (Me	dium)		3. Suł	ostantia	l (High	)



UNIT-I	BASIC NAV	IGATION AND CONTRIBUTION TO SAFE WATCH	08 Hours								
Keep lookout due indicating distre communication s stage and Bouyag wet bulb thermo equipment. Weat	ties, recogniz ss and desc systems onbo ge. Reporting ometer, Psyc ther and tide	te the lights of lighthouse, buoys and ship navigation lights. Identify si ribe procedures to use them- ROR and other signals. Operation bard. Take bearing of terrestrial objects using an azimuth mirror. RO and sighting of objects to OOW. Relieving the look-out man. Take read chrometer. Plot position on chart (Lat and long). Understand moderr data reading from the book – Basic. Identify the MOB marker	gnals used for of all internal R- Elementary ings of dry and a ship's bridge								
Competency Nun	nbers	4.1.10, 9.10 & 13.1.1									
UNIT-II	LIFE SAVIN	G APPLIANCES	14 Hours								
Ability to organize launching applian EPIRBs, SARTs, In equipment. Metho show different sur including radio life Competency Num	e abandon sh aces and arra nmersion su d of helicopta vival crafts a e saving appli nbers	hip drills and knowledge of the operation of survival craft and resc angements and their equipment, including radio life saving applia hits, and thermal protective aids. Discuss principles of survival. Us er rescue. Launching and handling of survival crafts in rough weather nd rescue boats, their launching appliances and arrangements and the iances, satellite EPIRBs, SARTs, Immersion suits, and thermal protecti [13.1,13.1.1]	ue boats,their nces, satellite se of survival . Describe and eir equipment, ve aids.								
UNIT-III	LAYOUT OF	DECK MACHINERY,COMMUNICATION SYSTEM & SHIP SECURITY	08 Hours								
of potential securi awareness of the information and security Knowledge of teo restricted areas of external,	f potential security threads, knowledge enabling recognition of weapons dangerous substance and devices and wareness of the damage they can cause crowd management and control techniques handling security related nformation and security related communications methods for physical searches and non-intrusive inspections. Knowledge of techniques for monitoring restricted areas knowledge of controlling access to the ship and to restricted areas onboard. Classification & operation of various communication system onboard internal and external,										
Competency Nun	nbers	3.1,18.2,18.3,4.1.10									
UNIT-IV	MOORING	AND ANCHORS	12 Hours								
Deck Machinery Construction and mechanism of mod	operation of oring/windla	f typical electric/hydraulic windlass/mooring winches. Explain the lss. Explain Anchor with chain locker arrangements.	speed control								
Competency Nun	nbers	4.1.10									
UNIT-V	LIFEBOAT D	DAVITS, DECK CRANES AND AIR MOTORS	12 Hours								
Different types of for gangway, pilot Construction and o	life boat davi ladder etc. M operation of l	its construction and operation of boat winch. Construction and operati laterials used in construction of this machinery. Deck cranes, gantries and other types of cargo handling equipment.	on of Winches								
Competency Nun	nbers	4.1.10									
		То	tal: 54 Hours								
Text Books:											
1. Graham l and Ca	Danton, "The nada, 1996.	theory and practice of seamanship", 11th Edition, Routledge, New yo	ork, USA								



# 1. MC George 'Marine auxiliary machinery' 7th edition

Program		B.E. – Marine Engineering														
Course code			Course N	ame						L	,	Г	Р		С	
241ME1A34	łTD		Marine Conditio	Refriger ning	ation ar	nd Air				2		1	0		3	
Year / Seme	ester		II Year/ I	II Semes	ster				C	Contact hours/Week 3 Hrs						
			Huma Social	nities an Sciences	d S		Manage cours	ement ses	]	Professio	nal Core		Professional Elective			
Course cates	gory	F								$\checkmark$						
			1	To Ex Refrig	To Explain theory of Carnot, Reverse Carnot's and vapour compression cycles. Refrigerant properties environment concern. (K2)											
			2	To constr	To outline single and multi-stage refrigeration plant principle design, construction. Vapour compression, Liquification of Gas cargoes (K2)											
Course obje	ctives	-	3	To ur Humic	To understand principles of Air conditioning Psychometry –temperature – Humidity control- Types of air conditioning plants- equipment- components. (K1)											
			4	To compo	To analyze maritime refrigeration plants-maintenance of equipments and components. (K3)											
			5	To mainte contre	discuss enance, olled atn	Refri o nospher	gerated classifica re in refi	carg tion rigerate	go ve soc d space	essel and iety s . (K2)	l refi –requir	rigerated rements/s	conta survey-Cert	iner v tifications;	essels-	
			On comp	letion of	fthe cour	se the s	student v	will be a	ble to							
			C01	Summ Refrige	Summarize the fundamentals of Carnot and Reversed Carnot principles to solve Refrigeration problems (K3)											
Course outc	omes		CO2	Explain the salient features in the design construction of refrigeration plant equipment and components (K2)										t and		
			CO3	Discuss various psychrometric concepts to design various refrigeration and AC Systems (K2)												
			CO4	Analyze the marine AC and refrigeration systems. (K3)												
			CO5	Explai	n the fur	damen	tals of re	efrigerat	ed cargo	os and co	ntainers (	K3)				
			C06	Demo	nstrate r	eal life	case stud	lies on r	efrigera	tion syste	ems. (K2)		1			
POs/COs	PO1	P02	P03	P04	PO5	P06	PO7	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	
C01	2	2	2	2	-	-	-	-	-	-	-	-	3	3	-	
CO2	3	3	3	3	-	2	2	3	2	3	2	3	3	3	-	
CO3	2	2	2	2 2 2 3 3						3	2	3	3	3	-	
CO4	3	3	3	3	3	3	3	3	2	3	3	3	3	3	-	
C05	2	2	-	-	-	-	-	-	-	-	-	2	3	-	-	
C06	3	2	3	2	2 - 3 3 3 1 3 2 2 3 3 -										-	



Average	2.50	2.33	2.60	2.40	2.50	2.50	2.75	3.00	1.67	3.00	2.25	2.60	3.00	3.00	
Correlation level		1.Sl	ight (Lo	w)		2. Mo	derate (	Medium	)		3. Sub	ostantial (	High)		



UNIT-I	BASIC REF	RIGERATION AND AIR CONDITIONING	11 Hours								
Reversed Carnot cycle – Va capacity – Refrigerants ar Refrigeration plant – Metho	apour compr nd secondary ods for impro	ression cycle – Refrigerating effect – Co-efficient of performance – ( 7 refrigerant used in marine practice and their justification– Rat ving C.O.P. – use of vapour Tables – Applied Problems.	Cooling ing of								
Competency Numbers		4.1.6, 4.1.8, 4.3.4									
UNIT-II	MARINE RI	EFRIGERATING SYSTEMS	12Hrs								
Design and constructional details of various equipment used for refrigeration in marine practice, operation a maintenance. Safety practices regarding refrigerant and equipments. Typical marine Refrigerating plants v multiple compression and evaporator system – heat pump cycles – Refrigeration in Liquefied gas carriers.											
Competency Numbers		6.4									
UNIT-III	MARINE AI	R CONDITIONING	10 Hours								
Principles of Air conditioning – Psychometric charts- various processes- Psychometric properties of air – comfor conditions – control of humidity – airflow and A.C. Capacity – Calculation for ships plants, types of A/C system Humidification and de-humidification. Design and constructional details of various equipment for air conditioning used in marine practice, their justification and steam heating. Control of temperature and humidity, central A/C system. Safety practices in Air conditioning concerning compressor, blower and refrigerant.											
Competency Numbers		4.1.6, 4.3.4									
UNIT-IV	REFRIGER	ATION AND A/C COMPONENTS	11Hou rs								
Operation, maintenance and trouble-shooting of Compressors and its unloader-lubrication system for different compressors – properties of lubrication for refer compressors. Evaporators Condensers - Expansion Devices - thermostatic switches - solenoid valves - low pressure and high pressure cut out switches, Refrigerant recovery bottle and recovery systems. Gas leak detection – rectification and charging of gas. Safety practices in the A/C system.											
competency Numbers	DEEDLCED	4.1 ATED CADCO VECCEI AND DEEDICEDATED									
UNIT-V CONTAINER											



Refrigerated cargo vessel- hold arrangements-air ventilation and circulation system – insulation- precooling, classification society requirement, survey and certification guidelines, refrigerated containers –guide lines, duties responsibility of marine engineers - ventilation system- controlled atmosphere - carriage of fruit cargoes, hazardous cargo viz., radioactive cargoes. IMDG code explanation regarding dangerous cargo. Safety practices regarding cargo loading/unloading.

**Competency Numbers** 

4.3.4

**Total: 54 Hours** 

### **Text Books:**

1. Arora C.P. "Refrigeration & Air Conditioning", 1st Edition, Sri Eswar Enterprises, Chennai, 1993.

 Stoecker, Wilbert .F Jones, Jerold. W., "Refrigeration and Air Conditioning", 2nd Edition, Tata McGrawHill, Delhi 1985

3. Refrigeration and Air Conditioning – Domkundwar.

### **Reference Books:**

4. D.A.Taylor, "Introduction to Marine Engineering", 2nd Edition, Butter Worth, London, 1993.

 J.R.Stott, "Refrigerating Machinery and Air Conditioning Plant", 1st Edition, The Institute of Marine Engineers, London, 1974, Reprint 1998.

PROGRAM	BE-Marine Engineeri	ng		E-Marine Engineering												
Course Code	Basic Shin Constructi	on	L	Т	Р	С										
241ME1A31TH	basic ship constructi	011	3	0	0	2										
Year and Semester	II Year (sem	ester IV)		Cor	ntact hours per v	veek										
Prerequisite course	NII	1	(3Hrs)													
Course	Humanities and Social Sciences	Management courses	Profe	essional Core	Profess	ional Elective										
cotegory																
category	Basic Science	Engineering Science	Op	en Elective	Mandatory											
	$\checkmark$															
Course Objective	<ol> <li>Understand t</li> <li>Learn about s</li> <li>Analyze hull s</li> <li>Assess fore an</li> <li>Interpret mid</li> </ol>	<ol> <li>Understand the principles and practices of ship construction.(K2)</li> <li>Learn about ship structural components and regulatory standards.(K2)</li> <li>Analyze hull structures and their functions. (K3)</li> <li>Assess fore and aft end structures, including the stern frame and rudder. (K3)</li> <li>Interpret midship sections and functions of structural components. (K2)</li> </ol>														
Course Outcome	After completion of the course, the students will be able to: 1. Explain the evolution and types of ships. (K2)															

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#### 4. Assess fore and aft end structures, including the stern frame and rudder. (K3) 5. Interpret midship sections and functions of structural components. (K2) 6. Apply knowledge of shipyard operations and maintenance techniques. (K3) P012 POS/COS PO1 PO2 P03 P04 P05 PO6 PO7 P08 PO9 PO10 P011 PSO1 PSO2 PSO3 3 2 2 3 2 C01 ---------3 CO2 3 2 -------2 3 3 2 --2 2 2 2 2 \_ 2 CO3 3 ---\_ 3 3 -CO4 3 2 2 2 -\_ \_ \_ 2 3 3 2 \_ \_ \_ 3 2 C05 2 2 -2 3 3 2 ------C06 3 2 2 2 -\_ \_ \_ \_ \_ 2 3 3 2 2 AVERAGE 3 2 2 2 -2 3 3 2 ----CORRELATION 1. SLIGHT(LOW) 3. SUBSTANTIAL (HIGH) 2. MODERATE(MEDIUM) LEVELS **UNIT 1: INTRODUCTION TO SHIP CONSTRUCTION** 10 Hrs. History and evolution of ship construction, Types of ships and their functions, Basic ship terminology, Materials used in shipbuilding, Tonnage, Gross Tonnage (GT), Net Tonnage (NT), Plimsoll Line and load line regulations **UNIT 2: HULL STRUCTURES AND STRUCTURAL COMPONENTS** 10 Hrs. Bottom structure (keels, floors, and double bottoms, Side shell plating and frames), Decks (deck beams and deck plating), Bulkheads (watertight and non-watertight bulkheads), Hatches and hatch covers, Superstructures (bridge, accommodation, and other deckhouses) **UNIT 3: FORE AND AFT END STRUCTURES** 10 Hrs. Fore end structures (stem, bulbous bow, bow thrusters), Aft end structures (stern frame, transom, skeg, rudder and rudder post), Functions of stern frame and rudder, Propeller and shafting arrangements. **UNIT 4: MIDSHIP SECTIONS AND STRUCTURAL FUNCTIONS** 12 Hrs. Midship section design and structural layout, Midship sections of various types of ships (e.g., tankers, bulk carriers, container ships), Functions of structural components (Deck beams, Shell plating, Bulkheads and pillars). **UNIT 5: SHIPYARD OPERATIONS** 12 Hrs. Ship design and planning process, Shipbuilding stages: from keel laying to launching, Shipyard layout and infrastructure, Safety and environmental regulations in shipyards, Corrosion prevention and control methods. Total: 54 Hours **TEXTBOOKS:** 1. "Ship Construction" by David J. Eyres and George J. Bruce - A comprehensive guide on ship construction covering design, materials, and processes. 2. "Introduction to Naval Architecture" by E.C. Tupper - Provides a broad understanding of naval architecture principles, including ship stability and design. **REFERENCES:** 1. International Maritime Organization (IMO) - www.imo.org - Access to international conventions and regulations on ship construction and safety. " Department of Naval Architecture & Offshore Engineering" **Designed by**

Describe materials used and tonnage/load line regulations. (K2)

Describe materials used and tonnage/load line re
 Analyze hull structures and their functions. (K3)



Program B.E. – Marine Engineering																	
Course co	de			<b>C</b> οι	ırse N	lame				I			Т		Р	С	
241ME1A	.33TC			Ma	rine E	Electr	ical M	lachines	5 – II	2	2		1		0	3	
Year / Ser	nester			II Y	ear/ l	II Sei	neste	er		(	Contact h	ours/	Week		3 Hrs	_1	
				Hu Soc	manit cial Sc	ies a ience	and s	Manage courses	ement s		Professi onal Core	Professional Elective					
Lourse ca	tegory			Bas	sic Sci	ence		Engine Science	ering	(	Open Elective	Mandatory					
				1	T a	and management level (K1)											e operational
				2	T d	To Explain the design features and system configurations of generator and distribution system. (K2)											
Course ob	Course objectives				T	To explain the maintenance and repair of electrical system equipment,											
		(1	X2)	Juan	us, ciccl		, 1013, 8	Seliciator				ui syste	aili	a equipinent.			
	4	To discuss the electric malfunction, location of faults and measures to prevent damage. (K2)															
				On	comp	letio	n of t	he cours	se the	stude	nt will be	able t	0				
					$1 \begin{bmatrix} II\\ a \end{bmatrix}$	lustra	ate tl	he desig	gn fea	itures	of Alter	nators	, thei	r co	onstruct	tion, oj	peration and
				CO	2 E	Explain the principles of operation and construction details of synchronous motors.											
Course ou	itcomes	5		CO	3 E	Explain the principles of operation and construction details of induction machines.											on machines.
				CO4	4 A	nalyz	e the	speed o	contro	l and t	rouble sł	nootin	g in in	duc	tion ma	chines	. (K3)
				CO	5 E	xami	ne th	e fault iı	n gene	rator a	and moto	ors. (Kä	3)				
				CO	6 D	escri	be th	e struct	ure ai	nd fun	ctioning	of ele	ctrical	tra	nsmissi	on and	distribution
POs/COs	P01	P02	POS	3	P04	P05	P06	PO7	P08	P09	P010	PO	11	PO 12	PSO1	PSO2	PSO3
C01	3	3	2		2	2	3	3	3	3				14	3	2	
CO2	3	3	2		2	2	3	3	3	3					3	2	
CO3	3	3	2		2	2	3	3	3	3					3	2	
CO4	3	3	2		2	2	3	3	3	3					3	2	
CO5	3	3	2		2	2	3	3	3	3					3	2	
C06	3	3	2		2	2	3	3	3	3					3	2	
Average	3	3	2		2	2	3	3	3	3					3	2	
C	Correlation level				1.Slight (Low)				2.Moderate (Medium) 3. Substa (High					Substantial (High)			



UNIT-I	ALTERNA	FORS	11 Hours								
Alternators – general arrange – e.m.f equation – armature r Starting, parallel operation a Diesel Generator and Shaft Ge	ment – con eaction – v nd changin enerator. Ma	struction of salient pole and cylindrical rotor types – types o oltage regulation – load characteristics – open circuit and sl g of alternators. Synchronizing methods. Load sharing. Par intenance required on Alternators and motors and paralleli	of stator windings hort circuit tests . allel operation of ng equipment.								
Competency Numbers		6.1.1.b & 6.1.1c									
UNIT-II	SYNCHRO	NOUS MOTORS	11 Hours								
Principle of operation – Torque equation – Operation on infinite bus bars – V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – damper windings- synchronous condenser.											
Competency Numbers     6.1 & 6.1.1c											
UNIT-III INDUCTION MACHINES 11 Hours											
Three phase induction motor –Principle of operation and theory of action – slip speed–rotor to stator relationship – rotor frequency– equivalent circuit– torque/slip characteristics – starting torque and maximum running torque - Effect of change in supply voltage on Torque-Induction generator.											
Competency Numbers		6.1 & 6.1.1c									
UNIT-IV	CONTROL	OF INDUCTION MACHINES	11 Hours								
Reversing – speed control of in – starting of induction motor starter – starting of special h characteristics – starting cont	nduction mo - method igh torque rol –constr	otor-Electronic methods of speed control of Induction Motor of starting – Direct on-line starters –Star – delta starter – induction motors –single phase induction motor – principle uctional details – Failure and repairs of electrical machine.	(IGBT, Thyristors) auto-transformer e and operational								
Competency Numbers		7.1 & 7.3									
UNIT-V	FAULT FI	NDING TECHNIQUES FOR MOTORS	10 Hours								
Faults in single phase in sing stator insulation failure in ind overloaded condition, Detec requirements for fault locatio Competency Numbers	le phase an luction mot tion of ele n and meas	d three phase induction motor, Fault finding techniques rel or, Fault prevention and fault rectification in induction moto ctrical malfunction, Actions to be taken on detection o <u>ure to be taken to prevent damage. Rectification methods for</u> 7.1 & 7.3	ated to rotor and r, Classification of f fault, Essential r different faults.								
I I I I I I I I I I I I I I I I I I I											
			Total hours: 54								
Text Books:											
1. A Textbook of Electrical Technology: - AC and DC Machines (Volume - 2) (English, Paperback, Theraja A. K.); Publisher S. Chand; ISBN:											
2. Edmund GR Kraallavers , "Advanced Electro-technology For Marine Engineers", 2nd Ed. Reeds Vol 07, Adlard Coles Nautical London 2010											
3. I.J Nagrath and D.P Kothari	, "Basic Ele	ctrical Engineering", 2nd Edition, McGraw Hill Publishing Co	., Ltd., New Delhi,								
2002.	J.T. Maria	Francisco and all a ditions The Institute Of Manine Francisco	a Landar 1000								
4. w. Laws, Electricity Applie	u to Marin	e Engineering , 4th edition, The Institute Of Marine Engineer	's, London, 1998.								
1 IInnal S L "Flectrical Powe	r" 13th Fdi	tion Khanna nublishers Mumbai 2002									
2. Berde M.S., "Electric Motor Drives", 1st Edition, Khanna Publishers, Mumbai, 2002											



Program		B.E. – Marine Engineering										
Course code	Course N	lame	_	L	Т	Р	С					
241ME1A33TD	Marine	<b>Fhermal Engir</b>	ieering	2	1	0	2					
Year / Semester		II Year / III S	emester	Contact hours/Week 03								
	Basi	c Science	Engineering Science	Open E	lective	Mandatory						
			✓									
Pre requisite	Thermod	lynamics										
	1	Explain about gas power cycles.										
Course	2	Interpret IC engine and its performance.										
	3	Outline about steam nozzles, turbines, .										
objectives	4	Summarize about compressors and its principles										
	5	Infer about various types of heat exchangers										
	6	Compare gas	power cycles.									
	C01	Apply gas pov	wer cycle knowledge	<u>.</u>								
	CO2	Evaluate engi	ine performance.									
Course	CO3	Assess steam	nozzle and turbine s	systems.								
outcomes	CO4	Analyze the p	performance of Air co	ompressors								
-	C05	Outline the w	orking of heat excha	ngers.								
	C06	Demonstrate	gas power cycle kno	wledge.								

POs/COs	P01	PO2	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	3	3	2	1	-	-	2	3	-	-	-	2	2	2	-
C02	3	2	1	1	-	-	2	3	-	-	-	2	2	2	-
CO3	3	3	1	1	-	-	2	3	-	-	-	2	2	2	-
CO4	2	2	1	1	-	-	2	3	-	-	-	2	2	2	-
C05	2	2	1	1	-	-	2	3	-	-	-	2	2	2	-
C06	3	2	2	1	-	3	2	3	-	-	-	2	2	2	-
Average	2.67	2.33	1.33	1.00	-	3.00	2.00	3.00	-	-	-	2.00	2.00	2.00	-



UNIT-I	IC ENGINES AND ITS PERFORMANCE 12 Hours										
Classification, Comp	onents of I	C Engines and their function. Working of two stroke and four st	roke engine,								
Valve timing diagram	n and port	timing diagram – actual and theoretical p-V diagram of four str	oke and two								
stroke engines. Carb	uretor, fuel	pump and injector system, Battery coil ignition system, magneto	coil ignition								
system, CDI system- Lubrication - types of lubrication - Cooling systems and its types. Performance test-											
Measurement of brake power – Indicated power – Fuel consumption – Air consumption; Heat balance test											
and Morse test on IC engines – Standard testing procedure of IC engines –Effect of various parameters on the											
performance of the e	engines – si	mple problems.									
Competency Numbers 4.1.1,4.5											
UNIT-II		GAS POWER CYCLES	10 Hours								
Gas power cycles – b	Gas power cycles – basic considerations, Carnot cycle and its importance, air standard assumptions. Otto										
cycle Diesel cycle, D	ial combust	tion cycle, Joule Brayton cycle. Derivation for Air standard efficie	ncy, mean								
ettective pressure- Problems related.											
Competency Numbe	Lompetency Numbers 4.5										
UNIT-III		STEAM NOZZLES AND TURBINES	10 Hours								
Flow of steam through nozzles, types of nozzles, effect of friction, critical pressure ratio, Supersaturated flow.											
Impulse and React	on princip	les, Rankine cycle-compounding. Problems related- speed re	egulations –								
Governors.											
Competency Numbe	rs	4.1.2, 4.5,									
UNIT-IV		AIR COMPRESSORS	12 Hours								
Classification and w	orking prine	ciple of various types of compressors, work of compression with	and without								
clearance, Volumetri	c efficiency,	, Isothermal efficiency and Isentropic efficiency of reciprocating c	ompressors,								
Multistage air comp	essor and i	nter cooling –work of multistage air compressor.									
Competency Numbe	rs 4	4.1.6,4.5									
UNIT-V	UNDAMEN	NTALS OF HEAT TRANSFER	10 Hours								
Basic concepts and	Basic concepts and review of thermodynamics of heat transfer, Heat transfer mechanisms, Conduction,										
Convection and Radiation. Types of heat exchangers, Application of heat transfer in Marine Heat Exchangers											
like Coolers, Conden	sers, Heater	rs and Evaporators. The Overall heat transfer coefficient, LMTD/N	NTU Method,								
Sizing and Selection	of Heat Exc	hangers.									
Competency Numbe	rs 4.	1.6, 4.5									
		Tota	al: 54 Hours								

Text B	ooks:
1.	Rajput. R. K., "Thermal Engineering" S.Chand Publishers, 2000.
2.	Kothandaraman.C.P., Domkundwar. S,Domkundwar. A.V., "A course in thermal Engineering", Fifth
	Edition, " Dhanpat Rai & sons , 2002



<b>Course co</b> 241ME1A	de 31TI		Cc Fl	ourse l <b>uid M</b>	Name <b>echan</b>	ics an	d Mar	ine Hy	draul	ics	L		Т	Р		С		
											2		1	0		2		
Year /Sem	ester		II	Year/	III Sen	nester					Contact	hours,	/Week	3 Hr	S			
				Huma	nities	and		Manag	ement		Profes	sional (	ore	Pro	fession	al		
				Socia	l Scien	ices		cou	rses		110103	5101141 (	2010	E	lective			
Course cat	egory							<del>.</del>	<u> </u>									
				Basi	c Scier	nce		Engine	eering		Oper	n Electiv	ve	Ма	andatory			
			$\checkmark$					5010	nee									
				1	Infe	r know	vledge K2)	on flui	d prop	erties	and pre	essure e	exerted	by fluid	on diff	erent		
<b>a</b> 1.				2	Illus	trate a	bout f	low rat	te and	contii	nuity eq	uation.	(K2)					
Course obj	ective	es		3	Sum	mariz	e the lo	oss of e	nergy	in flui	d flow d	ue to m	ajor an	d minor	losses	. (K2)		
				4	Explain the working principles and performance analysis of fluid pumps. (K2)													
			5 Interpret the working of different components of major sys											ystems	stems (K2)			
			0r	n com	pletion	of the	e cours	se the s	tuden	t will	be able .	to		<u>(1 · 1 )</u>	٦ (17	2)		
			(	CO2	Anal	yze va	rious i	fluid pi	operti	es & §	governii	<u>ng equa</u>	tions ic	r fluid i	10W (K	3)		
			(	CO2	Ana	lyze ti lyze ti	e voiu		<u>e or no</u> 1r in a	w and	through nines (K3)							
Course out	tcome	s			Sele	ct a si	itable	e pumr	for a	givei	n applic	ation a	nd eva	luate th	ie oper	ating		
			(	204	char	acteris	stics o	f Hydra	ulic p	imps	(K2)				<b>F</b> -	0		
			(	CO5	App	ly the o	concep	ot of di	fferent	comp	onents	of majo	or syste	ms. (K3	)			
			(	206	Cate	gorize	the ch	aracte	ristics	of var	ious hyo	draulic	machin	es used	for real	l time		
DO /CO	DO1		11	DOD			IS (KZ		DOO	DOO	D010	D011	D012	DC01	DCOO	DCOO		
PUS/LUS	201	PC	)Z 2	P03	P04	P05	P06	P07	P08	P09	P010	2 POII	P012	PS01 1	PS02	PS03		
C01	3		, }	1	2	-	2	2	_	2	_	2	1	1	1	1		
C02	2		ý )	1	-	1	2	2		2		2	1	1	1	1		
CO3	3	4	2	1	2	1	2	2	-	2	-	2	1	1	1	1		
C04	2		>	1	2	-	2	2	-	2	-	2	1	1	1	1		
C06	2	2	2	1	2	-	2	2	-	2	-	2	1	1	1	1		
Average	2.5	2.3	33	1	2	1	2	2	-	2	-	2	1	1	1	1		
Correlation	n leve	1			1.Slig	ht (Lo	w)		2. Mo	derat	e (Medi	um)	3. 5	Substan	tial (Hi	gh)		
UNIT-	[	FLUID PROPERTIES AND FLUID PRESSURE         12 Hot											ours					
Fluid flow-	- Newt	ton'	s la	w of v	riscosit	v- Nev	vtonia	n and 1	Non-No	ewtor	nian Flui	d- Idea	l and Re	eal fluid	s-Pron	erties		
of Fluids-	of Fluids- mass density, weight density and specific gravity. Dynamic viscosity-kinematic viscosity-																	
Properties	of p	res	sur	e-atm	osphei	ric pre	essure	, vacu	um, pa	rtial	vacuun	ı, abso	lute ze	ro pres	sure, g	gauge		
pressure-F	Pascal'	's la	w-]	Buoya	ncy an	d Floa	tation	– Met	a- cent	ric he	eight – s	tability	of float	ting and	l subme	erged		
bodies.				-	-						-			-		_		
Competen	cy Nui	mb	ers		5.1													
UNIT-I	Ι		FLUID KINEMATICS AND DYNAMICS         10 Hours															



Kinematics: Typ	es of fluid flo	ow – Types of flow lines – rate of flow – continuity equation										
Dynamics: Euler	Dynamics: Euler's Equation of motion – Bernoulli's equation – applications – venturimeter, orifice meter,											
pilot tube- Force	exerted by j	et on stationary and moving flat plates.										
Competency Nu	mbers	5.1										
UNIT-III		LAMINAR AND TURBULENT FLOWS	10 Hours									
Reynold's exper	iment – criti	cal Reynolds number – Rotating Viscometer –Full- bore flow of liqu	iids under a									
constant head. F	low through	an orifice. Flow through pipes-major and minor energy losses - pip	oes in series									
and parallel – po	wer transm	ission through pipes– total drag due to laminar and turbulent layer	– boundary									
layer separation	and its cont	rol.										
Competency Nu	mbers	9.5										
UNIT-IV	UNIT-IV PUMPS 10 Hours											
Classification of	pumps -Cer	ntrifugal pumps-Working principle of centrifugal pump -Volumetri	c efficiency,									
hydraulic efficient	ncy, mechani	ical efficiency and overall efficiency-Priming of centrifugal pump. Re	eciprocating									
pump -Classifica	ation -Constr	ruction and working principle-Discharge through a reciprocating pu	mp.									
Competency Nu	mbers	5.1/5.2										
LINIT-V	FU	IID FLOW AND CHARACTERISTICS OF MAIOR SYSTEMS	12 Hours									
			12 110013									
Diesel Engine Pr	opulsion Pla	int -fluid flow of lubricating oil system- fluid flows of cooling sea wa	iter system-									
Steam Engine Pr	opulsion Pla	nt- fluid flows of main steam. Pipes and Fittings- different types - cha	aracteristics									
appeared in eac	ch piping sy	stem- materials used for the construction pipes carrying the flu	ids. Valves-									
different types o	t valves- glob	be valve- screw-lift valve, a screw-down non-return valve and a non-r	eturn valve-									
applications of q	uick-closing	valve										
Competency Nu	mbers	5.4										
<b>T</b> . (D. ).		Total hours:54 Hours										
1 Loss "Hydrosylis	. Полиси Тион	namingian In Mauina Mashingur," Mauina Engineaning Duastica Val 1	Davet 07									
I. Joy, Hydraulio IMarEST, Londoi	n,2002	ismission in Marine Machinery , Marine Engineering Practice vol-1,	Part-07,									
2. Gupta, S.C.," Fl	uid Mechani	cs and Hydraulic Machines" 1st Ed. Pearson, 2011.										
3. John F.Douglas Pearson, Sixth Ir	s, Janusz M. ( npression, 2	Gasiorek, John A. Swaffield and Lynne B. Jack, " Fluid Mechanics", 1st 011	Ed.									
<b>Reference Bool</b>	ks:											
1. R K Rajput, "F New Delhi, 2002	luid Mechani	ics and Hydraulic Machines" 2nd revised Edition, S.Chand & Compa	ny Ltd.,									
2. R. K. Bansal. "A Edition 2010.	A Textbook o	f Fluid Mechanics and Hydraulic Machines ", Laxmi Publications Pvt	: Ltd,9 <sup>th</sup>									
3. Narayana Pilla	. Narayana Pillai,N,"Principles of Fluid Mechanics and Fluid Machines",3rd Edition, University Press, 2013											
4. Pani B S, Fluid	. Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016											
5. Kumar K. L., E	Kumar K. L., Engineering Fluid Mechanics, Eurasia Publishing House (p) Ltd. New Delhi, 2016.											



Program		B.E. – M	larine Engir	neering										
Course code		Course	Name		L	Т	Р	С						
241ME1A32'	ТВ	Gender	<sup>•</sup> sensitivity		2	0	0	0						
Year /Semes	ter	I Year/	II Semester											
Prerequisite course					Contact ho	ours/We	ek 2	Hrs						
		Basic So	cience	Engineering Science	Open Elec	tive	Mandato ✓	ry						
			Γ											
Course		1	To provide	an overview of gene	der sensitiv	ity (K1)								
objectives		2	To provide perspective	basic understanding es (K1)	g about con	tempora	ry gender	related						
		On com	pletion of th	e course the student	will be able	e to								
		C01	01Illustrate the fundamental principles of gender sensitivity (K2)02Explain biological, sociological and psychological conditioning (K2)											
		CO2	CO2 Explain biological, sociological and psychological conditioning (K2)											
Course		CO3	Demonstra	te Gender based div	ision of lab	our. (K2)								
outcomes		CO4	Explain cor	ntemporary perspec	tives of gen	der sens	itivity. (K2	)						
		C05	Illustrate a reference t	bout justice, human o gender. (K2)	rights and l	egal per	spectives v	vith						
		C06	Discuss em	erging issues and ch	allenges of	the geno	ler sensitiv	vity. (K2)						
UNIT-I	FU	NDAMEN	TALS OF GI	ENDER SENSITIVIT	Y			7 Hours						
Gender: defir	nitior	n, nature, evolution, cultural, traditional and historical perspective.												
UNIT-II	GEI	ENDER SPECTRUM 7 Hours												
Gender: An o	verv	iew of Bi	ological, soci	ological and psycho	logical conc	litioning								
UNIT-III	DI	ISION O	F LABOUR					7 Hours						
Gender based	d divi	division of labour-domestic work and use value;												
UNIT-IV	GE	NDER - C	ONTEMPOR	RARY PERSPECTIVE	3			7 Hours						



Gender justices and human rights, international perspective, constitutional and legal perspectives, Gender, Human Rights and Parity (parallel progress of both genders).

UNIT-V

# MEDIA AND EMERGING ISSUES IN GENDER

8 Hours

Print and Electronic Media and Gender Inequalities; Gender-Emerging issues and challenges; Case study on real life gender issues.

### Total: 36 Hours

# **Text Books:**

1. Rajya Lakshmi Kalyani et al. 2017. Gender Sensitisation. Himalaya Publishing House

### **Reference Books:**

2. Gender, School And Society - B.Ed 2nd Year Book (English, Paperback, Dr. S.C.Oberoi), Laxmi Publishers



Program			B.E. – Marine Engineering       Course Name     L     T     P     C														
Course code		(	Course N	Name		_				L	Т		Р	С			
241ME1A34	TE	]	Marine	Pumpi	ng & pij	ping sys	stem			2	1		0	3			
Year / Seme	ster		II Year/	III Sen	nester				Co	ntact ho	urs/Wee	k:	3 Hou	rs			
		]	Humani	manities and cial SciencesManagement coursesProfessional CoreProfessional Elective1To understand the operation of pumping systems. (K1)✓12To explain operational characteristics of pumps and piping systems, including control systems. (K2)33To summarize the operation of pumping systems. (K2)44To classify the operation of bilge, ballast and cargo pumping systems. (K2)5To explain the maintenance of pumps and piping system. (K2)6To apply the knowledge gained on various pumps and pumping systems. (K3)01Describe the pumping system principle.(K2)													
Course cates	orv		Social S	ciences													
	<u> </u>									$\checkmark$							
			1	Tou	indersta	and the	operat	tion of p	umpin	g system	s. (K1)						
			2	To e syst	xplain ems. (K	operati (2)	onal ch	aracteri	stics of	pumps	and pipir	ng syster	ns, inclu	ding cont	trol		
Course objec	ctives		3	To s	ummar	ize the	operat	ion of p	umping	g system	s. (K2)						
			4	Тос	lassify	the ope	ration o	f bilge, b	allast ar	nd cargo p	oumping	systems.	(K2)				
			5	To e	xplain	the mai	ntenan	ce of pu	imps ar	nd piping	g system.	(K2)					
			6	Тоа	pply th	e know	ledge g	ained o	n vario	us pum	ps and	pumpi	ng sys	tems.(ŀ	(3)		
		(	On comp	oletion	of the c	ourse s	tudents	s will b	e able t	0							
			CO1     Describe the pumping system principle.(K2)       CO2     Converse the difference terms of means (W2)														
Course outco	nmes		CO1Describe the pumping system principle.(K2)CO2Compare the different types of pump.(K2)														
Course outer	Jiiies		CO3	Exp	lain the	major s	system	compo	nents a	nd featu	res.(K2)						
			CO4	Sum	imarize	the ope	eration	of pum	ps.(K2)								
			C05	Ana	lyze sys	stem fau	ults. (Ki	3)									
			C06	Ider app	ntify the lication	e variou s.(K3)	s appli	cations	of vai	tious t	ypes of	fpump	s in rea	l time			
POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2	PSO3		
C01	2	2	3	1	2	2	3	-	-	-	-	2	-	1	2		
CO2	2	1	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$														
CO3	2	2	2 3 2 3 1 2 2 - 1 2														
CO4	2	2	2 2 2 2 1 1 2 - 1 2														
C05	3	1	1     2     2     3     2     2     -     -     -     2     -     1     2       2     2     2     2     -     -     -     2     -     1     2														
C06	3	2	2 3 2 2 2 2 2 - 1 2														
Average	2.33	1.67	3       2       2       2       2       -       -       -       2       -       1       2         2.50       1.83       2.17       1.50       1.83       -       -       2.00       1.00       2.00														
Correlation	level		1.Sli	ght (Lo	w)	2	. Mode	rate (M	edium)			3. Subs	tantial (	High)			



UNIT-I	<b>Pumping Syste</b>	m Principles	8 Hours
Classification of v cooling fresh wat	various types of p er), Various type	oumps, various layout and pumping operations( Ballast, Bilge, Cargo oil, Hydrophore, s of valves using in pipe line system	cooling sea water,
Competency Nur	nbers	5.1,5.2,5.4	
UNIT-II	Pump Types	·	10 Hours
Understand wor screw, Gear, Ro performance, be	rking principles ( otary vane), axia earings, coupling	of various pumps on board with Sketch-centrifugal pump, positive displacement pum al flow pump, materials used, types of shaft seals, types of impeller, Wear ring , s and safety precautions.	ıps(Reciprocating, characteristics of
Competency Nur	nbers	5.1,5.2,5.4	
UNIT-III	Major System (	Components & Features	10 Hours
Understand pip together, pipe co	ing layouts requ olor coding and c	irements, fittings, pressure ratings of pipes, materials used for sealing joints to join onstructional feature, applications and materials of valves used onboard.	lengths of pipes
Competency Nur	nbers	5.1,5.2,5.4	
UNIT-IV	<b>Operation Of P</b>	umping Systems	12 Hours
Operation of pu of pumps, neces	mps- starting and sity for priming in	d stopping of positive displacement pumps, axial- flow pumps and centrifugal pumps and n centrifugal pump and working of air ejector (vacuum pump)	l performance loss
Competency Nur	nbers	5.1,5.2,5.4	
UNIT-V	<b>Operating Faul</b>	ts And Maintenance	14 Hours
Understand pre Dismantle and R	cautions and pro eassemble: centr	cedures for cooling sea water system and lubrication system with respect to air ingress a ifugal pump, Reciprocating pump, Gear pump and screw pump.	and dirty filters.
Competency Nur	nbers	5.1,5.2,5.4	
Total: 54 H	lours		
·			

1. Pumps : Principles & Practice, Jaico Publishing House.

2. Pipes & Pipelines: Principles & Practice, Jaico Publishing House.

### **Reference Books:**

1. A. Nourbakhsh, A. Jaumotte, C. Hirsch & H. B. Parizi: Turbo-pumps & Pumping Systems, Springer.

2. H. D. McGeorge: Marine Auxiliary Machinery, Butterworth-Heinemann.

3. T. L. Henshaw: Reciprocating Pumps, OSTI, USA.

4. A. J. Stepanoff: Centrifugal & Axial Flow Pumps, Krieger Publishing Company.

5. Crawford, J. (2016). Marine and Offshore Pumping and Piping Systems. United Kingdom: Elsevier Science.

6. Flow of fluids through valves, fittings and pipe, Metric Edition – SI Units, CRANE Co., New York (1982), Technical Paper No. 410M.

7. Pumps, S. (2013). Sulzer Centrifugal Pump Handbook. United Kingdom: Elsevier Science.

8. Marine Engineering – by group of authorities, Editor: Roy L Harrington, ISBN: 0-939773-10-4, SNAME (USA)



Program			B.E. – Marine Engineering       Course Name     L     T     P     C													
Course co	de		Сс	ourse N	ame					]	L	Т		Р		С
241ME1A	A33PE		Ma Co	arine I onditio	Refrige ning I	eration Labora	and A tory	ir			0	0		2		1
Year/Sem	nester		II	Year /	III Sem	ester				Cont	act hou	irs/We	ek	2 ł	nrs	
				Huma	nities a	ind	М	anagen	nent	Pro	fession	al Core	e P	rofessi	onal El	ective
				Social	Scienc	es		course	S							
Course ca	itegory										√					
				Basic	: Scienc	ce	E	ngineer Scienc	ring e	0	pen El	ective		Ма	ndator	у
Pre requi	site		Th	nermod	ynamio	s, Ther	mal E	ngineer	ing							
				1	To ex	plain th	neory c	of Carno	ot, Reve	rse Car	mot's a	nd vap	or com	pressio	n cycles	5.
				Refrigerant properties environment concern (K2)												
			2 To demonstrate single and multi-stage refrigeration plant principle design,													
					const	ruction	. Vapo	ur com	pressio	n, Liqu	ificatio	n of Ga	s cargo	es (K2)		
Course of	ojective	s		3	To ur	ndersta	nd prir	nciples	of Air co	onditio	ning Ps	sychom	etry –t	empera	ture –	
					Humi	dity co	ntrol- '	Гурes o	f air co	ndition	ing pla	nts- eq	uipmer	nt- comj	ponent	s (K1)
				4	To an	alyze n	naritim	ne refrig	geratior	l plants	s-maint	tenance	e of equ	ipment	s and	
					comp	onents	. (K3)									
			(	CO1	Expla	in the j	perform	nance	of Paral	lel and	count	er flow	heat ex	kchange	ers (K2)	
			(	CO2	Demonstrate the working of a Refrigeration system (K2)											
Course ou	utcomes	;	(	CO3	Demonstrate the working of Air conditioning system (K2)											
			CO4 Determine the co-efficient of performance of a refrigeration system (K3)													
			CO5 Determine the co-efficient of performance of air conditioning system (K3)													
			(	CO6	Analy	vze vari	ious ty	pes of r	efrigera	ation s	ystems	s (K3)				
POs/COs	P01	РО	2	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2	PSO3
C01	2	2	2	PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO10       PO11       PO12       PS01       PS02       PS03         2       1       -       -       2       3       -       -       2       2       2       2       -												



CO2	3	2	1	1	-	-	2	3	-	-	-	2	-	-	-
CO3	3	3	1	1	-	-	2	3	-	-	-	2	2	2	-
C04	2	2	1	1	-	-	2	3	-	-	-	2	2	2	-
C05	2	2	1	1	-	-	2	3	-	-	-	2	2	2	-
C06	3	2	2	1	-	3	2	3	-	-	-	2	2	2	-
Average	2.50	2.17	1.33	1.00		3.00	2.00	3.00				2.00	2.00	2.00	
Correlation	n level		1.S	ight (L	ow)		2. Moo	derate (	Mediu	m)		3. Sub	ostantia	l (High	)
LIS	LIST OF EXERCISES TOTAL HOURS : 36														
1. 2. 3. 4. 5. 6.	To find To dete To dete To stud To stud To dete	out hea rmine t rmine t y the p y the p rmine t	at trans che coe che coe erform erform che coe	fer rate fficient fficient ance of ance of fficient	e in par of perf of perf f refrige f air-con of perf	allel & Forman Forman erating ndition Forman	counte nce of th nce of th system ning sys nce of w	er flows ne giver ne giver n. stem. vindow	a – Para n refrig n air-cc	allel & o geration ondition	counter n test ri ning tes ing test	r flow h g. st rig.	eat exc	hanger	
Cor petency	m	Nun	nbers		4.1,4.1	.6,4.3.4	ł								



Program	ı		B.E. – Marine EngineeringCourse NameLTPC														
Course c	ode		Cours	LTPCcoratory0021ear / III SemesterContact hours/Week2													
241ME1	A33PL	)	Marii Laboi	e Ther atory	mal En	gineei	ring			0		0	2		1		
Year/Ser	nester		II Yea	se Name       I       T       P       C         ine Thermal Engineering       0       0       2       1         ar / III Semester       Contact hours/Week       2       1         manities and       Management       Professional Core       Professional Elective         mainties and       Management       courses       Professional Core       Professional Elective         asic Science       Engineering       Open Elective       Mandatory         imadynamics, Thermal Engineering       Explain viscosity measurement principles. (K2)       Mandatory         Mandyze flue gases using the Orsat apparatus. (K3)       Determine fuel calorific value with Bomb Calorimeter. (K2)       Determine thermal conductivity of materials. (K2)         Perform tests on diesel engines. (K2)       Perform tests on diesel engines. (K2)       Determine flash point of samples safely. (K3)         2       Determine flash point of samples safely. (K3)       Analyze flue gases for CO2, CO, and O2 content. (K4)         4       Determine thermal conductivity of materials precisely. (K2)													
			Hur Soc	nanities ial Scier	and	М	anager cours	nent es	Р	rofessi	onal C	ore I	Professi	onal El	ective		
Course c	ategor	y															
		-	Ba	sic Scie	nce	E	nginee Scien	ring ce		Open	Electiv	e	Ма	ndator	у		
							√										
Pre requ	isite		Thern	lodynai	nics, Tł	nermal	Engin	eering									
			1	Exp	lain vis	cosity	measu	remen	t princ	tiples. (	K2)						
			2	Det	ermine	flash p	ooint of	fuels.	(K2)								
Course o	hi o otiv		3	Ana	lyze flu	e gase	s using	the O	rsat ap	paratu	s. (K3)						
Course o	bjectiv	/es	4	Det	ermine	fuel ca	lorific	value	with B	omb Ca	alorim	eter. (K2	)				
			5	5Determine thermal conductivity of materials. (K2)6Perform tests on diesel engines. (K2)													
			6	6 Perform tests on diesel engines. (K2)													
			On co	I completion of the course the student will be able to													
			C01	On completion of the course the student will be able toCO1Apply accurate viscosity measurement techniques. (K3)													
			C02	Det	ermine	flash p	oint of	samp	les safe	ely. (K3	)						
Course o	utcom	ies	CO3	Ana	lyze flu	e gase	s for C	02, CO,	and O	2 conte	ent. (K	4)					
			C04	Det	ermine	accura	te calc	rific va	alue us	ing Bo	mb Ca	lorimete	er. (K2)				
			C05	Det	ermine	therm	al conc	luctivi	ty of m	aterial	s preci	sely. (K2	2)				
			C06	Den	nonstra	te the	perfor	mance	and po	ollutior	ı tests	on diese	el engin	es (K2)			
POs/ COs	P01	PO	2 PO3	PO4	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3		
C01	3	3	2	1	-	2	2	3	-	-	-	2	2	2	-		
CO2	3	2	1	1	-	2	2	3	-	-	-	2	-	-	-		
CO3	3	3	1     1     -     2     2     3     -     -     2     2     2     -											-			
CO4	2	2	1 1 - 2 2 3 2 2 2 -											-			
C05	2	2	1 1 - 2 2 3 2 2 2 -											-			
C06	3	2	2 1 - 2 2 3 2 2 2 -											-			
Average	2.67	2.3	3 1.33	1.33     1.00     -     2.00     2.00     3.00     -     -     2.00     2.00     2.00     -													
Correlati	on lev	el		1.Sligł	nt (Low	)	2	. Mode	erate (N	Mediun	n)	3. S	ubstant	ial (Hig	gh)		

# Controlled



# LIST OF EXERCISES

**Total Hours: 36** 

### HEAT TRANSFER ANALYSIS

- 1. Determine the Thermal Conductivity of a conducting material
- 2. Determine the Thermal Conductivity of a Insulating material

### **IC ENGINE ANALYSIS**

- 1. Draw the Port timing diagram of the given 2 stroke engine cut-sectional model
- 2. Draw the valve timing diagram of the given 4 stroke engine cut-sectional model
- 3. Performance test on a single cylinder 4-stroke diesel Engine
- 4. Heat balance test on a single cylinder 4-stroke diesel engine.
- 5. Retardation test on a slow speed diesel Engine
- 6. Pollution test on a diesel engine using alternate fuels

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Program			B.E. – Marine Engineering Course Name															
Course co 241ME1A	de 31PI		Co Flu	ourse l <b>uid M</b>	Name <b>echan</b>	ics an	id Ma	rine H	ydrau	ilics	Ι	,	Т	F	)	С		
			La	borat	B.E Marine Engineering         We chanics and Marine Hydraulics ratory       L       T       P       C         Mechanics and Marine Hydraulics ratory       0       0       2       1         r/ III Semester       Contact hours/Week       2 Hrs       1         anities and Social Science       Management Courses       Professional Core Science       Professional Elective         Basic Science       Engineering Science       Open Elective       Mandatory         Outline the flow measurements using different devices. (K1)       Explain the factors affecting the flow through pipes. (K2)       Illustrate the characteristics curves for various experiments related to fluid mechanics. (K2)         Infer the competency towards preventive maintenance of hydraulic machine. (K2)       Relate the principles and working of fluid systems (K3)       Dumps. (K2)         Relate the principles and working of fluid sustems (K3)       Duderstand the basic properties of fluids and apply Newton's Law of Viscosity in solving practical problems. (K1)       Explain the significance of basic principles of fluid statics and application of hydrostatic law in determining forces on surfaces and hydraulic structures. (K Explain the principles of kinematics with specific emphasis on application of continuity equation (K2)         Apply the principles of kinematics with specific emphasis on application of continuity equation (K2)       PO       PO       PO         3       PO4       PO5 <t< td=""></t<>													
Year/Sem	ester		II	Year/	B.E. – Marine Engineering         e Name       L       T       P       C         Mechanics and Marine Hydraulics atory       L       T       P       C         7/ III Semester       Contact hours/Week       2 Hrs       1         r/ III Semester       Contact hours/Week       2 Hrs       Professional Elective       Professional Elective         sais Science       Engineering Science       Open Elective       Mandatory         Outline the flow measurements using different devices. (K1)       Explain the factors affecting the flow through pipes. (K2)         Illustrate the characteristics curves for various experiments related to fluid mechanics. (K2)       Infer the competency towards preventive maintenance of hydraulic machine. (K2)         Explain the working principle and performance of centrifugal pumps. (K2)       Relate the principles and working of fluid systems (K3)         mpletion of the course the student will be able to       Understand the basic properties of fluids and apply Newton's Law of Viscosity in solving practical problems. (K1)         Explain the significance of basic principles of suids and apply Newton's Law of Viscosity in solving practical problems. (K3)         Relate triction loss in laminar and turbulent flows. (K3)         Relate friction loss in laminar and turbulent flows. (K3)         Relate friction loss in laminar and turbulent flows. (K3)         Demonstrate the working of pumps. (K2)													
			Hı	umani S	B.E. – Marine Engineering         Vame       L       T       P       C         Vechanics and Marine Hydraulics atory       L       T       P       C         0       0       2       1         / III Semester       Contact hours/Week       2 Hrs         nities and Social Sciences       Management courses       Professional Core       Professional Elective         asic Science       Engineering Science       Open Elective       Mandatory         Outline the flow measurements using different devices. (K1)       Explain the factors affecting the flow through pipes. (K2)       Illustrate the characteristics curves for various experiments related to fluid mechanics. (K2)         Infer the competency towards preventive maintenance of hydraulic machine. (K2)       Relate the principles and working of fluid systems (K3)         Inpletion of the course the student will be able to       Understand the basic properties of fluids and apply Newton's Law of Viscosity in solving practical problems. (K1)         Explain the significance of basic principles of fluid statics and application of hydrostatic law in determining forces on surfaces and hydraulic structures. (K2)         Explain the principles of Rinematics with specific emphasis on application of continuity equation (K2)         Apply the principles of Bernoulli's equation in measurement of discharge in pipes, and in other pipe flow problems. (K3)         Relate friction loss in laminar and tur													
Course cat	tegory	,	√	Bas	sic Scie	ence		Eng S	gineer cience	ing e	0	pen Ele	ctive	N	landate	ory		
				1	Outli	ne the	flow r	neasu	remen	ts usir	ng diffei	ent dev	vices. (K	1)				
		F		2	Expla	in the	factor	's affec	cting t	he flov	v throu	gh pipe	s. (K2)	)				
Course ob	jective	es		3	Illust mech	rate th anics.	e chai (K2)	racteri	stics c	urves	for vari	ous exp	erimen	ts relate	ed to flu	ıid		
				4	Infer the competency towards preventive maintenance of hydraulic machine.         (K2)         Explain the working principle and performance of centrifugal pumps. (K2)         Relate the principles and working of fluid systems (K3)         ompletion of the course the student will be able to         Understand the basic properties of fluids and apply Newton's Law of Viscosity													
				5	Expla	in the	work	ing pri	nciple	and p	erform	ance of	centrifu	ıgal pur	nps. (Kž	2)		
				6	Relat	e the p	orinciț	oles an	d wor	king o	f fluid s	systems	(K3)					
		-	Or	a completion of the course the student will be able to01Understand the basic properties of fluids and apply Newton's Law of Viscosity in solving practical problems. (K1)														
			С	Understand the basic properties of fluids and apply Newton's Law of Viscosity in solving practical problems. (K1)CO2Explain the significance of basic principles of fluid statics and application of														
			С	<ul> <li>in solving practical problems. (K1)</li> <li>Explain the significance of basic principles of fluid statics and application of hydrostatic law in determining forces on surfaces and hydraulic structures. (K2)</li> </ul>														
Course ou	tcome	es	С	CO2Explain the significance of basic principles of fluid statics and application of hydrostatic law in determining forces on surfaces and hydraulic structures. (K2)CO3Explain the principles of kinematics with specific emphasis on application of continuity equation (K2)														
			С	04	Apply	the p	rincip n othe	les of l	Berno flow i	ulli's e proble	quatior ms. (K3	in mea	isureme	ent of di	scharge	e in		
		F	С	05	Relat	e fricti	on los	s in la	minar	and tu	ırbulen	t flows.	(K3)					
	-		С	06	Demo	nstra	te the	worki	ng of p	oumps	. (K2)							
POs/COs	P01	PO	)2	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3		
C01	3	2		-	-	1	2	1	2	2	1	-	2	1	1	1		
CO2	3	2		-	-	1	2	1	2	2	1	-	2	1	1	1		
CO3	3	3		2	1	1	2	1	2	2	1	-	2	1	1	1		
CO4	3	3	3 - 1 1 2 1 2 2 1 - 2 1 1 1												1			
C05	3	1	1         -         1         2         1         2         2         1         2         2         1															
C06	3	1	1     -     -     1     2     1     2     2     1     2     2     1     1     1       2     2     1     1     2     2     1     2     2     1     1     1															
Average	3	2.	2	1     1     2     1     2     1     2     1     1     1       2     1     1     2     1     2     1     2     1     1     1														
Correlation	n level			1.5	Slight (	Low)		2. M	oderat	e (Me	dium)		3. Su	bstanti	al (High	)		

# Controlled



# LIST OF EXPERIMENTS

### Total:36 Hours

- 1. Determine coefficient of discharge of a given venturimeter using experimental setup.
- 2. Determine coefficient of discharge of a given orifice meter using experimental setup.
- 3. Determine coefficient of friction of given pipe using experimental setup.
- 4. Determine operational characteristics of a given centrifugal pump using experimental setup.
- 5. Determine coefficient of discharge of Triangular Notch using experimental setup.
- 6. Determine coefficient of velocity of flow using a pitot tube.
- 7. Determine the metacentric height of the given apparatus.
- 8. To verify the Bernoulli's theorem.
- 9. Study design and working of a hydraulic lifting machine.
- 10. Study design and performance of any one hydraulic system considering its important components, pipes and fittings, valves, hydraulic power.

Competency Numbers	5.1,5.2.1,9.5	



Program			B.E. – Marine Engineering															
Course co	de		Course	Name						L		Т	Р		С			
241ME1A	34PF		Marin	e Wor	kshop	- II			-	0		0	4		2			
Year / Ser	nester		II Year	/ III Se	B.E Marine Engineering         L       T       P       C         o       0       4       2         emester       Contact hours/Week       O4 hrs         s and       Management       Professional Core       Professional Elective         emester $Contact hours/Week       04 hrs       Elective         emester       Contact hours/Week       04 hrs       Elective         emester       EngineeringScience       Open Elective       Mandatory         emestrate the safety precautions and procedures involved in Workshop (K2)       Mandatory         strate the various tools and equipment used (K2)       Mandatory       Mandatory         elop hands-on training given in fitting , plumbing and machiningions (K2)       Mandatory       Mandatory         elop hands-on training given in arc welding sections (K2)       monstrate fitting operations, various joints and tools used (K3)nonstrate fitting operations, various joints and tools used (K2)       monstrate fitting operations and perform joints in multiple positions(K2)         ionstrate Gas welding operations and perform joints in multiple positions(K2)       Poot       PO3       PO6       PO7       PO8       PO9       PO10       PO11       PO12       PS01       PS02       PS03       PS03       PS03       PS0$													
Prereguisi		rse	Marine	work	B.E Marine Engineering         ame       L       T       P       C         Workshop - II       0       0       4       2         III Semester       Contact hours/Week       04 hrs         orkshop-1, II       Vorkshop       Professional Core       Professional Elective         Sciences       Courses       Professional Core       Professional Elective         Science       Engineering Science       Open Elective       Mandatory         To demonstrate the safety precautions and procedures involved in Workshop (I       Illustrate the various tools and equipment used (K2)       Demonstrate the basic manufacturing processes (K2)         Develop hands-on training given in fitting , plumbing and machining       Sections (K2)       Develop hands-on training given in gas welding sections (K2)         Develop hands-on training given in gas welding sections (K2)       Demonstrate fitting operations, joints and tools used (K3)       Demonstrate fitting operations performed in lathe (K2)         Demonstrate fitting operations and perform joints in multiple positions(K       Professional cols used (K3)         Demonstrate Gas welding operations and perform joints in multiple positions(K         Demonstrate fitting operations and perform joints in multiple positions(K         Demonstrate Gas welding operations and perform joints in multiple positions(K         Demonstrate Gas welding operations													
Trerequisi		ise	Hum	anities	B.E Marine Engineering           Iame         L         T         P         C           Workshop - II         III         0         0         4         2           III Semester         Contact hours/Week         04 hrs         04 hrs           vorkshop-1, II         Professional Core         Professional Elective         Professional           Sciences         Engineering         Open Elective         Mandatory           Science         Engineering Science         Open Elective         Mandatory           To demonstrate the safety precautions and procedures involved in Workshop (K         Illustrate the various tools and equipment used (K2)         Demonstrate the basic manufacturing processes (K2)           Develop hands-on training given in fitting , plumbing and machining Sections (K2)         Develop hands-on training given in gas welding sections (K2)         Develop hands-on training given in gas welding sections (K2)           Develop hands-on training given in gas welding sections (K2)         Demonstrate fitting operations, joints and tools used (K3)         Demonstrate machining operations and perform joints in multiple positions(K2)           Demonstrate Rackeding operations and perform joints in multiple positions(K2)         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12         PS01         PS02         PS													
			Soci	al Scie	B.E Marine EngineeringVameLTPCWorkshop - II $1$ $0$ $0$ $4$ $2$ III Semestervorkshop-1, IIContact hours/Week $04$ hrsnities andManagement coursesProfessional CoreProfessional ElectiveScienceEngineering ScienceOpen ElectiveMandatoryTo demonstrate the safety precautions and procedures involved in Workshop (K2)Demonstrate the basic manufacturing processes (K2)MandatoryDevelop hands-on training given in fitting , plumbing and machining Sections (K2)Sections (K2)Demonstrate fitting operations, joints and tools used (K3)Demonstrate fitting operations, using user line and perform joints in multiple positions(K2)Demonstrate fitting operations and perform joints in multiple positions(K2)Demonstrate Gas welding operations and perform joints in multiple positions(K2)PO4PO4PO5PO6PO7PO8PO4PO1PO11PO12PS01PS02PS022222222222- <t< td=""></t<>													
Course cat	ogory	F									✓							
Course ca	egory	-	Bas	ic Scie	nce		Engir Sci	ieering ence	5	Ope	en Elect	ive	Μ	landat	ory			
		F																
			1	To d	emons	trate t	he safe	ety pre	cautior	ns and p	orocedu	res invo	olved in	Works	hop (K2)			
			2	Illus	Illustrate the various tools and equipment used (K2)         Demonstrate the basic manufacturing processes (K2)         Develop hands-on training given in fitting , plumbing and machining         Sections (K2)													
			3	Dem	Demonstrate the basic manufacturing processes (K2) Develop hands-on training given in fitting , plumbing and machining Sections (K2)													
Course ob	jective	S	4	Develop hands-on training given in fitting , plumbing and machining         Sections (K2)         Develop hands-on training given in arc welding sections (K2)         Develop hands-on training given in gas welding sections (K2)														
			5	Sections (K2)         Develop hands-on training given in arc welding sections (K2)         Develop hands-on training given in gas welding sections (K2)														
		F	6	Develop hands-on training given in arc welding sections (K2)         Develop hands-on training given in gas welding sections (K2)         mpletion of the course the student will be able to														
			On con	Develop hands-on training given in gas welding sections (K2) pmpletion of the course the student will be able to														
		F	C01	npletion of the course the student will be able to       Demonstrate plumbing operations, joints and tools used (K2)														
			CO2	Demonstrate fitting operations, various joints and tools used (						ed (K3)								
Course ou	tcomes	5	CO3	Demonstrate machining operations performed in lathe (K2)														
			CO4	Dem	onstra	ite Arc	weldir	ng oper	rations	and pe	rform jo	oints in	multiple	e posit	ions(K2)			
			C05	Dem	onstra	ite Gas	weldir	ng ope	rations	and pe	rform jo	oints in	multiple	e posit	ions(K2)			
			C06	Expl Mac	ain op hines (	eratioı K2)	n of var	rious n	nachine	es, tools	s and di	fferent	types of	weldin	lg			
POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3			
C01	3	2	2	2	-	2	2	2	3	3	-	2	2	2	-			
CO2	2	2	-	-	-	2	2	2	3	3	-	2	2	2	-			
CO3	3	2	2	2 - 2 2 2 3 3 - 2 2 -										-				
CO4	3	2	2	2 2 - 2 2 2 3 3 - 2 2 2 -														
CO5	2	2	2	2 2 - 2 2 2 3 3 - 2 2 2 -														
C06	3	3	3	3     -     2     2     2     3     3     -     2     2     2														
Average	2.67	2.17	2.20	2.20		2.00	2.00	2.00	3.00	3.00		2.00	2.00	2.00				

# Controlled



Correlation level	1.Slight (Low)	2. Moderate (Medium)	3. Substantial (High)
LIST OF EXPERIMENT I) Plumbing and Adher 1) Hands-on-exerci	<b>S</b> esives se. Basic pipe connect	cions – Mixed pipe material con	<b>Total Hours : 90</b> 10 Hrs nection – Pipe
Connections wit	th different joining of	components	Ĩ
2) Use of various tv	pes of adhesives, seala	nts. packing materials in carrying	out temporary
repairs.	F	, <sub>F</sub> ,,,	
3) Demonstration of <b>II</b> ) <b>Fitting</b> 1) Rectangular fitin 2) T - fitting	of plumbing requiremenng	nts of high-rise decks	20 Hrs
III) Machining Opera	tions		20 Hrs
<ol> <li>Turning,Milling</li> <li>Reaming</li> <li><b>IV) Electric Arc Weld</b> <ol> <li>Single V Butt jo</li> <li>Lan fillet joint i</li> </ol> </li> </ol>	,Drilling,Shaping,Thread <b>ing</b> pint in flat position n fillet position	l cutting, Grinding	20 Hrs
<ul> <li>2) hap fillet joint 1</li> <li>3) TEE fillet joint 1</li> <li>V) Oxy Acetelyne Wel</li> <li>1) Outside corner</li> <li>2) TEE fillet joint</li> <li>3) Square butt joint</li> <li>Competency Numbers</li> </ul>	in fillet position Iding joint in flat position in flat position nt in horizontal positio s : 8.2, 8.5, 8.6, 9.8	n	20 Hrs
Text Books:			
<ol> <li>Workshop Technolog</li> <li>Workshop Technolog</li> <li>Reference Books:</li> <li>A Text Book of Work:</li> <li>Workshop Technolog</li> <li>Elements of Manuface</li> </ol>	gy V [ I], S.K. Hajra Chau gy V [II], S.K. Hajra Chau shop Technology, R.S. I gy, W.A.J. Chapman Vol cturing processes, B.S. I	idhary. Media promoters & publis udhary. Media promoters & publis Khurmi& J.K. Gupta. S. Chand& con I & Vol II, Published by Routledge Nagendra Parashar& R.K Mittal. P	shers Pvt. Ltd. shers Pvt. Ltd. mpany Pvt. Ltd. (1972). HI Learning.

PROGRAM	BE.	– Ma	rine l	Engin	eerin	g									
Course Code:	Cour	Course Name     P     C       Marine Electrical Measurements and VERS 2Y     1000     3       Instrumentation     Instrumentation     Contact hours/Week: 3       II Year / IV Semester     Contact hours/Week: 3													
241ME1A43TE	Mari Insti	ine El rume	ectri ntatio	cal Me on	easur	emen	its and UN	VIVE	RSľ	ŦY	1 NAA	CT	0	3	
Year / Semester	II Ye	ear / I	IV Sei	meste	r		(Deened)	ie be University Linde	r Section 3 of UG	Contac	t hour	s/Wee	k: 3		
	Hum Scier	naniti nces	es an	d Soc	ial		Mana cours	gemen es	t	Profes: Core	sional	]	Profess	sional E	lective
Course category															
dourse category	Prog	gram					Engin Scieno	eering ce		Open F	Elective	e l	Manda	tory	
								✓							
	1			To ex princ	plain iples	the s of va	studen rious i	ts an i measu	nsigh ring i	it into t instrun	he con: nents (	struct K2)	ional d	etails a	nd working
	2			To ex meas	plain uring	the ı g elec	use of trical a	differe and ph	nt ty ysica	pes of a l quan	analog tities. (	and di K2)	gital m	eters f	or
Course	3			To de	mon: ctance	strate e and	e vario capac	us Bri itance	dges . (K2)	for the	meası	iremer	nt of re	sistanc	e,
objectives	4	4 To understand and apply different types of sensors for the measurement of 4 physical quantities such as speed, torque, pressure, displacement, temperature, etc. (K2)												rement of	
	5	temperature, etc. (K2)5To discuss the basics of instrumentation and control involved in marine engineering field (K3)												narine	
	6			To de	velop	o a so	und k	nowle	dge o	f Alarn	ı circu	its and	monit	oring s	ystem. (K2)
	C01			Dem their	onstra class	ate ki ificat	nowle ion.(K	dge on 2)	the o	charact	eristic	s of me	easurin	ıg instr	uments and
	C02			Expla (K3)	in th	e con	struct	ion, w	orkin	g of A(	<b>C / DC</b> 1	meters	and th	neir pro	oficient use.
Course outcomes	CO3			Class	ify br	ridge	compa	arison	meth	ods fo	r R, L a	nd C n	neasure	ement.	(K4)
	C04			Comp and s	oare o enso	const rs(K4	ructio	n and y	work	ing pri	nciple	of vari	ous typ	oes of t	ransducers
	C05			Dem	onstr	ate th	ne vari	ous ty	pes o	f moni	toring	systen	n and a	larm ci	rcuits (K2)
	C06			Expla	in th	e con	cepts	of mea	surii	ng insti	umen	ts (K3)			
POs/COs	P01	PO2	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2 2 2 - 1 1 1 1 1 1 - 1 2 3 3											3			
CO2	3 2 2 2 1 1 1 1 1 1 1 - 1 2 3 3										3				
CO3	2 2 2 2 1 1 1 1 1 1 1 2 3 3											3			
CO4	2 2 2 2 1 1 2 1 1 2 2 3 3											3			
C05	2     2     2     2     1     1     2     1     1     1     -     2     2     3     3											3			
C06	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$														
Average	2	2	2	1.7	1	1	1.5	1	1	1	-	1.5	2	3	3


Correlation Level	1.5	light (Low)	2. Moderate (Medium)	3. Substantial (High)					
UNIT-I	INTRO	DUCTION TO M	IEASUREMENT		10 Hours				
Functional elements of General - Static and Dynamic characteri Sensitivity, Linearity, Resolution Errors in Measurements - Syste	ized m stics o n, Hyst ematic	easurement sys f instruments - 1 eresis, Threshol and random err	tem - Types of measurement - Mean, Standard deviation - erro ld, Input impedance - loading er ors, propagation of errors, Lim	Classificatior or - Accuracy, ffects - Proba iting errors c	n of instruments Precision, bility of errors- of instruments.				
Competency Numbers		7.5							
UNIT-II	EL	ECTRICAL INST	RUMENTS		12 Hours				
Essential requirements of an instrument - Ammeter and voltmeter - Moving coil - Moving Iron - Extension of voltmeter and ammeter range - Electro dynamo meter type Wattmeter - Induction type Energy meter - Instrument Transformers- Power factor meter-Frequency meter- Construction, Phasor diagrams, testing, application of current transformer and potential transformer – Multimeter – Insulation tester, Continuity to Tong tester- Introduction to Megger.									
Competency Numbers		7.2, 7.3,7.4							
UNIT-III BRIDGES AND DISPLAY DEVICES 12 Hours									
Bridges: Measurement of low and high resistances – D.C potentiometer - Wheat stone, Kelvin and Kelvin Double bridge - A.C bridges for measurement of L and C - Maxwell, Anderson bridge and Heavy side Campbell bridges for inductance, Wein bridges for capacitance - Measurement of earth resistance - localization of cable faults by Murray and Varley loop test - Wagner Earthing Device. Display Devices: CRT display, Analog and digital CRO, LE and LCD.									
Competency Numbers		6.1.2, 6.1.2A							
UNIT-IV	TR	ANSDUCERS AN	ND SENSORS		10 Hours				
Transducers - Definition and cla Capacitive Piezoelectric – Force pickup transducer - Pressure: M Electromagnetic, Ultrasonic – L Current and Power: Hall Effect Vibration Sensors, Water Salino	assifica e: Strain Manom Jevel: D transd ometer	ation - Displacen n gauge – Torqu eters, Bourdon ifferential Press ucer, Smart Tran	ment: Resistive Potentiometers, e: magneto-stricitive – Speed: M – Temperature: Thermistors, Tl sure cell, Ultrasonic – Density: H nsmitters, RPM Sensors, Photo S	, strain gauge Magnetic and hermocouple Hydrometer - Sensors, Torc	e, LVDT, photo electric e, RTD – Flow: Voltage, que Sensors,				
Competency Numbers		6.1.2A, 6.1.2C,	.6.1.3.A						
UNIT-V	MC	NITORING SYS	TEM AND ALARM CIRCUITS		10 Hours				
Integrated automation control and monitoring system- Requirements of a Basic Fire Alarm System - FireDetection System - Rise-type Fire Detector-Combustion Detector- Fire Alarm Control Panel - Alarms for EngineRoom and Pump Room Systems - Alarm and Trip circuit for various machinery, simple fire alarm, dead manalarm, Important UMS alarms - Mist Detector - operation of fire detection unit using Ionization chamber typedetector - Pneumatic, Electrical transducers and receivers I/P,P/I,V/I,I/V converters.Competency Numbers6.1.3A, 7.5.1									
Text Books:         A.K. Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai and Co., New Delhi, 19th Edition, 2015.         2. J. B. Gupta, "A Course in Electronic and Electrical Measurements", S. K. Kataria & Sons, Delhi, 12th Edition, 2009.									
Pvt. Ltd., Special Indian Edition	, 2007.	in ement system	is – Applications and Design , 18	ata MCGFAW I					



#### Reference Books:

David Bell, "Electronic Instrumentation and Measurements", Oxford University Press, 1st Edition, 2013.

H.S. Kalsi, "Electronic Instrumentation", Tata McGraw Hill Education, 4th Edition, 2019.

C.S. Rangan, G.R. Sharma and V. S. V. Mani, "Instrumentation Devices and Systems", Tata McGraw Hill Book Co., New Delhi, 1st Edition, 2004.

Program	<b>B.E. – Marine Engineering</b>
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			Providence document contraction	(Deened to be University U	inder Section 3 of UOC Act 1956)	$\sim$		
Course code	Course N	Name		L	Т	Р	С	
241ME1A43TF	Marine	Materials		2	1	0	3	
Year/Semester	II Year	/III Semester		Contact	hours/Wee	k:	3Hrs	
Course code A1ME1A43TF Cear/Semester	Basic Sc	ience	Engineering Science	Open Elective		Manda	atory	
			$\checkmark$					
Pre-requisite	Enginee	ring Mathema	itics, Engineering	Mechanic	s, Material S	Science		
	1	To understar	nd the concept of s	stress stra	ain relations	hip (K1)		
	2	To draw shea theory of sim	ar force and bendi ple bending (K1)	ing mome	ent diagrams	s of beams	under differe	ent loads and the
Course objectives	3	To learn abo	ut the deflections	of beams	(K1)			
	4	To understar	nd the concept of t	torsion of	shafts (K1)			
	5	To study abo	ut the stresses on	shells du	e to interna	l pressure	(K1)	
	6	To Study abo	out spring and its a	applicatio	ns (K1)			
	C01	Summarize t	he stress, strain, t	ension, co	ompression	and shear f	for various m	naterials. (K1)
	CO2	Discuss the s diagram for v	hear force, bendir various types of be	ng momer eam and l	nt and draw oads. (K2)	shear force	e diagram & l	bending moment
Course outcomes	CO3	Analyze defle	ections of beams a	nd Strain	Energy. (K3	3)		
	CO4	Analyze tors	ion of shaft to find	l the powe	er. (K3)			
	CO5	Determine th	ne stresses and de	formatior	ns induced in	n thin and t	hick shells. (	(K2)
	C06	Apply the kn	owledge of stress	and strai	n for design	ing the ma	chine compo	nents. (K3)

POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2	1	-	-	-	-	-	2	-	-	-	-	2	-	-
C02	2	1	-	-	-	-	-	2	-	-	-	-	2	-	-
C03	2	1	-	-	-	-	-	3	-	-	-	1	3	-	-
C04	2	1	-	-	-	-	-	3	-	-	-	-	3	-	-
C05	3	2	2	-	-	-	-	3	3	3	-	3	3	2	-
C06	3	2	-	-	-	-	-	2	3	3	-	2	3	2	-
Average	2.33	1.33	2.00	-	-	-	-	2.50	3.00	3.00	-	2.00	2.67	2.00	-
Correlation	n level		1.	Slight (	(Low)		2. N	Modera	te (Meo	lium)		3. S	ubstantia	al (High)	

UNIT-I	UNIT-I STRESS, STRAIN AND DEFORMATION OF SOLIDS								
Strength, Stress and Strain - Direct Stress and Strain, Shear stress and shear strain. Elastic constants. Factor of									
Deformation of simpl	e and Compoun	d bars. Thermal stress and strain. Iron Carbon Equilibrium Diagram							
Competency Number	S	4.4 and 4.5							
UNIT-II	UNIT-II BEAMS AND STRESSES IN BEAMS								



Beam – Types – Load	ls. Shearing for	ce and bending moment diagram for cantilever beam, simply supp	orted beam with							
concentrated or uniformly distributed loads.										
Theory of simple bending, bending stress, neutral axis, Relation between bending stress and radius of curvature, relation between bending moment and radius of curvature, bending stress in symmetric section, bending stress in unsymmetrical										
between bending moment and radius of curvature, bending stress in symmetric section, bending stress in unsymmetrical										
section.										
Competency Numbers	5	4.5								
UNIT-IIIDEFLECTION OF BEAMS AND COLUMN12 Hours										
Elastic curve – Governing differential equations – Deflection of Built-in beams and Continuous beams by Double integration										
method – Macaulay's	method - Area i	noment method. Clapeyrons three moment theorem.								
Column – types – effe	ctive length of c	olumn - Struts - Euler's formula, Slenderness ratio. Rankine's Formu	la.							
Competency Numbers 4.5										
UNIT-IV TORSION AND SPRINGS 10 Hours										
Strength and stiffness	s of solid or ho	llow shafts, Stress due to torsion, Power transmitted by shafts and	d coupling bolts.							
Springs – types – Clos	ed and Open Co	oiled helical springs – springs in series and parallel. Stress with axial	load, calculation							
of mean diameter of s	prings, wire dia	meter and no. of coils.								
Competency Numbers	s 4									
UNIT-V	1	THIN SHELLS, THICK SHELLS AND STRAIN ENERGY	10 Hours							
Thin shells – Circumfe	erential and lon	gitudinal stress in thin cylindrical shells subjected to internal pressu	re. Thick Shells -							
Lame's equations, The	e Lame Line, Sh	rinkage allowance.								
Strain energy – due to	direct stress, b	ending and twisting.								
Competency Numbers	5 4									
		Total	hours: <b>54 Hours</b>							
Text Books:										
1. Reed Volume 2: Ap	oplied Mechanie	cs for Engineers; By William Embleton; Revised by J.T. Gunn; Publi	sher Sunderland							
Tyne and Wear) Thon	nas Reed.1983:	ISBN0900335874								
2. Strength of Materia	ls, R S Khurmi,	S.Chand & company Ltd., New Delhi, 7th edition, 2019.								
3. Rattan S.S., "Strengt	th of Materials",	, Tata McGraw Hill Education Pvt .Ltd., New Delhi, 2017.								
<b>Reference Books:</b>										
1. Strength of Materia	ls, G. H. Ryder, I	Macmillan Pub, India.								
2. Strength of Materials, Ramamrutham S, Dhanpat Rai Publishing, New Delhi.										
3. Strength of Materials, Rajput R.K, S. Chand Publishing, New Delhi.										
4. NPTEL online cours	se: strength of n	naterial by Prof. Sriman Kumar Bhattacharyya.								
5. https://onlinecours	ses.nptel.ac.in/1	noc20_ce34/preview.								

Program		<b>B.E.</b> – <b>N</b>	<b>Marine Engine</b>	ering				
Course code	Course Name		L	Т	Р	С		
241ME1A43TG	Mechanics of Mac	hines	2	1	0	2		
Year / Semester	II Year / IV Semeste	er	Contact hours/Week: 3 hrs					
	Basic Science	Engineering Science	Open El	ective	Ν	landatory		
		✓						
Prerequisite Course	Engineering Mecha	nics, Engineering Mat	erials					



				1	, ,	Го under of a syste	stand m/mac	the bas hine. (I	sic com K1)	ponents	and lay	out of l	inkages	in the a	ssembly	
				2	r	Гo under	stand t	he basi	c conce	pts of be	lt and ch	ain driv	es. (K1)			
Course objecti	ves			3	r	Γo unders	stand tl	ne moti	on resu	ulting fro	om a spec	cified set	oflinka	ges, (K1)		
				4	t	Го under toothed g	stand searing.	the bas (K1)	sic con	cepts of	Turning	Momen	t, Flywh	ieel &		
				5	(	Го discus (K2)	s the ba	sic con	cepts o	ftoothed	gearing	and kine	matics o	f gear tra	ins.	
				6	1	To Analyzing the undesirable effects of unbalances resulting from prescribed motions.(K4)										
			С	01	1	Explain the basic mechanisms and links used in machines (K1)										
			C	02	]	Discuss various belt and machine drives (K2)										
Course outco	mag		С	03	]	Discuss t	he func	tioning	of cam	s and fol	lowers (l	K2)				
Course outco	mes		C	04	]	Discuss the working of flywheel and gear systems(K2)										
			C	05	]	Discuss the need of balancing, functioning of governors and effect of vibration (K2)										
			C	06	]	Demonstroperation	rate the 1. (K2)	know	ledge o	f Mechai	nisms an	d links f	or the e	fficient		
POs/COs	P01	PO2	P03	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PSO1	PSO2	PSO3	
C01	2	1	1	-	-	2	-	-	-	-	-	2	3	1	-	
CO2	3	3	3	2	-	2	2	2	-	-	-	1	3	2	-	
CO3	3	3	-	-	-	-	-	2	-	-	-	-	3	-	-	
CO4	3	3	2	2	-	2	2	2	-	-	-	2	3	2	-	
C05	3	3	2	-	-	2	2	-	-	-	-	2	3	2	-	
C06	3	3	3	3	-	3	3	3	2	-	-	3	3	3	2	
Average	2.83	2.67	2.20	2.33		2.20	2.25	2.25	2.00			2.00	3.00	2.00	2.00	
Correlation leve	el		1.S	light (L	ow)		2. Mo	oderate	(Mediu	um)		3. Su	bstantial	(High)		
UNIT-I		KINE	EMATIC	S OF M	ACHI	NES, ME	CHANIS	SMS, Al	ND MA	RINE EN	GINE DY	YNAMIC	S 1	0 Hours	;	
Introduction to	basic n	nechan	isms, ki	nemati	c pair	s, links a	nd chai	n Inver	sions a	nd varia	nts of kir	nematic o	chains.			
Degrees of freed	dom. Gr	'UBler'	s criteri	ion, fou	r link	mechani	sm, Gra	shoff's	law. De	etermina	tion velo	ocities an	nd accele	erations of	of	
Piston, Connect	ing Roc	l inerti	a forces	of pist	on, co	nnecting	rod, cr	ank by	analyti	cal meth	od.					
Dynamically eq	uivalen	t syste	m of co	nnectin	g rod.											
Competency Nu	mbers			4.1.5, 4	.1.6 a	nd 4.1.7										
UNIT-II		BELT	r and c	CHAIN	ORIVE	ES							1	0 Hours	;	
Types of belt dr	ives – r	nateria	ls used	for bel	zs – ve	elocity ra	tio of b	elt driv	e – leng	gth of an	open be	lt drive -	length	of a cross	s belt	
drive – power ti	ransmi	tted by	a belt -	- centri	ugal t	ension -	maxim	um ten	sion in	belt –	•		0			
condition for tra diameter – class	ansmis: sificatio	sion of on of ch	maxim ains.	um pov	ver – i	nitial ten	sion in	the bel	t – chai	in drive ·	- relatior	n betwee	n pitch a	and pitch	circle	
J																



Competency Numbers		4.1.5, 4.1.6 , 4.1.7 ,9.5									
UNIT-III	CAM AND FOLLOWER MECHANISMS										
Types and Classificatior and Dynamics of Cam a velocity, SHM, uniform a	es and Classification Cam and Follower mechanisms used in different machineries on board, Kind Dynamics of Cam and Follower mechanisms and determination of cam profile for specified follo city, SHM, uniform acceleration and retardation, cycloidal motion.										
Competency Numbers		4.1.5, 4.1.6 , 4.1.7									
UNIT-IV	TURNING MO	DMENT & FLYWHEEL, TOOTHED GEARING Y NUMBER	9 Hours								
Function of a flywheel. ( Types of gear trains- Tr system.	Crank effort di ansmission of	agrams. Fluctuation of speed and Energy-Simple problems. Types of power by gear trains on parallels shafts- Simple Problems, Steering §	gears. Gear Trains - gear and Telemotor								
Competency Numbers		4.1.5, 4.1.6, 4.1.7 , 9.5									
UNIT-V BALANCING, GOVERNORS, GYROSCOPE 13											
only).Introduction, P Plane and Naval ship Effect of Gyroscopic to a Rotating Shaft, Ru	rocessional A , Stability of a Couple on a D udder and Supp	ngular Motion, Gyroscopic couple and its determination, Effect of Gy Four-Wheel Drive Moving in a Curved Path, Stability of a Two Wheel isc Fixed Rigidly at a Certain Angle	vroscopic Couple on a Vehicle Taking a Turn,								
Competency Number	S 2	4.1.7,4.5 ,9.5	Tatal having <b>F4 h</b> aving								
Text Books			1 otal nours: 54 nours								
1. Theory of Machine	s. R.S. Khurmi	. I.K. Gupta, SChand Publishing									
2. P L Ballaney, Theor	y of Machines,	Khanna Publishers, New Delhi.									
Reference Books:	,										
1. S. S. Rattan, Theory	of Machines,	Fata McGraw Hill Publishing Company, New Delhi.									
2. J. Hannah and R.C. S	Stephens, Adva	nced Mechanics of Machines, Viva publications, New Delhi.									
3. Kenneth J. Waldron / Gary L Kinzel, Kinematics Dynamics and Design of machinery, John Wiley and Sons.											
4. Thomas Bevan, The	e Theory of Ma	chines, CBS Publishers and Distributors, New Delhi.									
5. J. S. Rao, The Theor	y of Machines,	New Age International Publishers.									
6. Theory of Machines	s, Kinematics a	and Dynamics, Sadhu Singh, Pearson Publications,2013, Third Edition	l.								
L											



PROGRA	М	BE-M	arine E	Enginee	ering												
Course Co	ode	Naval	Archit	ecture	-I			Ι		Т		Р		С			
241ME1A4	41TJ	nuvu	111 01110					3	3	0		0		2			
Year an	d		П	Year (s	emeste	r IV)											
Semeste	er			icui (5	emeste				Contact hours per week								
Prerequis	site			l	NII.						(	(3Hrs)					
course																	
		Hu	maniti	es and		Manag	ement	Pı	ofessio	onal Cor	e	Profe	essional	Elective			
		So	cial Sci	ences		cour	ses		orebbit			11010	Jobroman	Lieetive			
Course cate	egory																
		Ba	asic Sci	ience		Engine Scie	ering nce		Open H	Elective			Mandat	ory			
			$\checkmark$														
Course Obi	activo	1. Un	derstar	nd prin	ciples	and cal	culatio	ons for	ship sta	ability. (	K1)						
Course Obje	ective	2. Un	derstai	nd prac	tical sl	kills for	· evalua	ating sł	nip stał	oility un	der vari	ous con	ditions.	(K1)			
		After completion of the course, the students will be able to:															
		1.	Expl	ain pri	nciples	s of shij	o stabi	lity, inc	luding	density	and buo	oyancy. (	(K2)				
		2.	Calc	ulate a	reas, vo	olumes	, and n	noment	s using	g Simpso	on's rule	es. (K2)					
Course Out	come	3.	Dete	rmine	transv	erse sta	ability,	BM, an	d meta	acentric	height.	(K3)					
		4.	Eval	uate lo	ngitudi	inal sta	bility a	and fac	tors aff	fecting t	rim. (K4	.)					
		5.	Asse	ss dam	age sta	ability	and im	pact of	floodi	ng. (K3)		(110)					
		6.	App	ly IMO,	MARP	OL, and	d SOLA	S guide	elines f	or ship s	stability	. (K3)					
POS/COS	P01	PO2	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2	PSO3		
<u>CO1</u>	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3		
C02	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3		
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3		
C04	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3		
C05	3	3	3	3	2	-	2	-	-	-	-	2	3	3	3		
C06	3	-	-	-	-	-	3	-	-	-	-	2	3	3	3		
AVERAGE	3	3	3 3 3 2 - 2.5 2 3 3 3										3				
CORRELAT	ION LE	VELS	1	. SLIGH	T(LOV	V)	2	. MODI	ERATE	(MEDIU	M)	3. Sl	JBSTAN	TIAL (H	IGH)		

#### **UNIT 1: PRINCIPLES OF SHIP STABILITY**

Density, relative density. Archimedes principle, Displacements, deadweight, meaning of buoyancy, reserve buoyancy. Tonnes per centimetre (TPC), Lines plan of ships, coefficients of form, Offset table, Effects of weight shifting and suspended weight on centre of gravity.

Competency No. : 11.1 , 11.2

### **UNIT 2: CALCULATION OF AREA, VOLUME AND MOMENTS**

Simpson's 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> rules for areas and volumes calculation, 1st moments and centroids, 2nd moments of area (Area moment of Inertia), Use of half-spaced ordinates.

Competency No. : 11.1 ,11.2

### **UNIT 3: TRANSVERSE STABILITY**

Static stability at small angles of heel, calculation of BM and meta centric height, meta centric diagram, inclining experiment, free surface effect, stability at large angles of heel, curves of static stability, cross curves of stability, angle of loll.

Competency No. : 11.1 ,11.2

### **UNIT 4: TRIM AND LONGITUDIONAL STABILITY**

Longitudinal BM – MCT1 cm – Change of trim, change of LCB with change of trim, alteration of trim by adding or removing weights, factors affecting trim and stability, necessary measures to preserve trim and stability. Competency No. : 11.1 , 11.2

Controlled

### 12 Hrs.

10 Hrs.

# 10 Hrs.

## 10 Hrs.



### UNIT 5: DAMAGE STABILITY AND WATERTIGHT INTEGRITY

At woods and wall sided formula, Dynamic stability, Assessment of ship conditions after flooding – Permeability, Lost Buoyancy, margin line, sub division. Change in mean draught due to bilging of amidships, side and end compartments, floodable length calculation, IMO code of intact stability, MARPOL & SOLAS guidelines for damage stability. Competency No. : 11.1,11.2

12 Hrs.

### **TEXTBOOKS:**

**Total: 54 Hours** 

- 1. **"Ship Stability for Masters and Mates" by D.R. Derrett and C.B. Barrass -** Essential guide covering principles and calculations for ship stability.
- 2. "Introduction to Naval Architecture" by E.C. Tupper Comprehensive resource on naval architecture, including ship stability and design.

#### **REFERENCES:**

2. **International Maritime Organization (IMO)** - <u>www.imo.org</u> - Access to international conventions and regulations on ship construction and safety.

<b>Designed by</b> "Department of Naval Architecture & Offshore Engineering"
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Program				B.E. – Marine Engineering													
Course co	de		Сс	ourse N	Vame						L			Р		С	
241ME1A	44TG		M	arine	Boiler	S					2	1		0		3	
Year/Sem	lester				II	Year /	IV Sen	nester			Conta	act hour	s/Weel	x 3	3 hrs.		
			ŀ	lumar	ities a	nd Soci	ial	Mai	nageme	ent	Prof	essiona	I Core	Р	Professional		
					Science	es		С	ourses		1101				Elective	<u>)</u>	
Course ca	tegory																
				1	To Understand marine boiler fundamentals. (K1)												
Course				2	To Un	Understand marine boiler mountings. (K1)											
Objectives				3	To Un	Understand operation care and maintenance of boilers. (K1)											
				4	To Un	Understand feed water system and boiler water treatment. (K1)											
				5	To Un	Γο Understand fuel and combustion system. (K1)											
			C	01	Summ	arize v	various	s mari	ne boi	ler fu	ndame	ntals.	(K2)				
			C	02	Discus	ss vari	ous bo	oiler m	ounting	gs and	combus	tion sys	stems (l	K2)			
Course ou	itcome	S	C	03	Summ	arize	the ope	eration	care ar	ıd maiı	ntenanc	e of boil	ers. (K2	)			
			C	04	Summ	narize (	operati	on pro	cedure	s for b	oiler ar	nd feed v	water sy	/stems. (	[K2)		
			C	05	Summ	arize f	uel and	l comb	ustion	system	n. (K2)						
			C	06	Summ	iarize t	he aut	omatio	n in bo	iler, A(	CC and F	PMS. (KZ	2)				
POs/COs	P01	P	02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	
C01	2		2	2	2	-	3	2	3	-	-	3	3	3	3	3	
CO2	3		3	3	3	-	3	2	3	-	-	-	3	3	3	3	
CO3	3		3	3	3	-	3	2	3	-	-	3	3	3	3	3	
CO4	3		3     3     3     -     3     2     3     -     -     3								3	3	3				
CO5	3		3	3	3	-	3	2	3	-	-	-	3	3	3	3	
C06	3		3	3	3	-	3	2	3	-	-	-	3	3	3	3	



Average	2.83	2.83	2.83	2.83		2.00	3.00			3.00	3.00	3.00	3.00	3.00
Correlation	level		1.Sli	ght (Lo	w)	2. M	lodera	te (Me	dium)		3. Si	ubstanti	al (High	)



UNIT-I	MARINE BOILER FUNDAMENTALS	11 Hours
Steam- Generation smoke tube and w rivets, welded se SMOKE TUBE BO	on & properties of steam. Uses of steam on board ships. Types of marine boilers. C water tube boilers. Boiler construction methods; destructive and non-destructive te ams; classification society's requirements for boiler construction. DILERS:	omparison of ests on plates,
surfaces of multi	tubular cylindrical boilers, vertical auxiliary boilers. <b>OILERS:</b>	staying of flat
General description and other parts superheat tempe	on with sketches of principal types of boilers in marine use; super heater, economize of water tube boiler. Circulation and use of unheated down comers in highly r rature control; function of attemperators, de-super heaters, double evaporation b	er, headers rated boilers; poiler.
Competency Nun	1bers 4.1, 4.1.4	
UNIT-II	BOILER MOUNTINGS	14 Hours
List of boiler mo valves-Improved automatic feed w	untings and their functions - Classification society requirements of different mou- high lift, full lift and full bore type, Gauge glass-Ordinary plate type and removater regulator, high and low water level alarms, retractable type soot blower etc.	ntings. Safety ote indicator,
Competency Nun	1bers 4.1.4,4.3.2	
UNIT-III	OPERATION CARE AND MAINTENANCE OF BOILERS	10 Hours
shortage of water survey of boiler, p blowback. Autom	c, oil in the boiler; blowing down of boiler, laying up a boiler, general maintenance, in blugging of tubes and their renewal. Safety measure: Alarm, Trips and Furnace explo ation in boiler and ACC.	nspection and sion,
Competency Nun	bers 4.1.4,9.1, 9.4	10 11
UNIT-IV	FEED WATER SYSTEM AND BUILER WATER TREATMENT	10 Hours
Feed water syste on boiler, oil in b	ms; Corrosion and scaling in boilers. Importance of boiler water treatment, and effe oiler.	ct of same
Competency Nun	nbers 4.1.4,9.4	
UNIT-V	FUEL AND COMBUSTION SYSTEM	09 Hours
Fuel systems incl control. Mainten Waste Heat Boile circulation boiler	uding pumps, heaters, burners, and types of burners. Air heaters and air registers. C ance of combustion equipment. rs: Lamont exhaust gas boiler, Cochran exhaust gas and composite boiler etc., forc s and associated systems.	ombustion ed water
Competency Nun	nbers 4.1.4,4.4	
	Τοτ	tal: 54 Hours
Text Books:		
1.Marine Boil	ers 3rd Edition - GTH Flanagan, Butterworth – Heinemann Ltd.	
<b>Reference Book</b>	S:	
1.Marine Stea	m Boilers – J.H. Milton, 4th edition, Butterworth – Heinemann Ltd.	



Program							B.E	. – Mar	ine Ei	ngineer	ing				
Course coo	le	Со	urse l	lame						L	Т		Р		С
241ME1A4	42TB	Ma	arine	Enviro	nment	tal Pro	tection	1		3	0		0		3
Year/Seme	ester			II Ye	ar / IV	Semes	ter			Con	itact hou	urs/Wee	ek	3 Hrs	
			Huma	nities a	nd	M	anagen	nent	Р	rofessio	nal Core	- F	Professional Elective		
			Social	Science	es		course	es				-			
Course cat	egory			v		F	nginoor	ina							
			Basic	Scienc	е	L.	Scienc	e e		Open E	Elective		Ma	ndatory	
			1	To dis	cuss t	he neg	ative i	mpact	s of m	arine p	ollution	on the	e enviro	onment,	sea
			_	Organi	sms a	nd hum	an hea	lth. (K	2) 	ha affa	-+!l !	1			
Course			2	conver	ntions	(K2)	bcedur	es req	uirea	to eneo	cuvely i	mpiem	ent the	MARP	OL
objectives			3	To sun	nmariz	ze the s	afety c	haract	eristics	s and bu	inkering	(K2)			
			4	Summ	arize o	of the es	ssentia	l featu	res of	COW, IG	systems	s, and sa	afety de	vices, (ŀ	(2)
			5	To Dis	cuss tl	he corre	ective a	actions	neces	sary to	control	SOX and	d NOX er	mission	s, (K2)
		C	01	Summ	arize t	the ill ef	fects o	f marir	ne poll	ution (K	(2)				
CO2				Explain	n the p	orocedu	ires to	implen	nent tl	ne MARI	POL con	vention	s (K2)		
		C	03	Summ	arize t	the safe	ty char	acteris	stics , ł	ounkerir	ng plan f	or bunk	ering o	peratio	ns (K2)
Course out	tcomes	s C	04	Summ	arize	the imp	ortant	featur	es of C	OW, IG	SYSTEM	IS and s	afety de	evices (F	(2)
		C	05	Explai	n the o	correcti	ve acti	ons to	contr	ol SOX a	nd NOX	polluti	ons and	lother	air
				Polluti	on (KZ	2)									
		С	06	Analyz	e and	take m	easure	s to co	ntrol n	narine e	nvironn	nental p	rotectio	on (K3)	
POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2	2	1	1	-	3	3	3	-	-	-	3	3	1	-
C02	2	1	1	-	-	-	-	3	-	-	-	-	3	-	-
CO3	3	3	2	2	-	3	1	2	-	-	-	-	3	2	-
C04	2	2	1	1 - 2 3 1 2 3 1 -											
CO5	2	2	-	-	-	2	3	3	-	-	-	3	3	1	-
C06	3	3	2	1	-	3	3	3	1	2	-	3	3	2	-
Average	2.33	2.17	1.40	1.25		2.60	2.60	2.50	1.00	2.00		2.75	3.00	1.40	
Correlation	level		1	.Slight	(Low)		2. N	Iodera	te (Me	edium) 3. Substantial (High)					



UNIT-I	INTRODUC	ΓΙΟΝ	10 Hours								
Definition of ma pollution, Causes	rine environ s of marine po	ment, Reasons for protection of sea life, Ecological consequences ollution, General information of products and cargo moved on ships.	of marine								
Competency Nun	nbers	16.1, 16.2, 16.3									
UNIT-II	POLLUTION	I PREVENTION CONVENTIONS	10 Hours								
Marpol 73/78, convention for preventing polluting by discharge of oil, Chemicals, sewage and garbage, Oil record book, both electronic and manual, SOPEP, SMPEP and the differences between them, Other conventions.											
Competency Nun	nbers	10.1.1,10.1.2									
UNIT-III	<b>EQUIPMEN</b>	T FOR POLLUTION PREVENTION	12 Hours								
Measuring and d and equipment different types of retention, ORB e	etection syste onboard ship ships. Bunken ntry (Part I – 1	ems and equipment, Limits of discharge of oil in restricted areas. Spe s, Remedial actions after resulting in pollution. Control of waste c ring safety, bunker check list, Calculating bunker, BDN, sample collecti machineries).	ecialized tanks lischarge from ion,								
Competency Nun	nbers	10.1.1,10.1.2									
UNIT-IV	OIL TANKE	R OPERATIONS	10 Hours								
A typical voyage use of slop tanks, their regulations	of a tanker, V double hull ta . Safety device	arious cargo related operations, Equipment, Tank cleaning, Crude oil nkers, Pollution prevention on chemical tankers, Pollution prevention es fitted in pump room, IG Safety system. ORB entry (Part II – Cargo c	washing, on tankers and operations)								
Competency Nun	nbers	10.1.2,10.1.3									
UNIT-V	AIR POLLU	ΓΙΟΝ	12 Hours								
Ozone depleting pollution measur efficient manage treatment and re & Recycling, Hon	substances, rement(EEXL, ement plan, o gulation, Anti g-Kong conve	NOX, SOX, Volatile organic compounds, IMO Incinerator, Bunker is CII) and recording. Greenhouse gases, Energy efficient design inde energy efficient operation indicator. Ballast water management, -pollution paints, regulation for anti-pollution paints, Ship re-cycling ention), Noise pollution SOLAS regulations, Port state inspection.	regulation, Air x, Ship energy Ballast water (Ship breaking								
Competency Nun	nbers	10.1,16.1,16.2									
		Тс	otal: 54 Hours								
Text Books:											
1. Revised l	MARPOL Anne	ex VI 2009. 2nd illustrated, IMO Publication									
<b>Reference Book</b>	S:										
1. MARPOL	2006, ISBN-1	0 8175980702, IMO Publication.									





Program							B.I	E. – Ma	rine E	Enginee	ring				
Course cod	le	(	Course	Name						L		Т	Р		С
241ME1A4	44TH	N	Marine	Inter	nal Co	mbust	ion En	gines	-I	3		0	0		3
Year / Sem	nester	Ι	I Year	/ IV Se	mester	•				Contac	ct Hours	/ Week		3 hr	S
			Hun Soci	nanitie al Scie	s and nces		Mana co	agemer ourses	nt	Profe	ssional	Core	Pr	ofession Elective	al
Course cat	egorv										√				
			1	To ma on	explain rine di board	n the de esel en ships. (	esign fe gines f K2)	eatures or relia	s and o able ar	lifferen nd efficie	ces betw ent prop	veen 2-s oulsion a	stroke a and auxi	nd 4- st lliary pc	roke wer
			2	To unc	'o summarize the constructional details of an IC engine for a better inderstanding of its design, operation, and maintenance. (K2)										
Course obj	ectives	5	3	To in I	explair C engir	n the prines for	rinciple improv	es and ved en	imple gine p	mentati erforma	on of sca ince and	avengin l efficier	g and su ncy. (K2	upercha )	rging
			4 To analyze the combustion phenomenon in marine IC engines and its impact on engine performance, emissions, and reliability. (K3)									pact			
			5	To summarize of the different types of marine engine fuel systems, including the components, functions, and applications, in a clear and informative manner (K										ng their er (K2)	
			C01	Exp	olain tł	ne desig	gn feat	ures o	fa2,4	Stroke r	narine d	diesel ei	ngines (	K2)	
			CO2	Sur	nmariz	the c	onstru	ictiona	l detai	ls of a IO	Cengine	(K2)			
			CO3	Exp	olain th	ne scave	enging	and su	ıperch	arging (	of IC eng	ines (K	2)		
Course out	comes		C04	Ana	alyze tl	ne com	bustio	n phen	omeno	on in ma	arine IC	engine (	K3)		
			C05	Sur	nmariz	e vario	ous Ma	rine Er	ngine l	Fuel syst	tems. (Ki	2)			
	•	_	C06	Apj Bre	ply the akdow	e knov vn (K2)	vledge	of IC	c engi	nes to	find a	solutio	on for	emerge	ncy
POs/ COs	P01	PO2	PO3	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2	2	-	-	-	•	-	-	-	-	-	-	3	-	-
CO2	2	-	-	-	-	•	-	-	-	-	-	-	3	-	-
CO3	2	2	-	-	2 3 3										
CO4	3	3	1	1	-	2	3	3	-	-	-	-	3	-	-
CO5	2	2	-	-	-	2	-	-	-	-	-	-	3	-	-
C06	3	3	2	2	-	2	3	3	-	-	-	3	3	3	-
Average	2.33	2.40	0     1.50     1.50     2.00     3.00     3.00     3.00     3.00												
Correlat	tion lev	vel	1.Slight (Low)2. Moderate (Medium)3. Substantial (High)									)			



	COMPARATIVE STUDY OF MARINE DIESEL ENGINES: DESIGN	12 Hours								
UNIT-I	FEAT URES, DEVIATIONS FROM IDEAL CONDITIONS, AND TIMING DIAGRAMS	12 Hours								
Design Feature engines. Timing etc, Comparativ	s of marine diesel Engine 2-stroke and 4-stroke cycles, deviation from ideal cond g diagrams of 2-stroke timing diagrams of 4-stroke.Marine diesel engine of MAN/B&W re study of Cross head type, trunk type, slow speed, medium speed and high speed di	ition in actual //Sulzer make iesel engines.								
Competency Nu	imbers <b>4.1.1, 4.3.1</b>									
UNIT-II	KEY COMPONENTS AND CONSTRUCTIONAL DETAILS OF IC ENGINES	10 Hours								
Constructional Details of IC Engines Principal components, Bed plates, A frames, Welded construction of bed plates and frames, Tie rods, Foundation Bolts, Jackets and liners, cylinder heads, Pistons, cross heads, connecting rods, Bearings, Crank Shaft, Exhaust Valves, etc.										
Competency Nu	Imbers         4.1.1 , 4.3.1									
UNIT-III	SCAVENGING AND SUPERCHARGING SYSTEMS IN 2-STROKE ENGINES	10 Hours								
Scavenging and their merits and cooled - water sealing arrange	Supercharging System Scavenging arrangements in 2-stroke engines, Various types d demerits, Turbocharger and its details, Pulse type and constant pressure type turbe cooled turbocharger casing. Centrally supported and end supported shaft bearing ments and lubrication arrangements.	of scavenging, o charging, air 1gs and types,								
Competency Nu	umbers         4.1.1 , 4.3.1 , 4.4									
UNIT-IV	OPTIMIZING FUEL COMBUSTION IN IC ENGINES: DESIGN AND PREPARATION CONSIDERATIONS	10 Hours								
Combustion of for fuel injector for combustion Competency Nu	fuels in IC engines. Preparation of fuels for efficient combustion, Fuel atomization,'s, high pressure pipes and jacketing arrangement, provision of fuel leak off alarms.chambers. Design aspect of modern injectors, Ignition delay, Injection delay etc.umbers <b>4.1.1, 4.3.1, 4.4</b>	Requirements Design aspect								
	MARINE DIESEL ENGINE FUEL SYSTEM									
UNIT-V		12 Hours								
Fuel pumps and type fuel pumps	metering devices, Jerk and common rail system, fuel injection system, helical groove a s, Pump timing of different marine diesel engines.	and spill valve								
Competency Nu	Imbers         4.1.1 ,									
	То	tal: 54 Hours								
Text Books:										
1. D.A. Tay 2. Publishi	lor, "Introduction to Marine Engineering", 2nd Edition, Butter worth – Heinemann, L Wood yard, Doug, "Pounder's Marine Diesel Engines", 7th Edition, Butter Worth Heir ng, London, 2001.	.ondon, 1999 1emann								



3. Leslie Jackson, Thomas D Morton, Paul A Russe I, "Motor Engineering Knowledge For Marine Engineers", 3rd Ed. Reeds Vol 12, Adlard Coles Nautical, London, 1994

#### **Reference Books:**

- 6. Marine Diesel Engines Vol I & Vol II. Notes by Prof K Venkatraraman
- 7. M.E.P., "Low Speed Diesel Engines New", Marine Engineering Practice, Vol-2 Part- 17,, IMarEST, London, 2004 2. S. H. Henshall, "Medium and High Speed Diesel Engines for Marine Use", 1st Edition, Institute of Marine Engineers, Mumbai, 1996.
- 8. D.K. Sanyal, "Principle & Practice of Marine Diesel Engines", 2nd Edition, Bhandarkar Publication, Mumbai, 1998.
- 9. Mathur, M.L., Sharma, R.P., "Internal Combustion Engines", 7th Ed. Dhanpat rai Publications, REPRINT 2002



Program			B.E. – Marine Engineering													
Course cod	e	(	Course	Name					L		T		Р		С	
241ME1A4	4PI	ľ	Marine	Work	shop ·	· III			0		0		4		2	
Year / Sem	ester	Ι	I Year	/ IV Se	mester						Con	act hour	s/Weel	K		
Prerequisit	e cour	se 🛛	Marine	works	hop-I &	&II						04 hi	ſS			
			Huma	anities	and	N	lanage	ment	F	rofessi	onal Co	re P	Professi	onal Fle	ective	
			Socia	l Scien	ces	-	Cours	ses	1	1010351	<u> </u>		1010331		.cuve	
Course cate	egory										✓					
			Basi	c Scien	ce	E	Enginee Scien	ering .ce		Open 1	Elective	;	Ма	ndatory	,	
			4	5	1					1	. ,	1. 1		(174)		
			1 Perceive the safety precautions and procedures involved in Workshop (K1)													
		-	2 Identify the various tools and equipment used (K2)													
Course obje	ectives		3	Expia Dovol	plain the basic manufacturing processes (K2)											
			4 Sections (K1)													
	5 Develop hands-on training given in arc welding sections (K1)															
			6	Deve	lop ha	nds-on	trainir	ng give	en in ga	as weldi	ing sec	tions (K	1)			
			CO1	Demo	onstrat	e plum	bing oj	peratio	ns, joi	nts and	tools us	sed (K2)				
			CO2	Demo	onstrat	e fitting	g opera	ations,	variou	s joints	and too	ols used	(K2)			
Course out	comes		$\frac{CO3}{CO4}$	Demo	onstrate	e mach	ining o	peratio	ons pe	rtormed	l in lath	e (K2)	11.1.1.		. (1/2)	
Gourse out	comes			Demo	nstrat	$e \operatorname{Arc} w$	elding	opera	tions a	nd perf	orm joi	nts in m	ltiple positions (K2)			
			05	Fypla	in one	e Gas w	of var	ious m	aching	nu per lo	s and o	n joints in multiple positions (K2)				
	_		CO6	mach	ines (K	(2)										
POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	
C01	3	2	2	2	-	2	2	2	3	3	-	2	-	-	-	
CO2	2	2	-	-	-	2	2	2	3	3	-	2	-	-	-	
CO3	3	2	2	2	-	2	2	2	3	3	-	2	-	-	-	
CO4	3	2	2	2 - 2 2 2 3 3 - 2								-				
C05	2	2	2	2 2 - 2 2 3 3 - 2							-					
C06	3	3	3	3	-	2	2	2	3	3	-	2	-	-	-	
Average	2.67	2.17	2.20	2.20		2.00	2.00	2.00	3.00	3.00		2.00				
Correlation	level		1.9	Slight (	Low)		2. M	oderat	e (Med	edium) 3. Substantial (High)						



LIST OF EXPERIMENTS	
I) Fitting:	12 Hrs
1) H - fitting	
2) Square fitting	
II ) Machining:	10 Hrs
1) Bearing Housing	
2) Bearing Plug	
III) Arc Welding	20 Hrs
1) Out side corner joint in flat position	
2) Straight line bead in horizontal position	
3) Butt joint in horizontal position	
IV) Gas Welding	20 Hrs
1) Square butt joint in vertical position	
2) TEE fillet joint in vertical position	
3) Butt joint brazing in flat position	
V) Use of hand tools, machine tools and measuring instruments	10 hrs
1)Safety measure for using hand tools, powered hand tools, measur	ring instruments
2)Safety measure for using machine tools (Center lathe,soldering,ar	c welding,gas welding,thermal cutting)
3) Properties and parameters considered in fabrication and repair of	of systems and components
Competency Numbers : 8.2, 8.5 ,8.6,9.8	
Text Books:	
1. Workshop Technology V [I], S.K. Hajra Chaudhary. Media promoters a	& publishers Pvt. Ltd.
2. Workshop Technology V [II], S.K. Hajra Chaudhary. Media promoters	& publishers Pvt. Ltd.
Reference Books:	
1. A Text Book of Workshop Technology, R.S. Khurmi& J.K. Gupta. S. Cha	nd& company Pvt. Ltd.
2. Workshop Technology, W.A.J. Chapman Vol I & Vol II, Published by Ro	outledge (1972).
3. Elements of Manufacturing processes, B.S. Nagendra Parashar& R.K.M.	littal. PHI Learning Pvt. Ltd.



Program							В	.E. – M	arine H	Enginee	ring				
Course cod	le	(	Course	Name						T		т	D		C
241ME1A4	4PJ	N	Marine	Engin	eering	Equip	ment	Drawin	lg - I	0		0	4		2
Year / Sem	ester	Ι	I Year /	/ IV Sen	nester					Canta		- /\AZ= -]-	0	4	
Prerequisi	te cour	se N	<b>Marine</b>	worksł	10p-I &	lI				Conta	ict nour	s/week	0	4	
			Huma	nities a	nd Soc	tial	Ма	nageme	ent	Drof	occiona	1 Coro	Drofog	cional I	
				Scienc	es		(	courses		FIOI	essiona	l Core	FIDIES	sionali	Siective
Course cat	egory										$\checkmark$				
			B	asic Sci	ence		Engine	ering S	cience	Op	oen Elec	ctive	Ν	landato	ry
			1	To de assen	evelop hbly of	profici stop, c	ency i heck, a	n 2D d nd safe	rawing ty valve	g techni es (K1)	ques ai	nd acqu	ire knov	wledge	on the
			2	To de assen	evelop ably of	profici valve a	ency in octuato	n 2D d rs for v	rawing arious	g techni industri	ques ai al appli	nd acqu cations	ire knov (K1)	wledge	on the
Course obi	ectives		3	To de	evelop ably of	profici autom	ency in atic val	n 2D d ves for	rawing indust	g techni rial auto	ques ai	nd acqu	ire know	wledge	on the
			4 To develop proficiency in 2D drawing techniques and acquire knowledge on the												
			4	assen	ıbly of	startin	ig air va	lves us	ed in n	, narine d	iesel en	igines. (I	K2)	0	
				To de	evelop	profici	ency i	n 2D d	rawing	g techni	ques ai	nd acqu	ire knov	wledge	on the
			5	assen	ıbly of	burne	r carrie	ers and	related	l compo	nents u	ised in i	ndustria	al furnae	ces and
			boilers (K2)												
			C01	Devel check	op skil and sa	lls to di afety va	raw 2D alves (K	drawi (2)	ngs and	l acquir	e know	ledge or	n the ass	sembly	of stop,
			CO2	Develop skills to draw 2D drawings and acquire knowledge on the assembly of valve actuators (K2)											
			CO3	Devel	op ski	lls to	draw 2	D drav	wings a	and acq	juire kr	nowledg	e on th	e asser	nbly of
Course out	comes			auton	natic va	aive (K.	<u>2)</u>	duarrin	ac and			dae en ti		abbraf	touting
			CO4	Devel	opskii Ivo (K	15 to ar 2)	aw 2D	lrawin	gs and a	acquire	Knowie	age on u	ne assen	ibly of S	starting
				Devel	on skil	<u>2)</u> Is to dr	aw 2D	drawin	os and	acquire	knowle	dge on t	he asse	mbly of	Rurner
			C05	carrie	er (K2)	15 to ui	uw 20	arawin	55 ana	acquire	RHOWIC	uge on t			Durner
			000	Devel	op skil	ls to dr	aw 2D	drawin	gs and	acquire	knowle	dge on t	he asser	nbly of	various
			C06	comp	onents	of a bo	oiler. (K	(2)	0	1		0		5	
POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2	PSO3
C01	3	3	3	2	-	1	-	3	-	3	-	-	3	2	-
CO2	3	3	3	2	-	1	-	3	-	3	-	-	3	2	-
CO3	3	3	3	2	-	1	-	3	-	3	-	-	3	2	-
C04	3	3	3	2	-	1	-	3	-	3	-	-	3	2	-
C05	3	3	3	2	-	1	2	3	-	3	-	-	3	2	-
06	3	3	3	2	-	1	2	3	1	3	-	-	3	2	-
Average	3.00	3.00	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										<u>  -</u>		
Correlation level 1.Slight (Low) 2. Moderate (Medium) 3. Substan							ibstanti	ai (High	J						



UNIT-I	ORTHOGRAPHIC PROJECTION	10 Hours										
Introduction to machine drawing with orthographic diagram. Concepts of projections, orthographic projections in first and third angle quadrants. Exercises in orthographic projections, Sectioning and sectioning components.												
Competency Number	rs 9.6											
UNIT-II	ASSEMBLY ON SIMPLE MACHINERY COMPONENTS	10 Hours										
Assembly drawing or orthographic project	Assembly drawing on hexagonal bolt, Screw threads and nut fasteners. Assembly drawing on screw jacks with orthographic projection. Assembly drawing on stuffing box.											
Competency Number	rs 9.6											
UNIT-III	ASSEMBLY OF DIFFERENT MACHINERY JOINTS	12 Hours										
Assembly drawing on simple orthographic projection. Assembly drawing on cotter joint with orthographic projection. Assembly drawing on knuckle joint with orthographic projection.												
Competency Number	Competency Numbers 9.6											
UNIT-IV	ASSEMBLY DRAWING ON VALVES AND PLUG	10 Hours										
Assembly drawing or	n return valve. Assembly drawing on Non return valve. Assembly drawing on cock ar	nd plugs.										
Competency Number	rs 9.6											
UNIT-V	ASSEMBLY ON CYLINDER RELIEF AND MARINE ENGINE CONNECTING ROD	12 Hours										
Assembly drawing or connection rod.	n cylinder relief valve. Assembly drawing on control valve. Assembly drawing on ma	rine engine										
Competency Number	rs 9.6											
Total: 54 Hours												
Text Books:												
1. Engineering	Drawing for Marine Engineers Volume 11 by Reed's marine engineering series.											
<b>Reference Books:</b>												
1. Machine Drav 2. Mac Gibbon's company, 199	wing by N.D. Bhatt, V.M. Panchal. Charotar publication, ISBN-10 9380358636. Pictorial Drawing Book for Marine Engineers by James G. Holburn & John, James M 59.	onroe &										



Program	m			B.E. – Marine Engineering													
Course Co	ode	Cou	rse Nan	ne							L	Т		Р			С
241ME1A4	13PF	Mar	ine Ma	terial	s Labo	oratory	,				0	0		2			1
Year / Semeste	er	II Ye	ar / IV	Seme	ster							Сот	ntact	hours,	/Week:	2 Hr	5
		B Sci	asic ence		Engi	neering	g Scier	nce		E	Open Clective	è			Ма	andat	ory
						$\checkmark$											
Pre-requi	site		9	Streng	gth of M	laterial	S										
		1	To im subjec	Γο impart knowledge and skill relevant to the mechanical properties of materials subjected to different types of loading. (K2)													
Course		2	To det equip	termiı ment.	ne expe (K2)	eriment	al dat	a in	clud	e univ	versal t	estin	g ma	chines	and tor	sion	
objectiv	es	3	To det impac	termii t teste	ne expe er, haro	eriment dness te	al dat ester.	a fo (K2	or spi )	ring te	esting 1	nachi	ine, c	ompre	ssion te	sting	machine,
		4	To det	To determine stress analysis and design of beams subjected to bending and shearing loads										ring loads			
			using	using several methods. (K2)													
		5	To det	10 determine Flexural strength of a Deam. $(KZ)$													
		1	Арріу	ше к	nowiet	ige of te	esting	ste	erro	u subj	jected	to ten	ISIOII		1 51011. (1	N9)	
		CO	Explai	n the	hardn	ess of d	iffere	nt n	netal	s. (K2	)						
		2	D		.1		11	1	1	1		1	<u> </u>	1 1	(110)	<u> </u>	
		3	Demo	nstrai	e the p	oractica	I KNOV	vied	ige a	bout	the def	lectio	on of t	the bea	im. (K2	)	
Course	)	CO	Demo	nstrat	e the k	nowled	lge ab	out	the	testin	g of he	lical s	pring	g and c	arriage	sprir	ng. (K2)
outcome	es	4					0				-			-	0	-	
		CO	Acqui	re the	knowl	edge al	oout d	lout	ole sh	iear te	est on 1	metal	and	impact	test on	meta	al. (K2)
		5	Apply	tha l	moulo	dao of	vario	uc n	nato	rial m	roporti	os to	cting	for so	loction	of m	atoriale in
		6	marin	e com	ponen	uge 01 ts. (K3)	vario	us 1.	llater		operu	es les	sung	101 50	lection	01 111	
POs/COs	PC	01	PO2	P03	P04	PO5	P06	P0 7	P08	P09	P010	P01 1	PO1 2	PS01	PSC	)2	PSO3
C01	3	3	3 2 2 - 3 2 3 3 2 -														
CO2	(* ) (* )	3	3	2	-	-	2	-	3	2	3	-	-	3	2		-
CO3		3	3	3	-	-	2	-	3	2	3	-	-	3	2		-
CO4	3	3	3	-	-	-	2	-	3	2	3	-	-	2	2		-
C05	3	3	3	3	-	-	2	-	3	2	3	-	-	2	2		-
C06		3	3	3	-	-	2	-	3	2	3	-	-	3	2		-
Average		3	3														



### LIST OF EXPERIMENTS

Total hrs=36

1. Test on Ductile Materials: Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.

- 2. Hardness Test: Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminum.
- 3. Beam Deflection Test: Deflection test on Mild steel and Aluminum– relation between load and deflection.
- 4. Impact test: Finding the resistance of materials to impact loads by Izod test and Charpy test.
- 5. Tests on springs of circular section: Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open / Closed coil spring)
- 6. Shear test: Single or double shear test on M.S. bar to finding the resistance of material to shear load.
- 7. Compression Test: Finding Compressive strength of a concrete block.
- 8. Fatigue Test: Finding Number of cycles to failure of a given specimen.

8

9. N.D.T Test: To finding surface crack, internal cracks, blow holes of a given given specimen

Competency Numbers

#### **Reference Books:**

1. Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.

2. IS 432(Part I) – 1992 – Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement

3. Rajput.R.K. Strength of Materials, S.Chand & Company Ltd., New Delhi 2014.



Program	B.E. – I	B.E. – Marine Engineering										
Course code	Course	e Name		L	Т	Р	С					
241ME1A53TH	Marine	e Electrical Tec	hnology	3	0	0	2					
Year / Semester	III yea	r / V semester		Contact	hours/	Week	- 3					
	Humai Social	nities and Sciences	Management courses	Professi	onal Co	re	Professional Elective					
Course category												
course category	Basic S	Science	Engineering Science	Open El	ective		Mandatory					
	1Identify and explain alternative sources of power and battery and their specifications for maritime applications. (K2)											
	2	Analyze the purpose and importance of marine protection and switchgear on ships. (K3)										
Course objectives	3	Demonstrate the different types of cables and lighting systems on board ship. (K3)										
	4	Evaluate stee	Evaluate steering systems and deck machineries. (K3)									
	5	Discuss the m	Discuss the maintenance requirements for auxiliary machinery and electrical safety. (K2)									
	6	Identify safe	electrical practices and eq	uipment fo	or hazar	dous	areas on ships. (K2)					
	C01	Demonstrate maritime app	knowledge of alternative blications. (K2)	sources of	power	and th	eir selection criteria for					
	CO2	Investigate th	ie importance of marine p	rotection a	nd swit	chgea	r. (K4)					
Course outcomes	CO3 Distinguish types of cables and lighting systems on board ship. (K3)											
course outcomes	CO4 Explain about steering systems and deck machineries (K3)											
	C05	Implement m	aintenance procedures fo	r auxiliary	machin	iery ai	nd electrical safety (K2)					
	CO6 Apply safe electrical practices and select suitable equipment for hazardous areas on ships											

POs /CO s	P01	PO2	РОЗ	PO4	РО5	PO6	P07	P08	P09	PO1 0	P01 1	P012	PSO1	PSO2	PSO3
C01	3	3	2	2	2	3	3	3	3	2	1	1	3	1	1
C02	3	3	2	2	2	3	3	3	3	2	1	1	3	1	1
C03	3	3	2	2	2	3	3	3	3	2	1	1	3	1	1
CO4	3	3	2	2	2	3	3	3	3	2	1	1	3	1	1
C05	3	3	2	2	2	3	3	3	3	2	1	1	3	1	1
C06	3	3	2	2	2	3	3	3	3	2	1	1	3	1	1
Average	3	3	2	2	2	3	3	3	3	2	1	1	3	1	1
Correlation level 1.Slight (Low)					2. Mo	derate (	Mediur	n)		•	3. Substa	ntial (Hig	h)		



UNIT-I	ALTERNATE AND EMERGENCY POWER SUPPLY	11 Hours											
Alternative Source Frequency, precaut merits and demerit Purpose of emerge start. Emergency b Location of emerge for hazardous area	Frequency, precautions while taking shore supply – Selection of AC and DC generators for use on ships – merits and demerits – location and Installation of generator sets. Purpose of emergency power supply. Emergency Generator & Different Starting methods including auto start. Emergency batteries construction and its different types (Lead acid and alkaline battery) & duties. Location of emergency power. Maintenance required on all the above equipment. Safe electrical equipment for hazardous areas. Competency 7, 7.5												
Competency Numbers	7, 7.5												
UNIT-II	MARINE PROTECTION AND SWITCHGEAR	11 Hours											
Maintenance of ele & distribution syst electrical circuits - finding and repair Safe Electrical prac equipment, microp shock and related h	ctrical systems, fault finding & repair: Type of faults & indication ems - different testing equipment & meters - Salvaging a motor - Indications & corrective arrangements - Necessary precaution - preventive maintenance, periodic surveys, spares requirement. ctice: Safe watch – keeping, points to check on electrical maching processor control and maintenance – electrical fire fighting, preca	ns on Generator, motor : Detection of faults on ns and care while fault ineries, switch gears & autions against electric											
Competency Numbers	6.3, 7, 7.5												
UNIT-III	CABLES AND LIGHTING SYSTEMS ON BOARD SHIP	11 Hours											
Electrical Cables: C tips. Cable insulat Temperature Rise - Lighting Systems: I signal lights – Signa lighting of Deck and	ables- conductors – Wire Sizes-Current Rating – Testing of Cable tion and Sheath– Cable gland – Degrees of Protection – T - Determination of Hot temperature. Types of Insulating Materia Introduction – Ship's lighting – Effect of voltage on lamp perfor als for a power driven ship under way (At night) – Emergency lig d pump house of oil tankers.	es-Codes and Practical emperature Ratings – als. rmance – Navigation & hting – Requirement of											
Competency Numbers	7, 7.5												
UNIT-IV	STEERING SYSTEMS AND DECK MACHINARIES	11 Hours											
Steering Systems & Steering –Typical s Machinery & Cargo – General cargo shi	& Gyrocompasses: Fundamentals – Auto Navy steering Syster ystem configuration- Components – Types. Gyroscopes – Compas Equipment: Electrically driven Anchor Windlass – Electrically d p deck machinery electric drives -Magnetic disc brakes.	ns – Electro hydraulic ss Considerations. Deck riven mooring winches											
Competency Numbers	7, 7.5												
UNIT-V	AUXILLARIES AND MAINTENANCE	10 Hours											
Electrical systems tankers -Tanker cl Miscellaneous Man watertight doors, l radio operation, m – Heat detectors – all the above equip – Electric shock – fi Competency	Electrical systems for operation in flammable areas- Special electrical practice for oil, gas and chemical tankers -Tanker classification - Hazardous zones - Temperature class - maintenance of apparatus. Miscellaneous Marine electrical equipment Alarm System: Alarm system (types, supply) on board watertight doors, bow-doors, oxygen analyzer, High & low level alarms, navigational lights, emergency radio operation, main engine telegraph, steering gears, Electrical Deck Cranes. Fire alarms and Detection - Heat detectors - Smoke detectors - Combustion detectors - Bilge oil separators. Maintenance routine of all the above equipment, including circuit breakers - active and passive safety measures - Do's and Don'ts - Electric shock - first aid - conditions of shock risk.												
Numbers	´ Total hours: 54												



#### Text Books:

1. Elstan.A. Fernandez., "Marine Electrical Technology", 4th Edition, "Shroff Publishers & Distributors Pvt. Ltd.,Mumbai, 2007.

2. BOWIC C.T., Marine Electrical Practice, 5th Edition, "Butter Worth", London, 1981.

2. LAW S.W., "Electricity applied to Marine Engineering", 4th Edition, "The Institute of Marine Engineers", London, 1998.

Reference Books:

1. Practical Marine Electrical Knowledge by Dennis .T. Hall.

2. Marine Electro Technology and Electronics by Gokhale & Nanda.



Program	1		B.E. – Marine Engineering													
Course c	ode		Course	Name						L		Т	Р		С	
Z41MEL	A54TK		Marine	Auxili	ary M	achine	ry-l			3		0	0		3	
Year / Se	emeste	r	III Year	/ V Se	mester					Conta	ct Hours	s / Weel	x 3 hr	S		
			Humar	nities a	nd Soc	ial	Man	ageme	nt	Drofo	ccional	Coro	Pr	ofessio	nal	
				Scienc	es		СС	ourses		FIOIe	SSIUIIAI	Core		Elective	é	
Course c	ategory	y _									✓					
	0,	,	Ba	sic Scie	ence		Eng	ineerir	ıg	Op	en Elect	tive	Mandatory			
							3	lience								
			Explain the piping arrangements of various systems in											gine r	oom,	
			Including steam, fuel oil, lubricating oil, cooling water, and air system													
			2 Explain the Valves, Cocks and fittings used in pipeline construction. (K											2)		
Course o	hiactiv		3	Discu	iss the	constr	uction	and op	eratio	n of air (	compres	ssor. (K	3)			
Courseo	bjecuv		Discuss the construction and operation of purifier and clarifier. (K2)													
			4	4												
			5 Evaluate the efficiency of Heat exchanger and implement methods to improve													
			their performance. (K3)													
			6 Analyze the fault findings of operational problems associated with purifiers, air compressor and Heat exchanger (K2)												s, air	
				Dem	onstra	te kno	wledg	e of pi	iping a	irrangei	nents f	or vari	ous svs	tems i	1 the	
			C01	engi	ne roo	m. (K2)		F	FO	- 0-			<b>j</b> -			
			CO2	Iden	Identify appropriate materials and standards in construction of valves, cocks and											
				fittir	igs. (Ka	2) aintain	Ain ag				ficient (	(1/2)				
_			CO3	Plan	anu m	amtam	All CO	mpress	or ens	uringer	ncient. (	נאט				
Course o	utcome	es –	CO4	Plan	and r	naintai	n Puri	fier and	d Clarif	fier ensu	uring ef	ficient p	perform	ance. (	K3)	
			C04												_	
			C05	Iden	tify m	aintena	nce w	orks, fa	ault fin	iding, ai	nd cond	litional	assessm	ent of	heat	
				EXC	tify th	$\frac{1}{10}$ (K3)	lome a	ad thai	r colut	ione ace	aciatad	with n	urifior a	ir com	roccor	
			C06	and	heat ex	xchang	er. (K3	)	i solut	10115 855	ociateu	with pt	ii iiiei, a	ii com	162201	
POs/	P01	P02	P03	P04	P05	P06	P07	POS	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	
COs	101	102	105	104	105	100	107	100	107	1010	1011	1012	1501	1302	1303	
C01	3	3	2	-	-	-	2	3	-	-	-	2	3	1	-	
CO2	2	2	-	<u>-</u> 2 <u>3</u> - <u>-</u> 2 <u>3</u> <u>1</u> -												
CO3	3	3	2	-	-	-	2	3	-	-	-	3	3	2	-	
C04	2	2	-	-	-	-	2	3	-	-	-	2	3	1	-	
C05	3	3	2	-	-	-	2	3	-	-	-	3	3	3	-	
CO6	3	2	2	2	-	1	2	3	1	1	-	3	3	3	-	
Average	2.67	2.50	2.00	2.00	Louis	 	2.00	3.00	1.00	1.00		2.50	3.00	1.83		
Correla	ation le	evel	1.3	siight (	LOWJ		Z. M	oderat	e (Med	numj		3. SU	ostantia	ii (High	J	



UNIT-I	ENGINE ROOM VARIOUS PIPING ARRANGEMENTS	12 Hours
Piping arrangement of st in the system. Pipeline m Layout of machines in en	team, fuel oil, lubricating oil cooling water, starting and service air s aterials and pipeline standards. Domestic fresh water and sea water h gine room. Location of stores and workshop, water tight doors, eme	ystems, with fittings nydrophore systems. rgency escapes.
Competency Numbers	5.1, 5.4	
UNIT-II	VALVES, COCKS & FILTERS	12 Hours
Understand construction Non return valves, Quic operation for shutting de Filters, auto clean filters	n and basic maintenance of valves and cocks .Globe valves, gate valves k closing valves and pressure reducing valves, Solenoid control s own low sea and high sea suction valves. Construction & operation and	ves, Butterfly valves, pool valves, Remote of Simplex & Duplex
<b>Competency Numbers</b>	5.4`	
UNIT-III	AIR COMPRESSORS	10 Hours
Design consideration, co air compressors, use of i air, requirements of cont reducing valve.	nstruction & operation of multistage reciprocating air compressors, nter coolers and aftercoolers, emergency air compressor on ships, us rol air. Mountings of main and emergency air reservoirs, dehumidifi	rotary and screw ses of compressed ers, filters, pressure
Competency Numbers	4.1.6	
UNIT-IV	PURIFIER AND CLARIFIER	10 Hours
Principle of separation in selection of gravity disc, B problems and their remed	gravity and centrifuge, purifier and clarifier operation, Factors affect asic components of purifier and clarifier, Working of purifier and cla lies.	ting purification, rifier, Operation
Competency Numbers	4.1.6	
UNIT-V	HEAT EXCHANGERS	10 Hours
Construction & operation construction. Expansion a finding and conditional as	n of Tubular Heat Exchangers, Plate type heat exchangers. Mate arrangement provided and their purpose. Maintenance works to b	erials used in their be carried out. Fault
initianing and contaitional as	sessment of heat exchangers.	
Competency Numbers	<ul><li>sessment of heat exchangers.</li><li>4.1.6</li></ul>	
Competency Numbers	sessment of heat exchangers. 4.1.6	Total: 54 Hours
Competency Numbers	<ul><li>4.1.6</li></ul>	Total: 54 Hours
Text Books: 1. Marine auxiliary mac 0750643986	4.1.6 chinery - H.D GEORGE, 7th edition, Butterworth-Heinemann Ltd, ISBI	<b>Total: 54 Hours</b> N-10



Program							B.E.	. – Mar	ine Ei	ngineer	ring						
Course co	de	Cou	irse Na	ime	<b>a</b> 1				L		Т		Р	С			
241ME1A	454 TL	Mai Eng	rine In gines -	Iternal	Comb	ustion			2		1		0	3			
Year / Se	mester		/ear /	V Seme	ster				Co	ntact ho	ours/We	ek	I	3 hrs			
		Hu So	maniti cial Sc	es and iences	М	anagen	nent co	ourses	]	Profess	ional Co	re	Professional Elective				
Course category											✓						
Pre requi	site																
			1	To exp includii and info	lain sa ng ormati	afe pra mair ve mar	actices atenano aner. (I	in ma ce, trou (2)	rine ( Iblesh	engine s ooting,	staring a and eme	nd reve ergency	rsing op procedı	peration, ares, in a	clear		
Course			2	To exp Trouble	lain sa eshooti	afe pra ing, an	ictices d emer	in ma gency	rine e proce	engine dures, i	operatic n a clear	n, inclu and info	uding m ormativ	aintena e manne	nce, er. (K2)		
objectives			To Assess marine engine performance, lubrication, components, maintenance, and impact succinctly (K2)												nce,		
			4	To explain marine diesel engine crankcase and governor procedures succinctly (K2)											y (K2)		
			5 '	To explain basic construction and operation of smart engines (K2)													
		CC	D1 I	Explain	safe p	ractice	s in ma	arine e	ngine	starting	and rev	ersing	operatio	n (K3)			
		CO	D2 I	Explain	safe p	ractice	s in ma	arine e	ngine	operati	on (K2)						
Course		CO	)3 /	Analyze	marii	ne engi	ne per	formar	ice and	l lubric	ation sys	stem. (K	3)		1		
outcomes		CO	)4	Explain case an	the in d gove	spectio ernor. (	n and K2)	mainte	enance	procec	lure for	marine	alesel e	ngine cr	ank		
		CO	D5 (	Analyze	e the o	constru	iction	and op	peratio	on of sn	nart engi	nes(K3	)				
		CO	06	Summa	rize th	ne deve	lopme	nts in t	he des	ign of s	martmai	ine eng	ine. (K2	)			
POs/ COs	P01	P02	PO3	P04	PO5	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3		
C01	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2		
C02	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2		
CO3	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2		
C04	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2		
C05	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2		
C06	3	3	3	-	-	-	-	2	2	-	-	-	- 3 2 2				
Average	3.00	3.00	3.00					2.00	2.00				3.00	2.00	2.00		
Correlation	n level		1	.Slight (	(Low)		2.1	Modera	ate (M	edium)		3. S	ubstanti	al (High	l)		



UNIT-I	MARINE DIE	ESEL ENGINE MANEUVERING SYSTEM	10 Hours
.Starting and reve	ersing system	of different marine diesel engines with safety provisions.	
Competency Nun	nbers	4.1.1	
UNIT-II	AUXILIARY CLUTCHES A	DIESEL ENGINES, MEDIUM SPEED ENGINE, GEARING SYSTEMS, AND EXHAUST VALVE	12 Hours
Auxiliary diesel E gears used in con	Engines, mediu junction with	um Speed engine, Gearing systems and Clutches: Types, couplings, an medium speed engines. Development in exhaust valve design, V- type	d reduction engine details
Competency Nun	nbers	4.1.1	
UNIT-III	PERFORMA CARDS & LU	NCE CHARACTERISTICS OF DIESEL ENGINE AND INDICATOR JBRICATING SYSTEM	10 Hours
Performance Cha indicator instrum fault detection, s performance cha engines including wear and preven	nracteristics of nents, Indicato imple draw ca nracteristics cu g Cooling Syst tive measures	f diesel Engine and indicator Cards & Lubricating System Construction or diagrams and power calculations. significance of power diagram ca and , light spring cards and out of phase diagram, power balancing, L arve, test bed and sea trails of diesel engines. Lubrication arranger em, Merits and demerits of different cooling mediums, cylinder lub s.	onal details of lculations and oad diagrams, nent in diesel rication, liner
Competency Nun	nbers	4.1.1	
UNIT-IV	GOVERNOR	S AND CRANKCASE INSPECTION	12 Hours
Governors and th Governors with crankshaft deflee	heir Operatior constant spee ction and aligr	n with PID Controller, Over speed arrangement and over speed safe ed arrangement. Marine diesel engine Crank Case Inspection, dep nment.	ety. Electronic th gauge and
Competency Nun	nbers	4.1.1	
UNIT-V	Basic Const	ruction and Operation of Smart Engines	10 Hours
Difference betwe Loop, Hydraulic Valve, ME Tacho-	een convention cylinder unit, l system	n and smart engines. Introduction to engine control system, Engine Fuel Oil Pressure Booster, Fuel Oil Injection working principle, Exha	Hydraulic Oil ust valve, Fiva
Competency Nun	nbers	4.1.1	
		То	tal: 54 Hours
<b>Text Books:</b> 1. D.K. Sa	anyal, "Princip	le & Practice of Marine Diesel Engines", 2nd Edition, Bhandarkar Pub Mumbai, 1998.	lication,
<b>Reference Book</b>	s:		
2. Interna Internatio	ational Safety onal Ltd. ISBN	<ol> <li>FSS Code, 2015 Edition, IMO Publication.</li> <li>Guide for Oil Tanker and Terminals (ISGOTT), 6<sup>th</sup> edition, Witherby -10 1856099180</li> </ol>	Seamanship



Program			B.E. – Marine Engineering														
Course coo	le		Course	Name						L	r	Г	Р		С		
241ME1A5	54TM		Ship F	ire Pre	eventi	on & C	ontrol			2	-	1	0		3		
Year / Sen	nester		III Yea	r / V Se	emeste	r			(	Contact	Hours /	Week		3 hrs			
			Hum Socia	anities al Scien	and ces	1	Manage cour	ement rses		Profess	ional Co	re	Professi	onal Ele	ective		
Course cat	egory										√						
		1	To ex for p Crew	o explain the potential fire hazards on board ships and the necessary me or preventing and combating fire to ensure the safety of the vessel, carg Crew (K2)										ures and			
		2	To ex use t Carge	'o explain the various fire protection systems installed on ships and their prope use to prevent and combat fire and ensure the safety of the vessel, crew, and Cargo (K2)										oper and			
Course obj	jective	S	3	To su ships shipt	umma s and board o	rize the their ro environ	e differ ole in ment	rent tyj prever (K2)	pes of nting a	fire det nd resp	ection a oonding	nd safe to fire	ety syste s to ma	ems usee intain a	d on safe		
			4	To ic type	To identify the various types of fire-fighting equipment and match them to the type of fire that may occur onboard ships (K2)												
			5	To ex ensu preve	To explain the fire control procedures that should be followed onboard vessels to ensure prompt response, effective containment, and extinguishing of fires to prevent loss of life and damage(K2)												
			C01	Expla	ain fire	e hazar	d on b	oard sh	ips (K	2)							
			CO2	Expla	Explain the Fire Protection built in the Ships (K2)												
Course out	tcomes	s	CO3	Summarize the fire detection and Safety Systems (K2)													
			CO4	Ident	tify the	e Fire F	ighting	g Equip	oment	based o	n the ty	pe of fir	e onboa	rd (K1)			
			CO5	Expla	ain the	e fire co	ntrol p	proced	ures o	n board	vessel (	K2)					
			C06	Expla	ain the	SOLAS	conve	ntion	for the	safety o	of life at	sea (K2	2)				
POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3		
C01	2	1	-	-	-	2	2	3	-	-	-	3	2	-	-		
C02	2	2	1	-	-	3	2	3	-	-	-	3	2	-	-		
C03	2	2	-	-	-	3	2	3	-	-	-	3	2	-	-		
C04	3	2	2	1	-	3	2	3	-	-	-	3	3	2	-		
C05	2	2	1	-	-	3	2	3	-	-	-	3	2	2	-		
C06	-	-	-	-	-	3	2	3	-	-	-	-	2	-	-		
Average	2.20	1.80	1.33	1.00		2.83	2.00	3.00				3.00	2.17	2.00			
Correlation	level	1	1.Sligł	nt (Lov	v)	2. N	lodera	ite (Me	dium)	um) 3. Substantial (High)							



UNIT-I	FIRE HAZA	RD ON BOARD SHIPS	10 Hours
Fire triangle, spo including vapori fire-fighting app	ontaneous co zing fluids an liances. IMO	mbustion, limits of inflammability, advantages of various fire exting d their suitability for ships use. Control of class A, B and C fires. Fire p approved model course. Explain classes and chemistry of Fire	uishing agents prevention and
			0.11
UNIT-II	FIREPROT	ECTION BUILT IN THE SHIPS	9 Hours
Requirements in escape means, el for firefighting s	respects of n ectrical insta ystems and e	naterials of construction and design of ships, fire detection and extin llations, ventilation system and venting system for tankers, statutory quipment on different Vessels.	ction systems, requirements
Competency Nur	nbers	12.1.1	
UNIT-III	DETECTION	N AND SAFETY SYSTEMS	14 Hours
Fire safety, preca alarm systems a Fire safety action paint locker fire Competency Nur	aution on car nd their opera n required for Inert gas sys nbers	go ships and tankers during working. Types of detectors, selection of ational limits. Commissioning and periodic testing of sensors and det Crank case explosion, and scavenge fire, boiler back fire, main engin tem construction and operation including deck seal (IGG & N2) <b>12.1.2</b>	detectors and rection system. e exhaust fire,
	EIDEEICHT	TINC FOUDMENTS	11 Hours
UNIT-IV	FIKEFIGHI	ING EQUIPMENTS	11 Hours
Knowledge of Fi connections, con installations for Foam system, D recharging of ap and SOLAS requi	re-fighting sy struction, ope ships. Proper ry powder s pliances. Prep rements, Use	stems, Fire pumps, hydrants and hoses, couplings, nozzles and intereration and merits of different types of portable and non-–portable fire ties of chemicals used. Fixed Fire Fighting System Co2 systems and ine ystem, Halon system Fireman's outfit its use and care. Maintenan paration for safety equipment and other surveys. High pressure locality es of foam monitor, foam applicator.	national shore e extinguishing ert gas systems ce testing and zed water mist
Competency Nur	nbers	12.1.3	
UNIT-V	FIRE CONT	ROL	10 Hours
Action required involving Oil sys dock. Procedure organization on s pollution preven <b>Various Check I</b> Cold wok permit isolation certifica Assessment	and practical tems, machir for re-entry a ships. Fire sign tion, oxygen, List / Work P c, hot work pe ate, lifting ge	I techniques adopted for extinguishing fires in accommodation, inc nery spaces, boiler rooms, and cargo holds, galley etc. Fire fighting is after putting off fire, Rescue operations from affected compartments nal and muster. Fire drill. Leadership and duties. Bunkering operation, acetylene cylinder safety, welding safety. <b>Permits</b> ermit, enclosed space entry permit, working loft, bunkering check list ar check list, poor visibility check list, arrival / departure check list	luding fires n port and dry . First aid, Fire safety and fire, c, electrical st, Risk
Compoton av Nur	u h o vo	10.1.4	
competency Nur	nuers	12.1.4 Te	otal: 54 Hours
Text Books:			
1. SOLAS 20	09, IMO Publ	ication.	
<b>Reference Book</b>	(S:		



- 1. FSS Code, 2015 Edition, IMO Publication.
- 2. International Safety Guide for Oil Tanker and Terminals (ISGOTT), 6th edition, Witherby Seamanship International Ltd. ISBN-10 1856099180
- 3. Marine Auxiliary Machinery by H D Mc. George. 7th ed, Butterworth Heinemann Ltd.
- 4. Frank Rush Brook, "Fire Aboard", 3rd Edition, Brown, son & Ferguson Ltd., Glassgow 1988.
- 5. Victory.G, Owen.I.H, "Fire Fighting Equipment And Its Use In Ships", Marine Engineering Practice, Vol 1, Part 05, IMarEST, London, Reprint 1998
- 6. Marine Engineering. D A Taylor, Revised Second edition, Butterworth Heinemann Ltd.



Program			B.E. – Marine Engineering													
Course cod	e		Course l	Name						L	r	Г	Р		С	
241ME1A	55TA		Marine	Steam	Engine	ering a	and Tu	rbines		3	(	)	0		3	
Year / Sem	lester		III Year	/ V Sem	1				C	ontact h	ours/We	eek		3 Hrs.		
			Huma	nities a	nd		Manage	ement	I	Professio	onal Core	e	Professio	onal Elec	ctive	
			Socia	l Scienc	es		cour	ses								
Course cate	egory												√			
			Basi	c Scienc	e		Enginee Scien	ring ce		Open 1	Elective		Mandatory			
			1         To Explain Various steam systems on board ships, waste heat recovery systems (K2)													
			2	2 To outline thermal oil, condensate and feed systems, operation of thermal oil heater, automation and controls. (K2)												
3 To understand construction and										rinciples	of mari	ne stean	n turbine	e. (K1)		
Course obi	octivos	-	4	To un	derstan	ıd oper	ative m	echani	sm and	safety o	f marine	steam t	urbines.	(K3)		
course obj	cenves	_	5	To discuss the operation of Gas turbines for marine applications. (K2)												
			On com	apletion of the course the student will be able to												
			C01	Summ	narize tl	ne Stea	m syste	ems and	l steam	utilizati	on princ	iples. (K	(2)			
		-	CO2	Expla	in the	therma	l oil sys	stems, s	afety aı	nd envir	onmenta	al aspect	s of ther	mal oil u	ıse. (K2)	
Course out	comes		CO3	Analy	ze the r	nateria	l select	ion for	design	of steam	turbine	s. (K3)				
			CO4	Discu	ss turb	ine sy	stems,	operat	ion of n	nain pro	pulsion	turbine.	(K2)			
		F	C05	Expla	in the w	vorking	and ope	eration	of Gas tu	ırbines. (	K2)					
		_	C06	Demo Starti	nstrate ng syste	the op em, Mo	erative unting a	mecha and cor	nism: G trol sys	earing s stem. (K	ystem & 2)	Lubrica	ting syst	em, Fue	l system,	
POs/COs	P01	PO2	PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02 PS03												PSO3	
CO1	2	2	-	-	-	-	-	-	-	-	-	-	3	-	-	
	2	_	-	-		-	-	-		-	-	-	3	-	_	
02	2	2				2	2									
CO3	2	2	-	2 3 3												



CO4	3	3	1	1	-	2	3	3	-	-	-	-	3	-	-
C05	2	2	-	-	-	2	-	-	-	-	-	-	3	-	-
C06	3	3	2	2	-	2	3	3	-	-	-	3	3	3	-
Average	2.33	2.40	1.50	1.50		2.00	3.00	3.00				3.00	3.00	3.00	
Correlatio	n level		1.S	light (L	ow)		2. Mo	oderate	(Mediu	ım)		3. Su	bstantial	(High)	
UNIT	-I	Marin	e Stea	m syste	ems and	steam	n utiliza	ation						1	4 Hours
Thermodyn material for	amics of pipeline	f steam, e, waste	steam heat re	cycle a covery	and loss in steam	ses, var 1 plants	<sup>.</sup> ious st s, const	eam se ruction	ervices and mo	and pip ountings	eline di on supe	stributio er-heate	on of ser d boilers	vices. Se	election of
Competenc	y Numbe	rs		4.3.2,	4.1.6										
UNIT	II	Therr	nal oil,	Conde	nsate a	nd Fee	d Syste	ems							8 Hours
Introductio oil systems Condensate water syste Competence	n to ther , Operati and Dra <u>ms and d</u> y Numbe	mal oil s ion of t ins Syst leaerato rs	systems hermal tem, La or	, Therm oil hea yout of 4.1.4	nal oil pr ater, aut conden	roperti tomatio sate re	es, requ on and turn lin	iiremen contro nes, Dra	nts, sele ls, Safe ain line	ction, Co ty and s to stea	ontrols a environi im traps	and pipel mental <i>a</i> s, Distille	ine com aspects o ed Water	ponents of therm Transfe	of thermal al oil use. r and feed
UNIT-III     Basic Construction and design principles of marine steam turbine     12 Hours															
Layout of a Blades/root selection ar compoundi Competence	Layout of a main propulsion turbine, construction and PV diagram of impulse turbine and reaction turbine, Construction of Blades/roots, gland sealing arrangement, blade tip clearance of reaction turbine, Operation of main propulsion turbine, Material selection and design features of steam turbines: Nozzles and nozzle boxes, Turbines impulse and reaction, Pressure and velocity compounding, Material of blades.													ruction of e, Material id velocity	
-															
UNIT-	IV	Basic	operat	ion and	d maint	enanc	e of ma	arine s	team ti	ırbines				1	l0 Hours
Warming u reduction g	p and oj ear. Alar	peratior m & Tri	n of ma ps, Shu	in turb tdown p	oine. Em procedu	iergeno res, Cri	cy oper itical sp	ation c eed.	of main	turbine	. Lubric	ation sy	stem of	main tu	rbine and
Competenc	y Numbe	rs	,	4.1.2											
UNIT	V						Ga	s Turb	ines					1	l Hours
Flow of air a shaft type of design featu system & Lu engine.	UNIT-VGas Turbines10 HoursFlow of air and gas through a simple Gas turbine. Material of compressor, combustion system, turbine. Types of Gas turbine, Turbo shaft type of Gas turbine for marine applications, Pressure/temperature diagrams, Lubrication system. Material selection and design features of marine gas turbine: Layout, operation, and study of gas turbine components. Operative mechanism: Gearing system & Lubricating system, Fuel system, Starting system, Mounting and control system. Application of gas turbine to free piston engine.														
Competenc	y Numbe	rs		4.1.3											
													тот	AL 54	Hours
Text Books	: nino En	noorie	- h	nour of	outh or the	Hog T-	itor D		minata	ICDN	0 02075	72 10 /			
1. Ma <b>2.</b> The Lor	<ol> <li>Marine Engineering – by group of authorities, Editor: Roy L Harrington, ISBN: 0-939773-10-4</li> <li>Thomas D. Morton, "Steam Engineering Knowledge for Marine Engineers", 3rd Edition, Thomas Reed Publications, London 1979.</li> </ol>														



Program	B.E. – Marine Engineering												
Course code	Course	Name		L	Т	Р	С						
241ME1A52TD	Constit	ution of India	and Merchant										
	Shippin	ng Act		1	0	0	1						
Year / Semester	II Year /	/ IV Semester		Contact Ho	urs / Week·	1							
Prerequisite course			1	contact in		-							
	Hum Socia	anities and al Sciences	Management courses	Professio	onal Core	Profession	al Elective						
Course category						Mand	atom						
	Bas	ic Science	Engineering Science	Open H	Elective	Mandatory ✓							
	1	Understand t	he Constitution's meanir	ng. importan	ce. and salie	ent features.	(K2)						
		Analyze the significance of the Preamble in guiding the governance of the country											
	Z	(K3)	0	0	0 0		5						
	3	Describe the concept of fundamental rights, including their meaning, limitations, and enforcement $(K^2)$											
		Evolore the	(N2) directive principles of s	tate policy -	and fundam	ontal dutios	and their						
Course objectives	4	relevance in shaping the nation's progress. (K3)											
		Summarize of the Union Government's structure, including the roles and powers of											
	5	the President, Vice-President, Prime Minister, Council of Ministers, Parliament, and											
		Supreme Court. (K2)											
	6	Understand the structure and functions of state and local governments, including the											
	0	Local Self-Go	vernment. (K2)	ite juuleiary	, i anchayat	Raj System,							
	CO1	Demonstrate	understanding of the	Constitutior	n, its signifi	cance, and	the salient						
		features of th	e Indian Constitution. (K	(2)									
	CO2	Analyze and i	nterpret the Preamble of	f the Constit	ution, recog	nizing its imp	portance in						
		guiding the co	ountry's governance. (Ka	<u>})</u> al sialata in	مان مانت م الم	··· 1::	a and the						
	CO3	mechanisms	for their enforcement. (k	al rights, in (2)	icluaing the	ar limitation	is and the						
Course outcomes	C04	Recognize the	e importance and releva	ance of dire	ctive princip	oles of state	policy and						
	04	fundamental	duties in shaping the nat	tion's progre	ess. (K3)								
	CO5	Describe the structure, roles, and powers of the Union Government, including the											
		Executive, Legislature, and Judiciary. (K2)											
	C06	Understand the functioning of state and local governments, including their executive,											
	1	l legislative, an	iu juuiciai components. (	rzj									


UNIT-I	INTRODUCTION TO CONSTITUTION	4 Hours
Meaning and impo Fundamental right enforcement and th	ortance of the Constitution, salient features of Indian Constitution. Preamble of the rs- meaning and limitations. Directive principles of state policy and Fundamenta neir relevance.	e Constitution. ll duties -their
UNIT-II	UNION GOVERNMENT	3 Hours
Union Executive- F Parliamentary proc	President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- F ceedings. Union Judiciary-Supreme Court of India –composition and powers and func	Parliament and tions.
UNIT-III	STATE AND LOCAL GOVERNMENTS	3 Hours
State Executive- Go Legislative Council and Urban Local Se	overnor, Chief Minister, Council of Ministers. State Legislature-State Legislative Asser . State Judiciary-High court. Local Government-Panchayat raj system with special ref elf Govt. with special reference to74th Amendment.	mbly and State erence to 73rd
UNIT-IV	ELECTION PROVISIONS, EMERGENCY PROVISIONS, AMENDMENT OF THE CONSTITUTION	4 Hours
Election Commission procedure, duration	on of India-composition, powers and functions and electoral process. Types of emerg n and effects. Amendment of the constitution- meaning, procedure and limitations.	gency-grounds,
UNIT-V	THE MERCHANT SHIPPING ACT, 1958	4 Hours
Select Provisions o registration of Indi for Seafarers.	f the Merchant Shipping Act- Establishment and functions of National Shipping Boa an Ships, Certificates of Officers. Provisions related to seamen, Functions of National	ard, Process of Welfare Board
	Те	otal: 18 Hours
Text Books:		
<ol> <li>M.V.Pylee, "</li> <li>Durga Das I Hall EEE, 20</li> </ol>	Introduction to the Constitution of India",4th Edition, Vikas publication,2005 Basu( DD Basu) , "Introduction to the constitution of India",(Student Edition),19 <sup>th</sup> edi 008.	tion,Prentice-
<b>Reference Books:</b>		
1. Merunanda	n, "Multiple Choice Questions on Constitution of India", 2 nd Edition,Meraga publicat	tion,2007.



Program	n		B.E Marine Engineering, ECE and Mechanical Engineering														
Course 242CS1	Code A53TK		Cour Fund	Course NameLTPCFundamental of Computer and Python2102Programming2102I year, I semesterContact hours per weekU2													
N	10		Prog		ing						2	1	_	0		2	
Year and	d Semest	er	I yea	r, I sei	nester					Hrs.3	act hour:	s per we	ek				
Prerequ	isite cou	rse															
Course	category	7	Hur	naniti Sc	es and S	Social	Manag	ement c	ourses	F	Professio	onal Co	re	Profes	sional E	Elective	
				Basic	Basic Science         Engineering Science         Open Elective         Mandatory												
				т	To understand the fundamental of commutant electric there are different electric.												
Course	Objectiv	'e	1	Το ι	To understand the fundamental of computer, algorithm and flow chart.												
			2	To l	To learn the basic programming constructs in Python.												
			3	To j	To practice various computing strategies for Python-based solutions to real world problems.												
			4	Τοι	To use Python data structures - lists, tuples, dictionaries.												
			5	То	To do input/output with files in Python.												
Course	Outcome	;	CO1	con con	nputer	compon onal pro	ents an blems.	d flow	chart, I	Develo	p algor	ithmic	solution	ns to sir	nple		
			CO2	Rea	ad, writ	e, execu	ite by h	and sir	nple Py	thon p	rogram	s.					
			CO3	Stru	acture s	simple P	ython p	progran	ns for s	olving	proble	ms.					
			CO4	Dec	compos	se a Pytł	ion pro	gram ii	nto fun	ctions.							
			CO5	Rep	oresent	compou	ind data	a using	Pythor	n lists, 1	tuples,	and dic	tionarie	es.			
			CO6	Rea	nd and	write da	ta from	/to file	s in Py	thon Pr	ograms	5.					
CO-PO	ATTAIN	MEI	NT														
POs / COs	PO1	PC	02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	2	2	2	2 2 2 2 - 1 2 1											1		
CO2	3	3	;	2	2	3	-	-	-	-	2	-	1	2	1	1	
CO3	3	3	3	3	2	2	-	-	-	-	2	-	1	2	1	1	
CO4	2	2	2	2	2	3	-	-	-	-	2	-	1	2	1	1	
CO5	2	2	2	2 2 3 2 - 1 2 1											1		



CO6	3	3	3	2	3	-	-	-	-	2	-	1	2	1	1
Average	2.5	2.5	2.33	2	2.67	-	-	-	-	2	-	1	2	1	1
CO	RRELATI	ON LEVE	ELS		1. SLIGH	Г (LOW)		2. M	ODERAT	TE (MED	IUM)	3. S	UBSTAN	TIAL (H	IGH)

#### UNIT I **COMPUTER FUNDAMENTALS**

Definition, Block Diagram along with its components, characteristics & classification of computers, Applications of computers in various fields. Memory: Concept of primary & secondary memory, RAM, ROM, types of ROM, flash memory, Secondary storage devices: Sequential & direct access devices viz. magnetic tape, magnetic disk, CD, DVD- Algorithms - building blocks of algorithms (statements, state, control flow, functions) – Flow chart.

#### **UNIT II** DATA, EXPRESSIONS, STATEMENTS

Python interpreter and interactive mode - values and types: int, float, boolean, string, and list - variables expressions – statements - tuple assignment - precedence of operators – comments - modules and functions function definition and use - flow of execution - parameters and arguments - Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

#### UNIT III CONTROL FLOW, FUNCTIONS

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (ifelif-else) - Iteration: state, while, for, break, continue, pass - Fruitful functions: return values, parameters, local and global scope, function composition, recursion - Strings: string slices, immutability, string functions and methods, string module, other built-in libraries.

#### **UNIT IV** LISTS, TUPLES, DICTIONARIES

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, advanced list processing, list comprehension - Tuples: tuple assignment, tuple as return value Application: Queue processing using list, vector processing using tuples.

#### **UNIT V** FILES, MODULES, PACKAGES

Files and exception: text files, reading and writing files, format operator - command line arguments - errors and exceptions - handling exceptions - modules - packages - Illustrative programs: word count, copy file.

#### **TOTAL: 45 HOURS**

#### Text Book:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, O'Reilly Publishers, 2016.

9 Hours

9 Hours

# Controlled

9

#### 9 Hours

9 Hours



2. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python –Revised and updated for Python 3.2, Network Theory L., 2011.

#### **Reference Books:**

- 1. John V Guttag, —Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013.
- 2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
- 3. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.

**Reference web site:** 

Program	B.E	B.E. – Marine Engineering												
Course code	Cour Mari	se Na	me wer Ge	norat	ion and	Distrib	ution	L		Т	Р	1	С	
24IMEIA55ID	Mail		wer ut		.1011 anu	DISCITO	ution	3		0	0		2	
Year / Semester	III Ye	ear / V	/ Seme	ster					Conta	ct hours/	Week	- 3		
	Hum Scier	anitie ices	es and	Social		Mana cours	gement ses		Profes	sional Co	ore F	Profession	al Elec	ctive
Course												Ň	(	
categofire ry	Basio	c Sciei	nce			Engir Scien	ieering ce		Open 1	Elective	N	Mandatory	/	
		-												
	1	Unc	derstand the Electrical Power generation and protection of generator. (K1)											
	2	Dise swi	iscuss the design features and system configurations of power distribution and witchgear (K2)											
Course	3	Des	Describe High Voltage and Low Voltage Cargo Switchboard Distribution (K2)											
objectives	4	Ide	ntify ca	auses	and haz	ards of ]	high volt	age.(K	1)					
	5	To s the	summa safe is	irize s olatio	afety re n of elec	quireme ctrical e	ents for v quipmen	vorkin t. (K2)	ig on shi )	pboard e	electri	cal system	ıs, incl	uding
	6	Dise syst	crimin cems(k	ate su (2)	itable el	ectrical	, Safety e	quipn	nent for	marine p	ower	distributi	on	
	C01	Imp	lemen	t the	Electrica	al Powe	r generat	ion an	d prote	ction of g	enera	tor (K2)		
	C02	Creation (K4	ate the )	desig	n featur	res and	system c	onfigu	rations	of power	distri	bution an	d swit	tchgear.
Course	CO3	Den	nonstr	ate Hi	gh Volta	ige and	Low Volt	age Ca	argo Swi	tchboard	l Distr	ibution (F	(3)	
outcomes	C04	Derive the Solutions and rectify the problems due to the Hazards of High Voltage. (K2)												
	C05	5 Inspect the working of different types of Breakers (K3)												
	C06	Infe	er all E	lectri	cal, Safe	ty equip	oment of	marin	e powe	r distribu	tion s	ystems (K	(3)	
POs/COs PO1	P02	02 P03 P04 P05 P06 P07 P08 P09 P010 P011 P012 PS01 PS02 PS03												



C01	3	3	2	2	1	1	3	3	1	1	1	1	3	2	2
C02	3	3	2	2	1	1	3	3	1	1	1	1	3	2	2
C03	3	3	2	2	1	1	3	3	1	1	1	1	3	2	2
C04	3	3	2	2	1	1	3	3	1	1	1	1	3	2	2
C05	3	3	2	2	1	1	3	3	1	1	1	1	3	2	2
C06	3	3	2	2	1	1	3	3	1	1	1	1	3	2	2
Average	3	3	2	2	1	1	3	3	1	1	1	1	3	2	2
	Correlation	n level			1.Sl	ight (Lov	w)	2. Moderate (Medium)3. Substantial (H						ntial (High)	

UNIT-I	POWER GENERATION ON BOARD SHIPS	12 Hours									
Specification of electric power for shipboard installations- generation of electric power and its various uses. The diesel-electric power generator and its configurations on ships- Turbo-electric power generation, shaft power generator, emergency generators, shore power supply and batteries. Various conditions of ships operation and power requirements. Governor droop characteristics and load sharing. AVR droop characteristics - Testing of generator protocol and devices.											
generator protection	n devices - Generator Preventive Maintenance.										
Competency Numbers	6.1.1a & 7.5										
UNIT-II	MARINE ELECTRICAL POWER CIRCUITS	12 Hours									
Ships' electrical po standards, diagram diagrams layout, co switchgear and indu	wer distribution – Single line diagrams - Definitions – G , and graphic symbols and ratings connections of different nnecting lines, junctions and crossovers, mechanical linkage astrial control –Schematic circuits.	eneral Information on reference ent instruments used. Schematic es. Schematic diagrams for power									
Competency Numbers	6.1.1a										
UNIT-III	MARINE POWER DISTRIBUTION SYSTEM	10 Hours									
System diagram of a group indicator con - Main Electrical Ne Mechanical Interloc Switchboard and Le Switchboard Distrib power distribution	typical distribution system. Ship's Specific Layout Explanati trol cabinet - Emergency Diesel Generator Control Panels - I twork - Breaker Identification – Circuit Breaker Interlock S k Procedures - HV Main Switchboard Control Location Flo ocal Control Panels - Main Switchboard Distribution. High pution. Insulated Neutral and earthed system, Fault finding, system, Protective devices on Distribution board.	on - Diesei Generator starting and Emergency Generator Fuel system System – Power Management Unit W Charts - Emergency Generator N Voltage and Low Voltage Cargo Neutral earthing system in Main									
Competency Numbers	6.1.1a & 7.5										
UNIT-IV	CAUSES AND HAZARDS OF HIGH VOLTAGE	10 Hours									
Causes of over volta Corona and its effec in uniform and non liquids, Maintenanc insulating materials Competency Numbers	ges and its effects on power system – Lightning, switching su ts – Protection against over voltages. Properties of Dielectri -uniform fields –Vacuum breakdown – Conduction and bre e of oil Quality – Breakdown mechanisms in solid and com in electrical equipment. 6.1.1.d ,7.3	rges and temporary over voltages, c materials – Gaseous breakdown eakdown in pure and commercial posite dielectrics- Applications of									
UNIT-V	HIGH VOLTAGE SAFETY AND PRECAUTIONS	10 Hours									



Circuit Breakers - Physics of arcing phenomenon and arc interruption — DC and AC circuit breaking — Types of circuit breakers — air blast, air break, oil, SF6, MCBs, MCCBs and vacuum circuit breakers. Relays – working principle- types. Lightning Arrester's- working and types. High voltage safety checklist- Definitions of Safety terms in on board ship- Working procedures with high voltage.

Competency	6.1.1.d, 7.1	
Numbers		
		Total hours: 54

Text Books:

1. A Textbook of Electrical Technology: - AC and DC Machines (Volume - 2) (English, Paperback, Theraja A. K.); Publisher S. Chand; ISBN:

2. Marine Electrical Technology 11th Edition; By Elstan A. Fernandez; Publisher: Shroff Publishers and Distributors; Year: 2020; ISBN: 9789352139514

Reference Books:

1. Practical Marine Electrical Knowledge by Dennis .T. Hall.

2. Marine Electro Technology and Electronics by Gokhale & Nanda.



Program		B.E.	– Mar	ine En	gineer	ing										
Course code 241ME1A53PH		Cou Mar	Course Name Marine Electrical Technology LaboratoryLTPC0021													
			0     0     2       II Year / V Semester     Contact hours/Week - 2											1		
Year / Semester	•	III Y	ear / \	/ Seme	ester					Contact	t hours/	Week –	2			
		Hun Soci	nanitie al Scie	es and ences		Man	ageme	ent cou	rses	Profess	ional Co	ore	Profess Elective	ional		
Course category	/	Basi	c Scie	nce		Engi	neerir	ng Scie	nce	Open E	lective		Mandat	ory		
				A 1			•	/	(1)	0						
		1		Analyz	e mar	ine ele	ctrical	syster	ms. (K	4)						
		2		Evalua	te safe	ety pro	cedur	es for s	shipbo	ard elec	trical ec	quipmer	nt. (K4)			
- · · ·		3	; ,	Apply	fault fi	nding	techni	ques i	n mari	ne elect	rical cir	cuits. (K	(4)			
Course objectiv	es	4		Demor	nstrate	know	ledge	of ship	board	electric	al regul	ations. (	(K3)			
		5		Mainta	ain ele	ctrical	syster	ns in h	azardous areas. (K4)							
		6	6 Assess electrical protective devices for safe operation. (K4)													
		C01		Identif	y mar	ine ele	ctrical	syste	ns. (K	2)						
		C02		Follow	' safety	v proce	edures	for ele	ectrica	l equipn	nent. (K	2)				
		C03		Troubl	leshoo	t mari	ne eleo	ctrical	circuit	cs. (K3)						
Course outcome	es	C04		Compl	y with	shipb	oard e	lectric	al regu	ilations.	(K2)					
		C05		Mainta	ain ele	ctrical	syster	ns in h	azardo	ous area	s. (K3)					
		C06	1	Utilize	electr	ical pr	otectiv	ve devi	ices fo	r safety.	(K3)					
POs/COs	P01	PO2	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	
C01	3	3     2     2     2     3     3     3     1     1     3								3	2	2				
CO2	3	3 2 2 2 3 3 3 3 1 1 3							2	2						
CO3	3	3	2	2	2	3	3	3	3	1		1	3	2	2	
CO4	3	3	2	2	2	3	3	3	3	1		1	3	2	2	
C05	3	3	2	2	2	3	3	3	3	1		1	3	2	2	
C06	3	3	2	2	2	3	3	3	3	1		1	3	2	2	
Average	3	3	2	2	2	2     3     3     3     1     1     3     2							2			



Correlatio	n level	1.Slight (Low)	2. Moderate (Medium)	3. Substantial (High)								
		LIST OF EXPERIMEN	VTS	36 Hours								
<ol> <li>Study of differ shown on diag by referring ci</li> <li>Study and us</li> </ol>	ent symbols us grams, flowcha ircuit diagrams e of: Insulatior	sed in electric/electro rts and detailed wirin 1 tester, Continuity test	nic circuit diagrams, reading block g diagrams, locating components i ster, Multimeter, Clamp meter, Ana	diagram, specifications n actual circuits and PCBs log and digital tachometers,								
<ol> <li>Test of Battery</li> <li>Test of Motor</li> <li>Study of Dism</li> <li>Test of Bilge A</li> <li>Test of Paralle</li> <li>Study of fault</li> </ol>	<ol> <li>Test of Battery Charging, Maintenance and Checking.</li> <li>Test of Motor Winding Insulation, Open Circuit &amp; Short Circuit Checking using Megger.</li> <li>Study of Dismantling &amp; Reassembling of Induction Motor.</li> <li>Test of Bilge Alarm.</li> <li>Test of Paralleling of Alternator.</li> <li>Study of fault Finding Exercise on Ship Wiring Circuit.</li> </ol>											
<ol> <li>Study of fault</li> <li>Test of D.O L S</li> <li>Test of Star De</li> <li>Test and calib</li> <li>Test and calib</li> <li>Test and calib</li> <li>Study of Period</li> <li>Breakers, Dist</li> <li>Study of Alarn</li> <li>Wat</li> <li>Oxy</li> </ol>	<ol> <li>Study of fault Finding Exercise on Ship Wiring Circuit.</li> <li>Test of D.O L Starter, Auto Transformer Starter.</li> <li>Test of Star Delta Starter, Soft Starters.</li> <li>Test and calibration of Pressure Sensors, Temperature Sensors, Level Sensors.</li> <li>Test and calibration of RPM Sensors, Photo Sensors, Water Salinometer.</li> <li>Study of Periodic and Breakdown maintenance of Generators, Electric motors, Switch Board, Starters, Circuit Breakers, Distribution system, DC Electrical systems.</li> <li>Study of Alarm system (types, supply) on board for         <ul> <li>Watertight doors &amp; Bow-doors,</li> </ul> </li> </ol>											
3. Hig 4. Stee 5. Elec	h & low level al ering gears etrical Deck Cra	arms, Navigational lig mes.	ghts,									
Competency Numbers	6.1.1a Operate (Table A-III/ 1 7. Maintenanc 7.1 Safety requ 7.3 Detection	e electrical, electronic -) e and repair of electri uirements for working of electric malfunction	and control systems , generator a ical and electronic equipment g on shipboard electrical systems. n, location of faults and measures	nd distribution systems								
Text Books:			Iotai	10Urs:36								
. Marine Electrical Technology by Eltsan Fernandez.												
Reference Books:	leference Books:											
1. Practical Marine E	lectrical Know	ledge by Dennis .T. Ha	11.									
2. Marine Electro Teo	chnology and E	lectronics by Gokhale	& Nanda.									
web Source: https://www.youtub https://www.youtub	pe.com/watch? pe.com/watch?	v=LvEqLof7fUE v=AoDTdThc074										



Program			B.	.E. – M	arine	Engine	ering										
Course cod	e		Co	ourse Name L T P C													
241ME1A5	4P0		М	arine	Equip	ment D	rawin	g - II			0	0	3		2		
Year / Sem	ester		II	I Year ,	/ VI Se	mester					Con	tact hou	rs/Wee	k	3		
			H Sc	umani ciences	ties an	d Socia	l Ma	nagem	ent cou	rses	Prof Core	essiona	l P	rofessio	nal Elect	ive	
Course cate	egory										~						
			Ва	asic Sci	ience		Engineering Science     Open Elective     Mandatory										
						<u> </u>							<u>,                                     </u>		_,	.1	
			1	1 assembly of stop, check, and safety valves (K2)											the		
			2	To develop proficiency in 2D drawing techniques and acquire knowledge on the assembly of valve actuators for various industrial applications (K2)											the		
Course obje	ectives		3		To develop proficiency in 2D drawing techniques and acquire knowledge on the assembly of automatic valves for industrial automation systems. (K2)											the	
			4		To ass	develo embly	p profi of star	ciency ting air	in 2D d valves	rawing used i	g technio n marin	ques and e diesel	d acquin engines	e knowl s. (K2)	edge on	the	
			5		To ass and	develo embly l boiler	p profi of buri s (K2)	ciency ter car	in 2D d riers ar	rawing d relat	g technie ed com	ques and ponents	d acquii used ir	re knowl i industr	edge on ial furna	the aces	
			C	01	De Foi	velop s ur Strol	kills to ke Pisto	draw 2 on, Oil	2D drav Fuel St	vings a ainer.	nd acqu (K2)	ire knov	wledge	on the a	ssembly	of	
			C	02	De <sup>.</sup> Sta	velop s rting A	kills to ir Pilot	draw 2 Valve	2D drav (K2)	vings a	nd acqu	ire knov	wledge	on the a	ssembly	of	
Course out	romas		C	03	De <sup>r</sup> Ful	velop s l Bore	kills to Safety	draw 2 Valve (	2D drav K2)	vings a	nd acqu	ire knov	wledge	on the a	ssembly	of	
oburse out	comes		C	04	De <sup>.</sup> Hig	velop s gh Lift S	kills to Safety V	draw 2 /alve. (	2D drav K2)	vings a	nd acqu	ire knov	wledge	on the a	ssembly	of	
			C	05	De Au	velop s tomatio	kills to : Valve	draw 2 . (K2)	2D drav	vings a	and acquire knowledge on the assembly of						
			C	06	De <sup>.</sup> Sta	velop s rting A	kills to ir Valv	draw 2 e, Gear	2D drav Pump.	vings a (K2)	s and acquire knowledge on the assembly of )						
POs/ COs	P01	PC	PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02 PS0									PSO3					



C01	3	-	-	-	-	-	2	2	-	3	-	-	-	-	2
CO2	3	-	-	-	-	-	2	2	-	3	-	-	-	-	2
CO3	3	-	-	-	-	-	2	2	-	3	-	-	-	-	2
CO4	3	-	-	-	-	-	2	2	-	3	-	-	-	-	2
CO5	3	-	-	-	-	-	2	2	-	3	-	-	-	-	2
C06	3	-	-	-	-	-	2	2	-	3	-	-	-	3	2
Average	3.00	-	-	-	-	-	2.00	2.00	-	3.00	-	-	-	3.00	2.00
Correlation	level		1.5	light (l	Low)		2. Mode	erate (N	ledium	i)		3. Substa	ntial (Hi	gh)	

UNIT-I	FOUR STROK	DUR STROKE PISTON & OIL FUEL STRAINER       10 Hours										
Four Stroke Pisto	n, Oil Fuel Strair	ner.										
Competency Num	lbers	9.1										
UNIT-II	STARTING AI	R PILOT VALVE	10 Hours									
Starting Air Pilot Valve.												
Competency Numbers 9.1												
UNIT-III	FULL BORE SA	AFETY VALVE.	10 Hours									
Full Bore Safety V	alve.											
Competency Num	lbers	9.1										
UNIT-IV	HIGH LIFT SA	FETY VALVE & AUTOMATIC VALVE	12 Hours									
High Lift Safety Va	alve, Automatic	Valve.										
Competency Num	lbers	9.1										
UNIT-V	STARTING AI	R VALVE & GEAR PUMP.	12 Hours									
Starting Air Valve	, Gear Pump.											
Competency Num	lbers	9.1										
	Total: 54 Hours											
Text Books:	Text Books:											
1. Engineeri Publicatio	<ol> <li>Engineering Drawing for Marine Engineers Volume 11 by Reed's marine engineering series – H.G.Beck, Reeds Publication 2019.</li> </ol>											



### **Reference Books:**

- 1. N.D.Bhatt, "Machine Drawing", 18th Edition, Charotar Publication, Mumbai, 2001
- 2. MacGibbon's "Pictorial Drawing Book for Marine Engineers-James", 8th Edition, G.Holburn & John J. Seaton, James Munro & Company Limited, Engineering and Nautical Publishers, Mumbai, 1978.

Program			B.E. – Marine Engineering														
Course cod	e		Course	Name					L		Т		Р		С		
241ME1A5	4PN		Marine	e Stean	n Plan	t Labor	atory		0		0		2		1		
Year / Sem	ester		II Year	/ IV Sei	mester					·	Conta	act houi	rs/Weel	K			
Prerequisit	e cour	se	Marine	works	hop-I &	&II						02hr	S				
			Huma	anities	and	M	lanage	ment	г	Profossi	anal Car		Profossi	onal Ela	ativo		
			Socia	l Scien	ces		cours	es	ſ	TOIESSI		e r	TOIESSI		ecuve		
Course cate	onrv										✓						
course cat	gory		Basi	c Scien	ice	E	Enginee Scien	ering ce		Open	Elective		Ма	ndatory	7		
			1	Perce	ive the	e safety	preca	utions	and pi	ocedur	es involv	ved in V	Vorksho	эр. (К1)			
			2	Identi	ify the	various	pipe li	ne dia	agram. (K1)								
- · ·			3	Expla	in the	basic of	burne	rs and	d inspection of combustion space. (K2)								
Course obje	ectives		4	Expla	in the	condens	ser clea	aning ,	inspec	tion and	l mainte	nance.	(K2)				
			5	Expla	in the	boiler a	iutoma	tion, s	afety a	nd shut	down sy	/stem. (	(K2)				
			6	Expla	in the	boiler c	perati	on and	Turbi	ne oper	ation. (	K2)					
			C01	Expla	in the	tracing	of vario	ous pip	eline o	liagram	. (K2)						
			CO2	Demo	onstrat	e the bi	urner n	nainter	nance	and insp	ection.	(K2)					
Course out	comes		CO3	Demo (K2)	onstrate	econo	denso	er cl	eani	ng, re	epair	and n	naint	enanc	ce.		
Gourse out	comes		CO4	Demo	nstrat	e boiler	auton	, nation	safety	and sh	utdown	system	. (K2)				
			CO5	Demo	nstrat	e boiler	. opera	tion. (I	(2)								
			C06	Expla	in stea	am turb	ine op	eratior	n. (K2)								
POs/COs	P01	PO2	PO3	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3		
C01	3	2	2	2	-	2	2	2	3	3	-	2	-	-	-		
C02	2	2	-	-	-	2	2	2	3	3	-	2	-	-	-		
C03	3	2	2	2	-	2	2	2	3	3	-	2	-	-	-		
CO4	3	2	2	2	-	2	2	2	3	3	-	2	-	-	-		
C05	2	2	2	2	-	2	2	2	3	3	-	2	-	-	-		
000	2	່ າ	2							2		- -					
C06	3	3	3	3	-	Z	Z	Z	3	3	-	Z	-	-	-		



Average	2.67	2.17	2.20	2.20		2.00	2.00	2.00	3.00	3.00	2.00			
Correlation	level		1.5	Slight (	Low)		2. M	oderat	e (Med	ium)	3. Sub	ostantia	l (High)	



#### Practical Laboratory Exercises List of Experiments

		Hours (P)
Section	Study of Steam Systems	
1	Tracing pipelines of ships steam plant & boiler feed water system – Main and Auxiliary	2
2	Tracing pipelines of boiler condensate, drain system, fuel oil supply and change over	2
3	Industrial standards / pipe line and component specifications	1
4	Types of boiler burners – maintenance routines	1
5	Inspection of combustion spaces	1
6	Isolation of subsystems and safe maintenance practices	1
7	Energy loss in steam systems – maintenance of steam traps, insulation.	1
8	Condenser cleaning, repairs and maintenance Condensate line steam traps and filters maintenance	2
9	Boiler automation – measurement, operation, safety and shutdown systems	2
10	Turbines operation	3
Total		18

### Competency Numbers:4.1.2,4.1.3,4.1.4

**Text Books:** 

1. Practical Handouts.

#### 2. Marine engineering- by group of authorities, Editor: Roy L Harrington.

#### **Reference Books:**

4. John B Woodward (1980) Analysis of steam propulsion plants.

5. Steam: Its Generation and Use(2005). United States:Babcock & Wilcox.

6. Hunt.E.C(1999). Modern Marine Engineers manual



Program	B.E. – Ma	rine Engineering										
Course code	Course Na	ame:		L	Т	Р	С					
242CS1A53PK	Python P	rogramming Laborate	ory	0	0	2	1					
Year / Semester	II Year / I	V Semester										
Prerequisite				Contact ho	urs/Weel	<: 2 Hrs						
course												
	Humaniti	es and Social Sciences	Management	Professio	nal	Professional Flec						
	manna	es and social sciences	courses	Core	LICCUVC							
Course category												
dourse category	1	Basic Science	Engineering	Open Elec	tive	Mandato	orv					
			Science	Spen Licenve Manadory								
			$\checkmark$									
Pre-requisite	Strength	of Materials										
	1	To write, test, and deb	oug simple Python p	programs.(K1)								
Course objectives	2	To implement Python	programs with con	ditionals and	l loops.(K	(3)						
course objectives	3	Use functions for stru	cturing Python prog	grams.(K3)								
	4	Represent compound	data using Python l	ists, tuples, a	nd dictio	naries(K1)						
	C01	Write, test, and debug	simple Python prog	grams.(K1)								
	CO2	Implement Python pr	ograms with conditi	ionals and lo	ops.(K3)							
	CO3	Develop Python progr	rams step-wise by d	efining funct	ions and	calling them.	(K3)					
Course outcomes	C04	Use Python lists, tuple	es, dictionaries for r	epresenting	compoun	d data.(K3)						
	C05	Use String Functions a	and Slices.(K3)									
	C06	Solve real time proble	em using python.(K3	K3)								

POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	2	1	3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	2	1	-	-	-	-	-	-	-	-	-	-
C06	2	3	1	1	2	-	-	-	-	-	-	-	-	-	-
Average	2.5	1.8	2.1	2.1	1.4	-	-	-	-	-	-	-	-	-	-
Correlatio	on level		1.Slight (Low)					lerate (	Mediun	n)	3. Substantial (High)				



LIST OF EXPERIMENTS		36 Hours										
1. Operators and Expression	ns											
2. Problems involving if-the	en-else structures											
3. Compute the GCD of two	numbers.											
4. Find the square root of a	number											
5. Exponentiation (power of	of a number)											
6. Find the maximum of a li	ist of numbers.											
7. List: Cloning, Comprehen	List: Cloning, Comprehension, Processing											
8. Tuples: Vector processin	. Tuples: Vector processing using tuples											
9. Dictionary operations	Dictionary operations											
10. String functions, slices	). String functions, slices											
11. Linear search and Binary	<i>y</i> search											
12. Selection sort, Insertion	sort											
13. Multiply matrices.												
Competency Numbers	6.2 & Annexure											
Text Books:												
1. William Stallings, Comp	outer Organization and Architecture – Designing for Performanc	e, Eighth Edition,										
Pearson Education, 201	Pearson Education, 2010.											
2. John C. Lusth, "The Art a	nd Craft of Programming in Python", The University of Alabama, 20	16										
<b>Reference Books:</b>												
1. Mark Lutz, Learning Pytl	non, O'Reilly, Fifth Edition, 2013.											
2. PovelSolin, Martin Noval	k, "Introduction to Python Programming", NCLab Public Computing,	, 2013										



PROGRAM	B.E. Ma	arine H	Engineering									
Course Code	Course	Name	:	L	Т	Р	С					
241ME1A54PL	Marine laborat	Intern ory	nal combustion engine	0	0	3	2					
Year and Semester	III Year	·(VSe	mester )	Contact h	iours per w	eek 3 Hrs						
	Humar and So Science	nities cial es	Management courses	Professi	onal Core	Profession Elective	al					
Course category					$\checkmark$							
	Basic Science	e	Engineering Science	Open Ele	ective	Mandatory						
	1											
- Course Objective	2		Knowledge about different starting arrangements, Modern engines starting methods, safety features, safe handling of machinery's (K1)									
	3		To gain knowledge about how to power, fault analysis, properties cylinder liner lubrication and we	o obtain inc of lubricar ear prevent	licator diag nt and unde tive measur	rams and con erstand about es (K1)	nputer					
	4		To understand about construction for propulsion, different types of (K1)	on, operation f coupling a	on of high s and gearing	peed engines arrangement	used s used					
	5		To understand about general co Understand about free piston ar combustion chamber (K1)	nstruction rangement	and operations and conve	ion of Gas tur entional air st	bines. ream					
	After th	ie succ	ccessful completion of this course students shall be able to									
Course Outcome	CO1	Unde type- varia	erstand the operational principles and construction features of cross head 2-2S diesel engines, including slow speed, medium speed, and high-speed ants. (K1)									
	CO2	Ident heads funct	ify and describe the components of s, liners, pistons, piston rods, and ions. (K1)	of the engir connecting	ne assembly rods, and t	7, such as cylin heir respectiv	nder ve					



CO2	Analyze the significance and functionality of critical engine bearings, including cross head bearings and bottom end bearings, as well as the role of connecting rod bolts and crankshafts in engine operation. (K3)
CO3	Demonstrate comprehension of engine support structures, including bed plates, holding down arrangements, tie rod choking mechanisms, resin chocks, and overall engine structure. (K2)
CO4	Evaluate the cooling systems integrated into the engine design, including jacket cooling arrangements in cylinder heads and liners, as well as piston cooling arrangements, to ensure efficient heat dissipation and optimal performance. (K4)
CO5	Explain the operation and maintenance requirements of essential engine components and systems, such as starting air valves, air distributors, fuel pumps, fuel injectors, exhaust valves, relief valves, turbochargers, scavenging systems, supercharging systems, gearing systems, and lubrication systems, to ensure safe and reliable engine operation. (K3)

														(54	Hours)	
CORRELA	ATION	LEVEL	S	1. SLI	GHT (I	LOW)		2. MO	DERA'	ГЕ (MEI	DIUM)		3. 5 (HI	SUBSTA GH)	ANTIAL	
Average	3.00	3.00	-	-	-	-	2.20	2.00	2.00	2.00	1.50	2.0	0	3.00	1.67	-
C06	3	3	-	-	-	-	-	2	2	2	1	2		3	1	-
C05	3	3	-	-	-	-	2	2	2	2	2	2		3	2	-
CO4	3	3	-	-	-	-	2	2	2	2	-	2		3	2	-
CO3	3	3	-	-	-	-	2	2	2	2	-	2		3	2	-
CO2	3	3	-	-	-	-	2	2	2	2	-	2		3	2	-
C01	3	3	-	-	-	-	3	2	2	2	-	2		3	1	-
POs / COs	P01	P02	PO3	PO4	P05	P06	P07	P08	P09	P010	P011	PO	12	PSO1	PSO2	PSO3

#### List of Experiments:

Study of:

- 1. Cross head type-2S diesel engine, Trunk type/ 4Stroke, slow speed, medium speed, high speed engines
- 2. Cylinder head, liner, piston, piston rod and connecting rod
- 3. Cross head bearing, bottom end bearing, Crank shaft, connecting rod bolts
- 4. Bed plate, holding down arrangements, Tie rod choking, resin chocks and Engine structure
- 5. Jacket cooling arrangements in cylinder head liner, Piston cooling arrangements



- 6. Starting air valve, air distributor
- 7. Fuel pump, Fuel injectors
- 8. Exhaust valve, relief valve, Turbo charger
- 9. Scavenging system, Types of super charging system
- 10. Gearing system and Lubrication system



Program			B.E. – Marin	ne Engin	eering									
Course code		Course Name	9	L	Т		Р	С						
241ME1A64TQ		Marine Electro Tech	nology	3	0		0	2						
Year / Semester		III year / VI seme	ester		Contac	t hours/Week	3							
	Hum	anities and Social Sciences	Management courses		Professio	nal Core	Professional	Elective						
Course category					√									
		Basic Science	Engineering Science		Open El	Mandato	ory							
		1												
	1	Analyze the operat	ion of electrical, e	electroni	c, and con	trol systems. (K	(4)							
	2	Evaluate the contro	Iluate the control systems used for propulsion and auxiliary machinery. (K3)											
Course objectives	3	Demonstrate proficiency in operating generators and distribution systems. (K4)												
	4	Apply knowledge o	of marine internal	commu	nication s	ystems. (K2)								
	5	Apply maintenance (K3)	e and repair techn	iques to	deck mad	hinery and carg	go handling equi	pment.						
	6	Utilize effective ma systems. (K3)	intenance and re	pair stra	tegies for	hotel equipmer	it's control and s	afety						
	C01	Assess and monito	r the operation of	electric	al, electro	nic, and control	systems. (K4)							
	C02	Construct the contr	rol systems used f	for prop	ulsion and	l auxiliary mach	inery. (K3)							
	CO3	Categorize proper	procedures for sta	arting, p	aralleling,	and changing o	ver generators.	(K4)						
Course outcomes	C04	Compare protective	e measures for ge	nerators	and swit	chboards. (K4)								
	C05	Demonstrate profie on board. (K3)	ciency in operatin	ig and tr	oubleshoo	oting internal co	ommunication sy	stems						
	C06	Perform maintenar (K3)	nce and repair tas	ks on de	ck machii	nery and cargo l	nandling equipm	ent.						

POs/ COs	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	3	3	3	2	1	1	1	1	1	1	1	2	3	2	2
CO2	3	3	3	2	1	1	1	1	1	1	1	2	3	2	2
CO3	3	3	3	2	1	1	1	1	1	1	1	2	3	2	2
CO4	3	3	3	2	1	1	1	1	1	1	1	2	3	2	2
C05	3	3	3	2	1	1	1	1	1	1	1	2	3	2	2



C06	3	3	3	2	1	1	1	1	1	1	1	2	3	2	2
Average	3	3	3	2	1	1	1	1	1	1	1	2	3	2	2
Correl	ation lev	el		1.Slight	(Low)			2. Modera	ate (M	edium	)	3. 5	Substa	ntial (Hi	igh)
UNIT-I Electrical pow lights. Instrum Electrical ma equipment an probable faul equipment an	wer distr nentatio terials1 nd safety lty functi nd safety	ibution b n, alarm a Troublesh devices-I devices-I	oard and and mon ooting o Logical ising of i	THE OPE l electric itoring sy f Electri Six step faulty fun es and no	RATION ( al equipr vstems - 1 cal & Ele trouble s nction, Lo eed for ac	DF ELEC nent - M Basic shi ctronic shooting ocalising ctual tes	TRICAL, E ISB, shore ipboard sy control eq procedur trouble t ting and s	ELECTRO supply, ystems (E quipment re (Symp to circuit imulation	NIC Al ESB, s Engine t & m otom i , Failu n testi	ND CO hore s and D onitor dentifi re ana ng-Lim	NTROL SYS upply, ESE beck), Elect ing system cation, Syn lysis) - Sin nitations.	STEMS and nor rical driv s-Functi nptom a nulation	12 Ho rmal & ves, Te on tes inalysi testin	emerge chnolog t of cor s, Listin g of cor	ency gy of ntrol 1g of ntrol
Lompetency I	Numbers	; 		7,7.5,	& 7.7								-		
UNI I - 11		МС	NITOR 7	THE OPE	RATION (	OF PROF	PULSION A	ND AUX	ILIAR	Y MAC	HINERY		7 Ho	urs	
Explain contr	ol systen	ns used fo	or propul	sion mad	on machine and auxiliary machines- Operational requirements in electrical										
Competency I	Numbers	5		7 &7.5.3											
UNIT-III		OP	ERATIO	N OF GEN	OF GENERATORS AND DISTRIBUTION SYSTEMS								10 H	ours	
Starting of ge systems.	nerators	, Paralleli	ng, load	sharing a	nd chang	ging ove	r generato	ors, Genei	rator p	protect	ion system	ıs, Switcł	n board	l protec	ction
Competency I	Numbers	5		7 &7.	5.3										
UNIT-IV		MA	RINE IN	TERNAL	COMMU	NICATIC	N SYSTEN	4S					11 H	ours	
Operation of a RADAR - Main	all interr ntenance	al comm	unication f theory,	n system: UMS ope	s on boar eration - I	d includ 3NWAS,	ing auton Dead Mar	natic pho n's Alarm	nes, so and V	ound p Vatch I	owered ph Keeper alai	one, wal m syste	lki talk ms.	ie, VHF,	, etc.
Competency I	Numbers	6		3.1 &	7										
UNIT-V		MA CA	INTANA RGO HAI	NCE ANI NDLING I	D REPAIR EQUIPME	COFDE	СК МАСНІ	NERY AN	ND				14 H	ours	
Maintenance and control s fire sensors, F power systen	and repa ystems o Hazardou n, Galley	ir of elect f cargo ha 1s Zones a equipmer	rical, ele andling e and Area at, Laund	ctronic a equipmer s. Mainte Iry equip	nd contro nt. Prever nance an ment, Ele	ol systen nt, Contr nd repair ectrical F	ns of deck ol and Fig of contro Fault Findi	machine ht fire or l and saf ing.	ry, Ma 1- boa ety sy:	intena rd Fire stems	nce and re e detection of hotel eq	pair of el and alar uipment	ectrica m syst 's Acco	l, electr em, Typ mmoda	onic ce of ition
Competency I	Numbers	6		7 &7.	5.3										
Total hours: 5	54														
Text Books:															
1. A Textboo Publisher: Sh	k of Elec roff Publ	trical Teo ishers an	chnology d Distrib	v Vol-2, H utors; Ye	3 L Thera ar: 2020	aja. 2. M ; ISBN: 9	arine Ele 97893521	ctrical Te 39514.	echnol	ogy 1	1th Editior	ı; By Els	tan A.	Fernan	ıdez;



Reference Books:

1. Marine High Voltage Technology; By J. Majumder, Elstan A. Fernandez, Lakshman Singh Yadav; Publisher: Shroff Publishers and Distributors; Year: 2018; ISBN: 9788175981799.

2. Maintenance and troubleshooting of Marine Electrical Systems, Elstan Fernandez, Lakshman Singh Yadav; Publisher Zed Kuailz Publishers; Year: 2020; ISBN 9788194710608. 3. High Voltage Engineering by M.S. Naidu, V Kamaraju; Publisher Tata McGraw–Hill.

Program	n		B.E. – Marine Engineering													
Course	code		Соі	urse Na	me					L		Т		Р		С
241ME1	A64TR		Ма	rine A	uxiliar	y Macł	ninery	II		2		1		0		3
Year / S	emeste	r	III	Year / `	VI Seme	ester				Conta	act hou	rs/Wee	k	3	hrs	
				Humar Social	iities ar Science	nd	Ма	nagem	ent	Pro	ofessior	nal Core	e 1	Professio	onal Ele	ective
Course	rategory	7		✓												
Pre regi	isite	r														
Course			1	De (K	escribe 2)	the de	sign co	nsidera	ations a	and op	eration	of eva	porator			
objective	es		2	2 Explain the design and construction of steering gear systems. (K2)												
			3	3 Demonstrate knowledge of shaft alignment methods and shafting components. (K3)									K3)			
			4	4 Understand the process of types and operation of thrusters. (K3)												
			5	Id	entify a	and ex	plain t	he cori	rosion p	preven	tion an	d ventil	ation s	ystem (	K2)	
			6	Ap pr	ply safopulsio	ety pro n syste	cedure ms. (K	es and 1 4)	mainter	nance p	oractice	es for s	teering	gear, sh	afting,	and
			CO	1 Ap	ply pri	nciples	of des	ign and	d opera	tion to	effecti	vely ut	ilize ev	aporato	rs. (K3)	
		-	CO	2 De	monsti	ate pr	oficiend	cy in op	erating	and m	aintain	ing ste	ering g	ear syste	ems. (Ki	2)
		-	CO	3 De	Demonstrate proper shaft alignment and maintenance techniques. (K2)											
outcome	s		CO	Lonauct inspections of thrusters and propellers.(K3)												
		Ī	CO	Summarize corrosion prevention system and ventilation system.(K2)												
			CO	6 Ar	alyze s	afety n	neasure	es and	mainter	nance p	orotoco	ls for s	teering	gear, sh	afting,	and
				pr	opulsio	n syste	ms. (K	4)							1	
POs/ COs	P01	PC	)2	P03	P04	P05	P06	P07	PO8	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	3		3	1	1	-	-	-	3	-	-	-	2	-	1	-
CO2	3		3	2	2	-	-	-	3	2	-	-	2	-	1	-
CO3	3		3	2	2	-	-	3	3	2	-	-	2	2	-	-
CO4	3		3 2 2 - 3 - 3							3	-	-	3	2	2	-
C05	3		3	2	2	-	3	3	3	2	-	-	2	2	2	-
C06	3		3	2	2	-	3	3	3	3	-	-	3	3	2	-
Average	3.00	3.	00	1.83	1.83		3.00	3.00	3.00	2.40			2.33	2.25	1.60	
Correlatio	on level			1.5	1.Slight (Low) 2. Moderate					(Medium) 3. Substantial (High)						



UNIT-I		EVAPORATORS	12 Hours								
Principle of oper Reverse osmosis cooling water fro arrangement of d	ation and cons . Efficient oper m diesel engine listilled water f	truction of vacuum evaporator, flash evaporator, multiple effect e ration and methods of improving efficiency. Layout of arrangemente. Automatic control of salinity. Care and maintenance. Distillers and or drinking purpose.	vaporator and nt with use of d conditioning								
Competency Num	nbers	4.1.6									
UNIT-II		STEERING GEAR	12 Hours								
Design considera of telemotor syst steering gear pla	tion and constr em and huntin nts. Safety dev	ruction of electro-hydraulic (rams and rotary vane types) steering g g gear mechanism. Emergency steering arrangement. Care and ma ice. SOLAS requirements of steering gear system including single fa	gear. Function aintenance of ilure criteria								
Competency Nun	nbers	4.1.7									
UNIT-III		SHAFTING	10 Hours								
Methods of shaft alignment, constructional details and working of thrust blocks. Intermediate shaft bearing. Oil & water lubricated stern tubes. Air Sealing system. Stresses in tail end, intermediate and thrust shafts. Tail shaft and bearing condition monitoring (survey requirement).											
Competency Num	nbers	4.1.5									
UNIT-IV		THRUSTERS & PROPELLERS	10Hours								
Different types of thrusters. Bow thrusters, Azimuth, side thrusters, retractable thrusters, controllable pitch propeller, Fixed pitch propeller and water jet propulsion.											
Competency Num	nbers	4.1.5									
UNIT-V	CC	ORROSION PREVENTION &VENTILLATION SYSTEM	10 Hours								
Basic principle of Ferrous Ion gene used on hull. Principle of opera turbo blowers	<sup>2</sup> corrosion, Typ rator. Types of ation. Design co	bes of corrosion, Corrosion prevention system: Sacrificial Anode, MC pipeline coatings ( rubber, epoxy) and laggings using onboard. Vari onsideration, construction & operational details of blowers. etc. Rot	GPS, ICCP, ous paints ary blowers,								
Competency Nur	ihers	4.3.4									
dompetency man		Te	otal: 54Hours								
Text Books:											
1. Marine au 2. SOLAS 20	ixiliary machin 09 consolidated	ery - H.D GEORGE, 7 <sup>th</sup> edition, Butterworth Heinemann Ltd. 1 edition, IMO Publication.									
<b>Reference Book</b>	s:										
1. MARPOL	2006, ISBN-10	8175980702, IMO Publication.									
2. FSS Code,	2015 Edition,	IMO Publication.									
3. Internatio Internatio	onal Safety Guid onal Ltd. ISBN-	le for Oil Tanker and Terminals (ISGOTT), 6 <sup>th</sup> edition, Witherby Sea 10 1856099180	manship								



Program		B.E. – Marine Engineering														
Course co 241ME1A	de 64TS	Cou Ma	irse Na r <b>ine In</b>	me t <b>ernal</b>	Comb	ustion			L		Т		Р	С		
		Eng	gines -	III					1	1 1			0 2			
Year / Se	mester	III Y	/ear/	VI Sem	ester				Contact hours/Week				2 hrs.			
		Hu So	maniti cial Sc	es and iences	M	anager	nent co	ourses	]	Professi	onal Cor	e	Profess	sional Ele	ective	
Course											✓					
category		Ba	asic Sc	ience	E	Engineering Scie				Open	Elective		Mandatory			
Due ve mui	-:+ -															
Pre requi	site		To amply the Deposite and Challenges of Dual Evel Systems Appliesticus and													
			1	Future	Trends	ie bei s. (K2)	ients a		menge	s of Dua	ai ruei s	ystems,	Арриса	ations at	lu	
Course	Course			To exp nannei	explain Dual fuel diesel electric (DFDE) systems, in a clear and informative nner. (K2)											
objectives	objectives		3	То ехр	• explain the Construction and operation of MEGI and MEGA engines. (K2)											
		4	To exp	lain so	aveng	ing, fue	el and e	exhaus	t systen	ns of dua	al fuel e	ngines s	succinctl	y. (K2)		
			5	To exp	lain Lu	bricati	on, Fue	el and g	gas har	ndling of	gas eng	jine. (K2	2)			
		CC	01	Explair	the	Benefit	ts and (	Challer	nges of	f Dual Fi	iel Syste	ems. (KZ	2)			
		CO	02	Explain Dual fuel diesel electric (DFDE) systems. (K2)												
Course			)3	Explain the construction and operation of MEGI and MEGA engines. (K2)												
outcomes		CC	)4	Explain Scavenging, fuel and exhaust systems of dual fuel engines. (K2)												
		CC	)5	Explain Lubrication, Fuel and gas handling of gas engine. (K2)												
POc/		CO	06	Summa	arize tl	ne deve	elopme	nts in	the de	sign of d I	uel fuel e	engine. (	[K3]			
COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	
CO1	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2	
CO2	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2	
CO3	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2	
CO4	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2	
CO5	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2	
CO6	3	3	3	-	-	-	-	2	2	-	-	-	3	2	2	
Average	3.00	3.00	3.00					2.00	2.00				3.00	2.00	2.00	
Correlation	ı level		1.	Slight	(Low)		2.1	Modera	ate (M	edium)		3. S	ubstanti	ial (High	)	

UNIT-I	Introductio	n to dual fuels	6 Hours								
Definition and Types	of Dual Fuels,	Repetits and Challenges of Dual Fuel Systems, Applications and F	uture Trends.								
Competency Numbers	S	(Deemed to be University Linker Section 3 of USC Act 1966)									
UNIT-II	Constructio	on of Dual fuel diesel electric(DFDE) systems	8 Hours								
Introduction to DFDE and Examples, Future	Systems, Com Directions an	nponents of DFDE Systems, Construction and Integration Process, ad Innovation.	Case Studies								
Competency Numbers	4.1.1										
UNIT-III	UNIT-III Construction and operation of MEGI and MEGA										
Introduction to MEGI and MEGA Engines, Key Components of MEGI and MEGA Engines, Construction Process for MEGI and MEGA Engines, Operation and Control Systems for MEGI and MEGA Engines, Advantages and Challenges of MEGI and MEGA Technology.											
Competency Numbers	S	4.1.1									
UNIT-IV	Scavenging,	, fuel and exhaust systems of dual fuel engines	8 Hours								
Scavenging System in Engines, Fuel Storage	Dual Fuel Eng and Supply Sy	gines, Fuel Injection System in Dual Fuel Engines, Exhaust System ystem, Integration and Control Systems.	in Dual Fuel								
Competency Numbers	S	4.1.1									
UNIT-V	Lubrication	h, Fuel and gas handling	6 Hours								
Lubrication System, F	uel Handling	System, Gas Handling System, Combustion System, Emission Cont	rol system.								
Competency Numbers	S	4.1.1									
		TOTAL	36 Hours								
Text Books:											
1. Marine Auxiliary m	achinery - H.I	D. McGeorge.									
2. The Running & Mai	ntenance of M	Iarine Machinery – J. Cowley.									
Reference Books:											
1. Basic Marine Engin	eering- J.K. Dł	nar.									
2. Marine Engineering	2. Marine Engineering Practice - IMEI Publication.										
3. General Engineerin	g Knowledge	for Marine Engineers - Reeds Volume: 8.									
4. Marine Machineries	4. Marine Machineries- Operation & Maintenance – T.B. Srinivasan, IMEI Publication.										
5. Gas and DUAL-FUE	L Engines –Ke	ees Kuiken, Target global energy training.									



Program	n		B.E. – Marine Engineering												
Course c 241ME1	ode A65TA		Course Profes	Name sional	Electiv	e-I(Ma	rine Po	llution		L	Т		Р		С
			Prever	ntion A	nd Safe	ety)				3	0		0		3
Year / Se	emeste	r	III Year	: / VI Se	emester				Con	tact hou	irs/W	eek 03 ł	nrs		
			Hun Soci	nanities ial Scier	and	1	Manager cours	nent	Pro	ofessior	al Cor	e F	Professi	onal Ele	ctive
Course c	ategor	y -												$\checkmark$	
			Bas	sic Scie	nce		Enginee Sciend	ring ce	(	Open El	ective		Ма	ndatory	7
Pre requ	isite		1	Toot	mmani	zo tho	nogativ	. imn	acta of	monin	noll	ition of	n tha a	nuinonn	nont
			1	wildli	fe, and	human	health.	(K3)	acts of	maim	e pom		ii the e		nent,
			2 To explain the procedures required to effectively implement the MARPOL conventions and ensure compliance with international regulations in a clear and informative manner (K2)										RPOL ar and		
Course o	bjectiv	res	3 To compile and present the safety characteristics and bunkering plan required for safe and efficient bunkering operations in a clear and informative manner. (K2)												
			4	4 To summarize of the essential features of COW, IG systems, and safety devices, emphasizing their importance in ensuring safe and efficient operations (K3)									5, )		
			5	To ex	plain th	ne corr	ective a	ctions 1	necessa	ary to co	ontrol	SOX and	d NOX (	emissio	, 1S,
				as we huma	ll as otl n healt	ner air h in a d	pollutan clear and	ts, and d inforr	minim native	ize thei manne	r impa r (K2)	ct on th	e envir	onment	and
			C01	Sumn	narize t	he ill e	ffects of	marine	e pollut	ion (K3	)				
			CO2	Expla	in the p	orocedu	ures to ii	npleme	ent the	MARP	OL con	vention	s (K2)		
Course o	utcom	05	CO3	Comp	ile the	safety	characte	ristics	, bunke	ering pla	an for	bunkeri	ng ope	rations	(K2)
Course o	utcom	C3	CO4	Sumn	narize 1	he imp	oortant f	eature	s of CO	W, IG S	YSTEM	IS and s	afety de	evices (I	(3)
			C05	Expla Pollut	in the c tion (K2	orrecti 2)	ive actio	ns to c	ontrol	SOX an	d NOX	pollutio	ons and	l other a	air
		F	C06	Analy	ze and	take m	easures	to cont	rol ma	rine en	vironn	nental p	rotectio	on (K4)	
POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2	2	1	1	-	3	3	3	-	-	-	3	3	1	-
CO2	2	1	1	-	-	-	-	3	-	-	-	-	3	-	-
CO3	3	3	2	2	-	3	1	2	-	-	-	-	3	2	-
CO4	2	2	1	1	1 - 2 3 1 2 3 1 -									-	
CO5	2	2	-	-	2 3 3 3 3 1 -										
C06	3	3	2	1	-	3	3	3	1	2	-	3	3	2	-
Average	2.33	2.17	1.40	1.40         1.25         2.60         2.60         2.50         1.00         2.00         2.75         3.00         1.40											
Correlatio	on leve			1.Sligh	it (Low	)	2. M	oderat	e (Med	ium)		3. Su	bstanti	al (High	)



UNIT-I	BILGE ,CAR	GO, BALLAST SYSTEM & OWS	10 Hours							
Layout of Bilge s Oil water separa procedure.	ystem, Cargo tor – differen	oil system and Ballast system. It types. Operation of OWS and its maintenance. 15 ppm alarm workin	g and testing							
Competency Nur	nbers	10.1								
UNIT-II	SEWAGE TR	REATMENT PLANT	10 Hours							
Basics of Aerobic and Anaerobic bacteria. Different types of sewage treatment plant- construction and working. Vacuum toilet system working and pipeline diagram. Sewage discharge test and its procedure.										
Competency Nur	nbers	10.1								
UNIT-III	INCINERAT	OR	12 Hours							
Garbage compac Garbage segrega	tor- Construction, manage	ction and Working. ment and disposal.								
Competency Nur	nbers	10.1	[							
UNIT-IV	NOx & SOx	REDUCTION METHODS	12 Hours							
NOx- Selective Ca High pressure ar SOx-Scrubber: co of scrubber wast	atalytic React nd Low pressionstruction an ce.	for and Exhaust Gas Recirculation: working and construction. Layout of ure EGR). nd working. Layout of scrubber system for high Sulphur fuels. Handlin	SCR and EGR(							
Competency Nur	nbers	10.1								
UNIT-V	BUNKERING	G	10 Hours							
Bunkering-check Different bunker SOPEP, Implicati	klists prepara sample colle ons of bunke	ations, pre-bunkering, During bunkering and After bunkering. ection. Bunker calculation. r spill.								
Bunkering-check Different bunker SOPEP, Implicati Competency Nur	klists prepara sample colle ons of bunke nbers	ations, pre-bunkering, During bunkering and After bunkering. ection. Bunker calculation. r spill. 10.1								
Bunkering-check Different bunker SOPEP, Implicati	klists prepara • sample colle .ons of bunke nbers	ations, pre-bunkering, During bunkering and After bunkering. ection. Bunker calculation. er spill. 10.1 <b>T</b> C	otal: 54 Hours							
Bunkering-check Different bunker SOPEP, Implicati Competency Nur <b>Text Books:</b>	klists prepara sample colle ons of bunke nbers	ations, pre-bunkering, During bunkering and After bunkering. ection. Bunker calculation. r spill. 10.1 Te	otal: 54 Hours							



Program	B.E N	Marine Engineering, ECE and Mechanical Engineering												
Course Code	Cours	se Name	:	L	Т	Р	С							
242051A6311	Adva	nced Computing Sc	ience	3	0	0	3							
Year and Semester	I Year	& II semester		Contact hou	rs per week									
Prerequisite course	Nil			птя.5										
Course category	Hum	nanities and Social Sciences	Management courses	Profess	ional Core	Professional Elective								
		Basic Science	Engineering Science	Open	Elective	Mandatory								
			$\checkmark$											
Course Objective	Address fundamental concepts and abstractions in computer architecture,													
	2	Build an understanding of the fundamental concepts of computer networking and device.												
	3	Gain a historical perspective of AI and its foundation.												
	4	Study of Data Science and Machine Learning.												
	5	Study of IoT and Information Security												
	6	Applications of a	dvance computing.											
Course Outcome	CO1	Learning the basi	c structure of compute	er, operation	and instruction	ons								
	CO2	Understanding of	the fundamental concept	s of compute	r networking.									
	CO3	Study of the desig	gn of intelligent comp	utational tecl	nniques									
	CO4	Understanding of	f the Data Science and	Machine Le	arning.									
	CO5	Identify the Components that forms part of IoT Architecture and Information Security												
	CO6	Application of IoT, Data Science and Machine Learning.												



POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	-	-	-	-	-	-	-	3	1	1
CO2	3	2	3	2	1	-	-	-	1	1	-	2	3	2	1
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	3	1
CO4	3	3	3	3	-	-	-	-	1	1	-	2	3	2	2
CO5	3	2	3	2	2	-	-	-	1	1	-	2	3	2	2
CO6	3	2	3	2	1	-	-	-	-	1	-	-	3	1	1
Average															
COI	CORRELATION LEVELS				1. SLIGHT (LOW)				ODERAT	TE (MED	IUM)	3. SUBSTANTIAL (HIGH)			

#### UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM

Functional Units - Basic Operational Concepts - Performance - Instructions: Language of the Computer - Operations,

Operands - Instruction representation - Logical operations - decision making - MIPS Addressing.

#### UNIT II BASICS OF COMPUTER NETWORK

Overview of Networking: An introduction to computer networking, Network types (LAN, WAN, MAN), Network topologies, introduction to internet and its uses. Define computer network, identifying basic networking elements and describing roles of Clients, Server, Peers, and Transmission Media . Network Connectivity devices, Modern repeaters, Hubs Bridges, Multiplexes and routers

#### UNIT III INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Concept of AI, history -current status – scope - agents – environments - Problem Formulations - Review of tree and graph structures - State space representation - Search graph and Search tree- Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems.

### UNIT IV INTRODUCTION TO DATA SCIENCE AND MACHINE LEARNING

Concept of Data science - Application areas - Traits of Big data – Data Science tools - Overview of machine learning concepts – Types of Learning: Supervised, Unsupervised and Semi- Supervised Learning -ML tools.

## UNIT V BASICS OF IOT AND INFORMATION SECURITY

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT- Application of IoT- IoT Tools- Core Information Security Principles, CIA (Confidentiality, Integrity, Availability), Information Security Management Governance, Security Policies

## Controlled

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9



**Text Book:** 

1. David A. Patterson, John L.Hennessy, "Computer Organization and Design", Fifth Edition, Morgan Kaufmann Publishers, 2014.

#### **Reference Books:**

- 1. Carl Hamacher, Zvonko Vranesic, safwat Zaky, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2011.
- 2. William Stallings, "Computer Organization and Architecture", Tenth Edition, Pearson Education, 2015.

#### Reference web site:

**Total :45 Hours** 

PROGRAM		]	B.E. Marine Engineeri	ing		B.E. Marine Engineering												
Course		Course Name:		L	Т	Р	C											
Code	Pov	wer electronics and electri	cal Propulsion															
241ME1A				2	1	0	3											
64TP																		
Year and Semester		III Year ( VI Semest	ter)	Contact hours per week 3 hrs														
	Humani	ties and Social Sciences	Management courses	Professio Core	nal	Profess Electi	ional ive											
Course				$\checkmark$														
category		Basic Science	Engineering Science	Open Elec	tive	Mandatory												
	1	1 To illustrate the basic operation of power semiconductor devices, including their types, characteristics, and applications, in a clear and informative manner (K2)																
	2	To provide solutions to and drives used on boar	common problems as d ships, in a clear and	sociated with l informative	ı conv mann	erters, inve er. (K2)	rters,											
Course Objective	3	To categorize the topolo ships, including their con informative manner. (K2	gy of various electric mponents, functions, ?)	propulsion s and applicati	ystem ons, ir	s used on bo n a clear and	oard l											
	4	To explain the safety pra	actices required wher	n working wit	th high	n voltage												
		equipment on board shi clear and informative ma	ps, including precauti anner. (K2)	ions, procedu	res, ai	nd regulatio	ns, in a											
	5	To design an optimal layout for DC and AC drives on board ships, including their placement, wiring, and cooling systems, in a clear and informative manner. (K4)																



	6	To analyze the operation of drives used on board ships, including their functions, performance characteristics, and maintenance requirements, in a clear and informative manner. (K3)
Course	At the end	l of the course the student will be able to
Outcome	C01	Illustrate the basic operation of power semiconductor devices (K1)
	CO2	Solve the problems of converter, inverter and drives used on boards (K2)
	CO3	Categorize the topology of various electric propulsion systems used on boards (K2)
	C04	Explain the safety practices on high voltage equipment's on boards (K2)
	C05	Design the layout of dc and ac drives on boards. (K4)
	C06	Analyze the operation of Drives (K3)
	•	

POs / COs	P01	P02	P03	P04	PO5	P06	PO7	PO8	P09	PO1 0	P01 1	P01 2	PSO 1	PSO 2	PS
C01	3	2	1	1	1	3	1	1	1	3	1	1	3	1	
CO2	3	3	2	2         1         1         2         3         3         1         1								3	2		
C03	3	3	2	2	1	1	2	3	3	3	1	2	3	2	
C04	2	2	1	1	1	3	2	3	-	3	1	2	3	2	
C05	3	3	1	1	1	3	2	3	3	3	2	2	3	3	
C06	3	3	2	2	1	1	1	3	3	3	3	-	3	2	
Ave rage	2.83	2.67	1.50	1.50	1.00	2.00	1.50	2.50	2.16	3.00	1.16	1.30	3.00	2.00	1.
COR	RELAT	ION LEV	VELS		1. Sligh	t (Low)		2. M	oderat	e (Medi	um)	3. 9	Substar	itial (Hi	gh)
Unit: 1 Structu snubbe when r dimme Compe Unit: 2 Variabl armatu	Unit: 1POWER SEMI-CONDUCTOR DEVICES(12 Hours)Structure, operation and characteristics of SCR, TRIAC, power transistor, MOSFET and IGBT. Driver and snubber circuits for MOSFET - Turn-on and turn-off characteristics and switching losses List the precautions when replacing MOSFETs and IGBTs in electronic circuits Determine methods to test a TRIAC in chart-table dimmerCompetency Numbers6.1.2.aUnit: 2CONVERTORS, INVERTORS & DRIVESVariable speed drive Hardware development, Direct current (DC) drives, Six thyristor full convertor. Duel-														
commu curren	itated in t fed inv	vertor, nverter verter.	Induc	tion mo	otor var	iable sp	beed dr	ives. Cy	clocon	verter.	Auto se	equenti	ally con	nmutat	ed
Compe	tency N	lumber	s 6.1	2.a											
Unit: 3 Electric inversi	c Propu on, Co	llsion So nvertor	EI cheme, • types	ECTRIC Power , Propu	C PROP supply ulsion	ULSION networ system	l - I rk, Revi opera	iew of r tionA	notor o utomat	peratio ic sequ	n, Cont iential	rolled l startin	(10 Rectific g of p	Hours) ation a ropulsi	nd on
machir	nery aft	er resto	oration	of pow	er after	· blacko	out								
Lompe	tency N	umber	S 6.]	.1.e, b.	1.2.a		I II						(10	Lours)	
UIIII: 4			L L	ICC I KI	ι ρκυρ	OF2IOL	N — 11						110	nours)	



Harmonics, Use of Harmonic filters, AC drive with controllable pitch propeller, Salient feature of diesel electric											
Propulsion, Advantag	es and disadv	vantages of elect	rical Propulsio	n. Shaft generators	, Synchronous						
condenser	enser										
<b>Competency Numbers</b>	icy Numbers 6.1.1.e, 6.1.2.a										
Unit: 5	HIGH VOLTAGE PRACTICE (12 Hours)										
Power system layout of a high voltage system on board the ship, Applications of high voltage systems or board for thrusters, Azipods and main propulsion. Earthing for HV Installation.											
<b>Competency Numbers</b>	6.1.1.d										
			Total: (54 Hor	ırs)							
Text Books:											
1 Elstan.A. Fe	Elstan.A. Fernandez ,Marine Electrical Technology ,5th Edition.										
2 Dr. P.S.Bimb	Dr. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003										
Reference Books:											
1 M.D. Singh a	M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.										
2 Edmund G ,	Marine Electri	cal Installation & I	Diesel Electric P	ropulsion.							

PROGRAM	BE-Marine Engineering									
Course Code	Naval Arc	hitecture-II	L	Т	Р	С				
241ME1A61TL	ivavai ni c		3	0	0	2				
Year and Semester	III Year (s	emester VI)	Contact hours per week							
Prerequisite course	1	NIL	(3Hrs)							
	Humanities and Social Sciences	Management courses	Profes	sional Core	Professional Elective					
Course category										
	Basic Science	Engineering Science	Ope	n Elective	Mandatory					
	$\checkmark$									
Course Objective	<ol> <li>To provide students with a comprehensive understanding of ship resistance and powering principles. (K1)</li> <li>To equip students with the knowledge and skills necessary to analyze, evaluate, and optimize ship resistance and propulsion systems. (K1)</li> </ol>									
Course Outcome	After completion of the course, the students will be able to: 1. Summarise the principles of ship resistance, including frictional and residuary resistance. (K2) 2. Analyze the factors affecting ship powering and evaluate effective power calculations. (K3)									



		3. Ex	3. Explain the concepts of ship bilging and its impact on stability and safety. (K2)												
		4. Ap	4. Apply Froude's and Reynolds's numbers in ship resistance analysis. (K3)												
		5. Eva	5. Evaluate different types of propellers and their selection criteria for optimal propulsion. (K4)												
		6. Demonstrate proficiency in assessing hull-propeller interaction and optimizing propulsion system efficiency. (K3)													
POS/COS	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	3	2	2	-	-	-	-	-	-	-	-	2	3	3	3
C02	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
CO3	3	2	2	-	-	-	-	-	-	-	-	2	3	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
C05	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3
C06	3	2	2	-	-	-	-	-	-	-	-	2	3	3	3
AVERAGE	3	2.5	2.5	3	2.7	-	-	-	-	-	-	2	3	3	3
CORRELATI	ION LE	LEVELS 1. SLIGHT(LOW) 2. MODERATE(MEDIUM) 3. SUBSTANTIAL (HIGH						IGH)							

#### **UNIT 1: INTRODUCTION TO SHIP RESISTANCE**

Froude's and Reynolds's number, components of ship resistance such as frictional resistance, wave making resistance, eddy making resistance and air & wind resistance, Laws of comparison.

#### **UNIT 2: FRICTIONAL AND RESIDUARY RESISTANCE**

Understanding frictional resistance and its calculation methods, Concepts of residuary resistance and its significance in ship hydrodynamics, Effects of hull form and surface roughness on frictional and residuary resistance.

#### **UNIT 3: POWERING OF SHIPS**

Effective power calculations, Admiralty coefficient, ships co-relation factor (SCF), measuring ships performance in terms of speed, fuel consumption and displacement, Model ship correlation, Determination of effective horsepower. Relation between power, speed, displacement and fuel consumption, specific fuel consumption, fuel consumption for the voyage.

#### **UNIT 4: PROPULSION OF SHIPS**

Propeller action and calculations of propeller slip, Selection of suitable types of propellers (fixed pitch, variable pitch, ring propeller) Special types of propellers (Kort nozzles, VoithSchneider propeller) Geometrical properties of screw propeller thrust deduction and wake fraction, ship model correlation, ship trials. Law of similitude for propellers, efficiencies such as open water efficiencies, relative rotative efficiency, hull efficiency etc.

#### **UNIT 5: HULL-PROPELLER INTERACTION**

Understanding the interaction between the hull and propeller, Effects of hull design, appendages, and propeller positioning on propulsive efficiency, Strategies for optimizing hull-propeller interaction to enhance overall propulsion system performance.

## Controlled

#### 10 Hrs.

#### 12 Hrs.

10 Hrs.

12 Hrs.

10 Hrs.



#### **Total: 54 Hours**

#### **TEXTBOOKS:**

- 1. **"Principles of Naval Architecture" by E.C. Tupper -** Comprehensive resource covering fundamental principles of resistance, propulsion, and hull design.
- 2. "Marine Propellers and Propulsion" by John Carlton In-depth guide focusing on propeller selection, design, and performance analysis.

#### **REFERENCES:**

- 1. "Ship Resistance and Propulsion" by Anthony F. Molland Detailed reference covering various aspects of ship resistance, including frictional and residuary resistance.
- 2. **"Introduction to Naval Architecture" by Bruce Johnson -** Provides foundational knowledge on ship design, including hull-propeller interaction and model ship correlation.

Program		B.E. – Marine Engineering											
Course Code		Course Name		L	Т	Р	С						
241ME1A64TT	Marin	e Safety Emergency Practice	es-I	3	0	0	3						
Year / Semester	III	Year / V Semester	Со	Contact hours/Week : 3 hrs									
	Humanities and Social Sciences	Management courses	Profession	al Core	Profess	Professional Elective							
Course category			✓										
Pre requisite				·									
	1	Explain main engine safeties and trouble shooting. (K3)											
	2	Explain safe / emergency temporary repairs. (K3)											
	3	Explain safety and emergency procedure for operation of plant machinery.(K2)											
Course objectives	4	Explain Inspection, Survey and Monitoring of security activities. (K3)											
	5	Summarize misc. safe working practices. (K2)											
	6	6 Demonstrate auxiliary machinery troubleshooting. (K2)											
	On completion of the course the students will be able to												



C01				Apply main engine safeties and trouble shooting. (K3)											
C02				Apply safe / emergency temporary repairs. (K3)											
Course ou	<b>t</b> a a ma a		CO3	Explain safety and emergency procedure for operation of plant machinery (K2)											
Course ou	come	s	CO4	Apply Inspection, Survey and Monitoring of security activities. (K3)											
			CO5 Apply misc. safe working practices( K4)												
			C06	6 Demonstrate auxiliary machinery troubleshooting. (K2)											
POs/COs	P01	P02	PO3	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	3	2	2	2		2		3				3	3	3	
C02	3	2	2	2		2		3				3	3	3	
CO3	3	2	2	2		2		3				3	3	3	
CO4	3	2	2	2		2		3				3	3	3	
CO5	3	2	2	2		2		3				3	3	3	
C06	3	2	2	2		2		3				3	3	3	
Average	3.00	2.00	2.00	2.00		2.00		3.00				3.00	3.00	3.00	
Correl	ation le	evel	1.Slig	ht (Lov	v)	2	. Mode	erate (	Mediu	m)	3. Substantial (High)				



UNIT-I		MAIN DIESEL ENGINE SAFETIES & TROUBLESHOOTING	10 Hours								
Troubleshoot prevention of kno	Troubleshooting related to various types of marine propulsion diesel engines – causes, effects, remedies and prevention of knocking at TDC and BDC, Black smoke from funnel, Turbocharger surging, scavenge fire, Air starting line explosion, crankcase explosion, Exhaust uptake fire, OMD alarm.										
Competency N	umbers	4.2,4.3,4.6,4.3.1,9.1									
UNIT-II		SAFE EMERGENCY/ TEMPORARY REPAIRS	10 Hours								
Use of va	arious types	of adhesives, sealants, packing materials in carrying out temporary method	s.								
Application: Sea water pipeline leak- Minor & Major, Centrifugal pump casing pump crack.											
Competency Numbers 8.4,9.1											
UNIT-III	SAFE	TY AND EMERGENCY PROCEDURES FOR OPERATION OF PLANT MACHINERY INCLUDING CONTROL SYSTEM	14 Hours								
Protective/safety of	levices inco	rporated in each system in a ship's propulsion machinery stating that prote devices isolated from their control systems.	ctive/safety								
	- Main eng	ine shut down such as over speed, lubricating oil low pressure, etc.									
		- prime mover of generator shut down									
	- Bo	piler shut down such as low water, non-detect flame eye etc.									
		- purifier shut down									
	- te	esting functions/performances of protective/safety devices									
		in the ship's statutory survey									
Competency Nu	umbers	7.1,7.5.1,4.3.1,9.1									
UNIT-IV	INSP	ECTION, SURVEYS AND MONITORING OF SECURITY ACTIVITIES	12 Hours								
Procedure for conducting inspections and surveys and monitoring of security activities specified in ship security plan; security related contingency plans Knowledge of security documentation; knowledge of enabling recognition of political security threats; knowledge of enabling recognition of weapons; dangerous substances and devices, and awareness damage they can cause; crowd management and control techniques; handling security information and security related communications; Knowledge of techniques for monitoring _restricted areas; knowledge of controlling access; and restrict the areas on board; methods of effective monitoring of deck and surrounding area Methods of controlling the embarkation; dis- embarkation and access while onboard crews & their effects; knowledge of various equipment and systems, including their limitations; need for testing calibrating security systems and equipment's.											
Competency Nu	umbers	18.2,18.3,9.1									
UNIT-V		MISC SAFE WORKING PRACTICES	8 Hours								
EXPLAIN THE FOLLOWING FROM SAFETY ASPECTS: LSA & FFA, Bunker operation safeties, BDN, ORB, Garbage record book, Handling of chemicals, Purpose of MSDS, Local control of ME, Telegraph & fuel control, C/O of ME controls, Immobilization certificate, Critical & hazardous operations, Critical activities check lists, Complete											



understanding of enclosed space, Local maneuvering, Working aloft, Black out condition. Explain with scenario, Dead ship condition explain with scenario, Causes of power failure, Difference hazard & harm, ISM safety measures, Bridge & ECR handing over controls, Explain SMS, Explain SOLAS, Explain IMO, Permits and check lists, Electrical isolation, ECB & MCB power change over, Explain locked out and tagged out, Explain tool box meeting, Emergency generator manual starting from B/out, E/R type of accidents and actions, Explain declaration of Security, Security levels, Drills and exercises related to ship security, Critical equipment's and its maintenance, PMS, ISPS, SSP, Near Miss, Accidents reporting, UMS ships and operation requirements.

Competency Numbers

9.10

#### Total: 54 Hours

**Text Books:** 

1. Taylor D. A., Introduction to Marine Engineering, revised second edition, Butterworth-Heinemann, 1999 ISBN 07506 25309.

 McGeorge H. D., Marine Auxiliary Machinery, seventh edition, Butterworth-Heinemann, 1995 ISBN 0 7506 4398 6.

3. Shipboard Operations, H. I. Lavery, 2nd edition, Published February 15, 1990 by Routledge.

4. Original Equipment Manufacturers Manuals For On Board Equipments.


Program	B.E. – Marine Engineering										
Course code	Course	Name	ago and	L	Т	Р	С				
241ME1A04FV	Automa	tion Labo	pratory	0	0	2	1				
Year / Semester	IV	Year / VI	Semester	С	ontact hou	rs/V	Week: 2				
	Humani Social S	ities and Sciences	Management courses	Professio	onal Core	Professional Elective					
Course estagons				۲	/						
Course category	Basic S	Science	Engineering Science	Open E	Elective	Mandatory					
	1	Determi characte	ine temperature eristics. (K2)	ire using thermocouple and analyze its							
Course objectives	2	Utilize F characte	RTD to measure eristics. (K2)	temperatu	re and und	erst	and its				
	3	Examine linear di	e the characteris isplacement. (K	stics of LVE 3)	T transduc	er a	ind measure				
	4	Examine	Examine the characteristics of strain gauge. (K3)								
	5	Develop	Develop skills troubleshoot pressure switches effectively. (K2)								
	6	Evaluate float switches, perform bilge alarm circuit, and troubleshoot (K3)									
	On com	pletion of	the course the	student wi	ll be able to	)					
	C01	Evaluate characte	e temperature u eristics. (K3)	sing therm	ocouples a	nd a	nalyze their				
	CO2	Analyze temperature using RTDs and understand their characteristics. (K3)									
Course outcomes	CO3	Demons measure	strate proficience e linear displace	y in utilizin ment. (K2`	ng LVDT tra	nsd	ucers to				
	CO4	Understand and apply the characteristics of strain gauges in practical applications. (K2)									
	C05	Develop skills to troubleshoot pressure switches in various scenarios. (K2)									
	C06	Examine switches, perform bilge alarm circuits, and troubleshoot them appropriately. (K2)									

POs/ COs	P01	PO2	PO3	PO4	PO5	P06	PO7	P08	P09	P010	P011	P012	PS 01	PSO2	PSO3
C01	2	3	2	2	3	-	-	-	2	2	-	3	3	3	3



CO2	3	3	2	2	3	-	-	-	2	2	-	3	3	3	3
CO3	3	3	2	2	3	-	-	-	2	2	-	3	3	3	3
CO4	3	3	3	2	3	-	-	-	2	2	-	3	3	3	3
C05	3	3	2	2	3	-	-	-	2	2	-	3	3	3	3
C06	3	3	3	2	3	-	-	-	2	2	-	3	3	3	3
Average	2.8	3	2.3	2	3	-	-	-	2	2	-	3	3	3	3
Correlat	ion Lev	el	1.Sl	ight (Lo	ow)		2. Mod	lerate (l	Medium	1)		3. Subst	antia	l (High)	
<ul> <li>a) To measure the temperature of given heat source using thermocouple.</li> <li>b) To Exercise the characteristics of thermocouple.</li> <li>2 a) To measure the temperature of given heat source using RTD</li> <li>b) To Exercise the characteristics of RTD</li> <li>3 a) Exercise the characteristics of LVDT transducer</li> <li>b) To measure the linear displacement using LVDT.</li> <li>4. To Exercise the characteristics of strain gauge.</li> <li>5. To Exercise the operation &amp; trouble shooting of pressure switch.</li> <li>6. a) To Exercise the operation &amp; trouble shooting of Float switch.</li> <li>b) To measure I to P &amp; P to I converter.</li> <li>8. Calibration &amp; testing of Pressure gauges &amp; Pressure switches using dead weight tester.</li> <li>9. Calibration &amp; testing of RTD and thermocouple.</li> <li>10. To Exercise the level process station using PID control by virtual instrumentation</li> <li>11. To Exercise the level process station using PID mode controls.</li> <li>12. Arithmetic operation, Timer, Counter operation using PLC <ul> <li>a) Interfacing of lamp and button with PLC for ON/OFF operation.</li> <li>b) Perform Delayed Operation of Lamp By Using Push Button.</li> <li>c) Combination of Counter and Timer for Lamp ON/OFF operation.</li> </ul> </li> </ul>															
Compet	tency N	umbers	5			P	.,	6.1	2B, 6.1	L.3A, 6.1.3	B, 6.4				
Text Books:															
1. Mari Distr	ne Cont ributors	trol Tec ; Year:	hnolog 2020; I	y 4h Ed SBN: 97	ition; B 789352	y J. Maj 139682	umder, 2.	Elstan	A. Ferna	andez; Pu	blisher: S	Shroff Pu	blish	ers and	
2. Appl Publ	ied Maı ishers a	rine Co Ind Dist	ntrol an tributor	d Autor s; Year:	mation; : 2019;	By J. M ISBN: 9	ajumde 78935	er, Elsta 213919	n A. Fei 4.	rnandez, l	Mahesh F	Patil; Pub	lishe	r: Shroff	
3. Prog	ramma	ble Log	ic Cont	roller R	egh, JA	Pearso	n								
Reference Bo	oks:														
4. Richa	4. Richard C. Dorf and Robert. H. Bishop, "Modern Control Systems", Pearson Education, 12th Edition, 2011.														
5. John J. D'Azzo, Constantine H. Houpis and Sttuart N. Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor and Francis Reprint, 6th Edition, 2014.															

PROGRAM	BE -Marine	Engineering			
Course Code	Course Name:	L	Т	Р	С
241ME1A65PP		0	0	2	1



			Powe	er Elec	tronics a	nd Eleo	ctrical F	Propulsi	ion						
Vooro	nd Son	octor		1	Lab III Voor (	orator <u>.</u> VI Som	y ostor)			<u> </u>	ntact h	ours no	or wool	2 Hrs	
Ital a	inu sen	lester		l	ill leal (	vi Sein	ester j			CO	intact ii	ourspe	er week	21115	
			Hu	imanit	ies and		Manag	ement		Professi	onal Co	ore F	Profession	onal Ele	ective
			So	cial So	ciences		coui	rses							
Cour	an anto	~~~~								·					
Cour	se cate	gory	В	asic S	cience	Eng	gineerii	ng Scier	nce	Open I	Elective	ò	Mai	ndatory	1
Cour	se Obje	ctive	1		To learn (K1)	about	differer	nt kinds	s of po	ower sem	icondu	ctor de	vices us	ed on b	oard
			2		To learn	about	convert	ters inv	erters	s and driv	res (K1)	)			
			3		To unde	rstand	about	various	elect	tric propu	ilsion s	ystems	(K1)		
			4		To learn	about	high vo	ltage pi	ractic	es on boa	rd (K1	)			
			5 A++b	and	To pract	ice Hig	h voltag	ge powe	er sys	tem(K1)					
			CO		Fynlain	the has	ic oper	ation of	f now	er semico	nducto	nr devic	es (K2)		
			C0	2	Discuss	the wo	rking p	rinciple	e of co	nverter. i	nvertei	r and di	rives us	ed on	
					boards.	(K2)	0 F	P		,					
Cour	se Outo	come	CO	3	Explain	the top	ology o	of variou	ıs ele	ctric prop	oulsion	system	s used o	on boar	ds.
					(K2)										
			<u> </u>	4	Explain	the safe	ety prac	ctices o	n high	<u>ı voltage</u>	equipm	<u>nent's o</u>	n board	s. (K2)	
				5	Design t	he layo	ut of do	c and ac	comp	es on boar	rds. (Ka	3) ric nan	alboard	a (V2)	
				0	Discuss,	labilica	ite, mst	all allu	comm		le elect	nc pan		IS. (KZ)	
POs										D01	D01	D01	DCO	DCO	DCO
/	P01	PO2	P03	P04	P05	P06	P07	P08	POS		P01	201	PS0	PS0	PS0
COs										0	1	Z	T	Z	3
C01	2	2	1	3	2	1	1	2	2	2	1	3	2	2	2
C02	2	2	1	3	2	1	1	2	2	2	1	3	2	2	2
C03	2	2	1	3	2	1	1	2	2	2	1	3	3	3	3
<u> </u>	2	2	3	3	2	1	1	2	2	2	1	3	3	3	3
	2	2	5	5	2	1	1	2	2	2	1	5	5	5	5
C05	3	3	2	2	2	1	1	2	2	2	1	3	3	3	3
C06	3	3	2	2 2 2 2 2 2 2 2 2 2										3	3
Aver	2.3	2.3	1.7	2.7	2	1.2	1.2	2	2	2	1.2	3	2.7	2.7	2.7
age	2.0	2.0	1.7	2.7	-	1.0	1.2			-	1.0	0	2.7	2.7	2.7
	orrelat	tion I as	تماد		1 Sligh	t (Low	0	2 1	Mode	rate (Med	ium)	3	Substa	ntial (I	Jigh)
			1015		1. 5ligi		J	<b>2.</b> 1	viouei		lullij		54556	inciai (1	ngnj
													(36	Hours)	
List of	Experir	nents:	fSCD	ימד המ											
$\begin{bmatrix} 1 & C \\ 2 & C \end{bmatrix}$	aracter	istics o	f MOSF	ET an	d IGBT										



- 3. AC to DC fully controlled converter
- 4. AC to DC half-controlled converter
- 5. Step down and step up MOSFET based choppers
- 6. IGBT based single-phase PWM inverter
- 7. IGBT based three-phase PWM inverter
- 8. Resonant DC-to-DC converter.
- 9. Study and obtain waveforms of three- phase half controlled bridge converter with R and RL loads.
- 10. Study and obtain waveforms of three-phase full controlled bridge converter with R and RL loads.

#### **Text Books:**

1 Dr. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003

- **Reference Books**:
- 1 M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.
- 2 Edmund G, Marine Electrical Installation & Diesel Electric Propulsion.

Program		B.E. – Marine Engineering         Course Name       L       T       P       C         Fire Fighting Laboratory       0       0       2       1         III Year / VI Semester       Contact hours/Week – 2 hrs         Humanities and       Management courses       Professional Core       Professional											
Course code	Course l	Name			L	Т	Р	С					
Z41ME1A04PM	FIFE FIg	nting Labor	atory		0	0	2	1					
Year / Semester	III Year	/ VI Semeste	er	1	Co	ntact ho	urs/Wee	ek – 2 hrs					
	Huma Social	nities and Sciences	Management cou	rses	Professio	onal Core		Professional Elective					
Course category						$\checkmark$							
	Basic	Science	Engineering Scie	nce	Open I	Elective		Mandatory					
	1	To create a media bas	a decision-making p ed on the type of fir	rocess re. (K1	s for selectii l)	ng the ap	propriat	e extinguishing					
	2	To explain of fire onb	the emergency res oard a vessel. (K2)	ponse	procedures	and act	ions to b	e taken in case					
Course objectives	3	To categorize the procedures for inspecting and maintaining fire-fighting equipment in aship, ensuring their optimal performance in emergency situations. (K2)											
	4	To acquire tools, and	e hands-on skills in techniques. (K2)	the pi	roper use of	f various	firefight	ing equipment,					
	5	To categor various en	ize the different typ nergency situations	es ano 5. (K3)	d usage of ei	nergency	/ escape	equipment for					
	C01	Select the	extinguishing media	a base	ed on type of	fire. (K2	)						
	CO2	Defend any	y Emergency situati	ons o	n-board due	e to fire. (	K3)						
Course outcomes	CO3	Classify the (K2)	e inspection and ma	intena	ance proced	lure for f	refightir	ig equipment.					
	C04	Demonstrate the use of firefighting equipment. (K2)											



			C05	Categorize the use of emergency escape equipment & the exit (K2)											
			C06	Dem	nonstra	te the	skills i	n using	g firefi	ghting a	ind safet	y equip	oment. (1	K2)	
POs/	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
COs															
C01	3	3	3	3	-	3	2	3	2	2	-	3	3	3	-
CO2	3	3	3	3	-	3	2	3	2	2	2	3	3	3	-
CO3	3	3	3	3	-	3	2	3	2	2	2	3	3	3	-
CO4	3	2	-	-	-	3	2	3	2	2	-	3	3	-	-
CO5	3	3	3	3	-	3	2	3	2	2	-	3	3	3	-
C06	3	2	2	<u>3</u> <u>2</u> <u>3</u> <u>2</u> <u>3</u> <u>3</u> <u>3</u> <u>3</u> <u>3</u> <u>-</u>								-			
Average	3.00	2.67	2.80	3.00	3.00 3.00 2.00 3.00 2.00 2.00 2.33 3.00 3.00										
Correlation level1.Slight (Low)2. Moderate (Medium)3. Substantial (High)										)					



#### LIST OF EXERCISES

#### **BASIC FIRE FIGHTING LAB**

#### Total Hours : 36

- 1. Basic theory of fire, Fire triangle, Fire Prevention, Types of Fire, Different types of Extinguishers used, Extinguishing Small Fire by Sand and blanket
- 2. Starting Fire pump, Extinguishing Fire by Water, Boundary cooling, Using Fire hose, Dual nozzle, and dual nozzle after use in box.
- 3. Uses of Portable Foam Extinguisher, Extinguishing fire by Foam Extinguisher. Visual inspection of Foam Extinguisher.
- 4. Uses of Portable Dry powder Extinguisher, Extinguishing fire by Dry powder Extinguisher.
- 5. Uses of portable water extinguisher, extinguishing fire by water extinguisher & Internal test.
- 6. Uses of Portable Co2 Extinguisher, Extinguishing fire by Co2 Extinguisher. Visual inspection of Co2 Extinguisher.
- 7. Uses of Fire Man's outfit, Uses of SCBA, safety checks for SCBA, Using SCBA entry in the smoke filed area, Uses of EEBD and demonstration.
- 8. Study of Fire Plan, Locating Fire Fighting Equipment's as per Fire Plan.
- 9. Emergency Alarm Reporting to Muster Station, Forming Firefighting parties, Preparing Muster card.
- 10. Explaining about the muster list and assigning duties & following for all the drills. Internal test.
- 11. Rescuing injured Person (Dummy) Using Fire man's outfits and the Stretcher Rescuing the injured person.
- 12. Checking the Wheeled Foam, Dry powder Co2 Extinguishers.
- 13. Precaution and flooding ER with fixed Co2, High Expansion Foam, Emergency stop, Quick closing operation, stopping ventilator flaps,(Shipping Campus),Safe Entry after extinguishing fire.
- 14. Demonstrating High power Water Mist, Foam Applicator, Foam Monitor.

15. Practical, Written, and Oral Tests.

15. Practical, written, and	frai l'ests.
Competency Numbers	12.1 to 12.1.4



I	Program		B.E. – Marine Engineering														
	rse code	c		Professi	Cour	se Name: ive-IV (Ma	rine Conti	rol	L	Т	Р			С			
241111		3		Eng	gineering	and Auton	nation)	01	2	1	0			3			
Year /	Semester				IV Year /	VII Semes	ter				Contac	t hours	/Week	:: 3			
			Hur	nanities a	nd Social	Sciences	Manag cour	ement ses	Profess Cor	ional e		Pro	fessior	nal Ele	ective		
Cours	e category	,											1	/			
	0,			Basi	c Science		Engine Scie	eering nce	Open El	ective			Mano	latory	7		
			1	Analy	ze the cha	racteristic	cs of open-	loop and	closed-loc	op cont	rol sys	stems. (	K3)				
			2	Devel	op mathe	matical mo	odels for e	lectrical, r	nechanica	l, and o	electro	-mecha	inical s	ysten	ns. (K2)		
Course	objective	s	3	Apply	block dia	gram redu	iction tech	niques an	d Mason's	s Gain I	Formu	la. (K3)					
			4	Const	ruct signa	l flow grap	phs and de	etermine t	ransfer fu	nction	s. (K2]	)					
			5	Sumn	narize erre	or analysis	and unde	erstand the	e theory o	f contr	ollers.	(K2)					
			6	Desig	n various	types of co	ontrollers,	such as O	N-OFF, PI	D, and	pneun	natic con	ntrolle	rs (K	4)		
On completion of the course the students will be able to																	
			<b>CO</b> 2	Evalu (K4)	ate the ch	aracteristi	cs and dif	ferences b	etween oj	pen-loo	op and	closed-	loop c	ontro	l systen	15.	
			CO2	2 Creat (K4)	Create accurate mathematical models for electrical, mechanical, and electro-mechanical systems (K4)										15.		
Course	outcome	S	CO3	Bevalu 3 (K4)	ate compl	ex system:	s using blo	ock diagra	m reducti	on tech	inique	ies and Mason's Gain Formula.					
			CO4	4 Const	ruct and i	nterpret s	ignal flow	graphs to	determin	e syste	m tran	isfer fur	nctions	s. (K2	)		
			COS	Analy	ze errors	and specif	ỳ time dor	nain chara	acteristics	for dif	ferent	control	l systei	ns. (ŀ	(3)		
			CO	Demo 5 PID, a	nstrate th nd pneum	e applicat natic contr	ion of vari ollers (K3	ous types )	of control	lers in	practi	cal scen	arios,	incluc	ling ON	-OFF,	
POs/CO s	P01	Р	02	P03	PO4	PO5	P06	PO7	PO8	P09	PO1 0	P011	PO1 2	PSO 1	PSO2	PSO 3	
C01	3		3 3 2 3 1 1 2								2	1	2	3	3	3	
CO2	3		3	3	2	3	1	1	2	1	2	1	2	3	3	3	
CO3	3		3	3	2	2	1	1	2	1	2	1	2	3	3	3	
C04	3		3	3	2	3	1	1	2	1	2	1	2	3	3	3	
C05	3		3	3	2	3	1	1	2	1	2	1	2	3	3	3	
C06	3		3	3	2	2	2	2	2	2	2	2	2	3	3	3	
Average	3		3	3     2 <td>3</td> <td>3</td> <td>3</td>										3	3	3	



Correlation level

1.Slight (Low)

2. Moderate (Medium)

3. Substantial (High)

UNIT-I	MODELLING OF LINEAR TIME INVARIANT SYSTEMS	10 Hours											
Control systems – Characteristics of Control System - Open loop and Closed loop – Feedback control system characteristics - Mathematical modeling of Electrical, Mechanical and Electro-Mechanical Systems - Electrical Analogues Systems - Block Diagrams Reduction Techniques – Masan's Gain Formula - Signal flow graphs - Transfer functionsSequential Control circuits-preferential tripping-Digital sequential control devices.													
Competency Nun	nbers 6.1.2B, 6.1.2C, 6.1.3												
UNIT-II	ERROR ANALYSIS AND THEORY OF CONTROLLERS	10 Hours											
Standard test sig specifications – Controllers, Puls	gnals – Transient analysis of first and second order systems using step input - Tim Error Analysis – Classification of Controllers – ON-OFF Controllers, Multi Positio e Controllers, PID Controllers, Pneumatic and Hydraulic Controllers - Application on S	e responses – Time domain n Controllers, Stacked Type nip using Controllers.											
Competency Nun	nbers 6.1.3A, 6.1.3B, 6.3.2												
UNIT-III	INTRODUCTION TO AUTOMATION	12 Hours											
Automation over Basic Elements of propulsion mach engine and auxil and piping system	view – Requirement of automation systems – Architecture of Industrial Automation Sy of an Automated System- Flowcharts for automatic and control systems-UMS of engin ninery, Boilers, Auxiliary machinery using flowchartFunctions and mechanisms of iary machinery including generator distribution systems, steam boilers, oil purifier, re ms, steering gear system, cargo handling equipment and deck machinery.	stem – Levels of Automation- e room, Automation of Main automatic control for main efrigeration system pumping											
Competency Nun	nders 7.5												
UNIT-IV	PROGRAMMABLE LOGIC CONTROLLER & LADDER LOGIC PROGRAMMING	12 Hours											
Introduction to Modules, Special Starters, Manual, Schematics into Timer Instruction	PLC, Principles of Operation - Size and Application. Hardware Components: I/O Se I/O Modules, PLC Wiring Diagrams and Ladder Logic Programs: Electromagnetic Cont /Mechanical Operated Switches, Sensors, Output Control Devices, Seal-in Circuits, Latcl PLC Ladder Programs, Programming Timers: Mechanical Timing Relays, Timer Instr n. Retentive Timer, Cascading Timers.	ection, Discrete /Analog I/O rol Relays, Contactors, Motor ning Relays, Converting Relay uctions, On-Delay /Off-Delay											
Competency Nun	nbers 7.5.2												
UNIT-V	SCADA FUNDAMENTALS AND INTRODUCTION TO IOT	10 Hours											
Introduction, Op Logic, Terminatio Merging units. Technologies, Ch	en system: Need and advantages, Building blocks of SCADA systems, RTU-Evolution, C on and Testing and HMI subsystem - Power supplies, Advanced RTU functionalities, I IoT fundamentals, IoT Architecture and protocols, Various Platforms, IoT comp allenges in IoT.	omponents, Communication, EDs, Data Concentrators and onents and Communication											
Competency Nun	nbers 7.5.1												
Total hours: 54													
Text Books:													
1. Marine ( Year: 20	Control Technology 4h Edition; By J. Majumder, Elstan A. Fernandez; Publisher: Shroff 20; ISBN: 9789352139682.	Publishers and Distributors;											
<ol><li>Applied and Dist</li></ol>	Marine Control and Automation; By J. Majumder, Elstan A. Fernandez, Mahesh Patil; ributors; Year: 2019; ISBN: 9789352139194.	Publisher: Shroff Publishers											
3. Program	mable Logic Controller Regh, JA Pearson												
Reference Books	:												
1. Richard	C. Dorf and Robert. H. Bishop, "Modern Control Systems", Pearson Education, 12th Edi	tion, 2011.											
2. John J. D CRC Tayl	o'Azzo, Constantine H. Houpis and Sttuart N. Sheldon, "Linear Control System Analysi lor and Francis Reprint, 6th Edition, 2014.	s and Design with MATLAB",											



Program			B.E Marine Engineering       Course Name     L     T     P     C													
Course Co	le	Course	e Name								L	Т		Р	С	
241ME1A	74TW	Marin	e Safety I	Emerg	gency P	ractic	es-II				3	0		0	2	
Year / Sen	nester	IV Yea	r / VII Se	mester				(	Contact	hours/	Week		3	hrs		
Cours	se ry	Huma and S Scien	nities ocial ces	М	anagen	nent co	ourses		Profe C	essional ore		Profe	ssional	Elective		
										$\checkmark$						
Pre req	uisite			1												
			1	Expla	ain prej	paratio	ns for v	vork on	diesel	engine.	(K3)					
			2	Expla	ain prej	paratio	ns for v	vork on	auxilia	ry mach	inery. (l	K3)				
Course also			3	Expla	ain star	ndard ta	ask in d	ry docl	ĸ. (K2)							
Course obj	ectives		4	Com	ply dry	y dock :	survey	and ma	aintena	nce. (Kä	3)					
			5	Sum	marize	proc	ess of t	aking s	hip to d	ry-dock	. (K2)					
			6	Dem	onstrat	e know	/ledge o	of dry d	ock rep	airs. (K	2)					
	On completion of the course the students will be able to															
			CO1	Appl	y prepa	rations	s for wo	ork on d	liesel ei	ngine. (F	(3)					
Course ou	taomoo		C02	Appl	y prepa	rations	s for wo	ork on a	uxiliary	y machii	nery. (K3	)				
Course ou	comes		CO3	Expla	ain star	ndard ta	ask in d	ry docl	к (K2)							
			CO4	Appl	y dry d	ock sui	rvey an	d main	tenance	e. (K3)						
			C05	Appl	y proce	ess of ta	king sh	ip to dr	ydock (	K4)						
			C06	Dem	onstrat	e know	vledge o	of dry d	ock rep	airs. (K2	2)					
POs/COs	P01	PO2	PO3	PO4	PO5	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	
C01	3	2	2	2		2		3				3	3	3		
CO2	3	2 2 2 2 3										3	3	3		
CO3	3	2 2 2 2 3						3				3	3	3		
CO4	3	2	2	2		2		3				3	3	3		
C05	3	2	2	2		2		3				3	3	3		
C06	3	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$										3	3	3		



Average	3.00	2.00	2.00	2.00		2.00		3.00			3.00	3.00	3.00	
Correlation	Correlation level			nt (Lov	v)	2	. Modei	rate (M	edium)		3. Subst	antial (I	High)	



UNIT-I	PREPARA	FION FOR WORK ON DIESEL ENGINES	10 Hours
Permits, isolations	and proced	ure for carrying out maintenance on diesel engine, preparation for decarbo	nization
report, dismantlin	g and assem	bling of diesel engine bearings, turbocharger overhaul.	
Competency Numb	pers	9.1,9.3,9.4	
UNIT-II	PREPARA	ΓΙΟΝ FOR WORK ON AUXILIARY MACHINERY	10 Hours
Permits, isolations	and proced	ure for carrying out maintenance on pumps, assembly and disassembly, air o	condition
Competency Num	hers	9193994	
IINIT-III			10 Hours
List the standard t	asks to be up	ndertaken as follows:	10 110013
(a) Clean the shin'	s bottom, wł	nich could include high-pressure water or grit blasting	
(b) Paint and recoa	at the under	water area and boot topping of the hull	
(c) Clean and pain	t the chain lo	ocker	
(d) Range and insp	ect the ancl	nors and cables	
(e) Inspect and pai	int draught i	narks, plimsoll line and freeboard markings	
(f) Renew sacrifici	al anodes as	and where appropriate	
(g) Conduct any ge	eneral steel v	work repairs, i.e., flame cutting or welding	
(h) Carry out gene	ral repairs t	o deck and engine room	
Competency Num	Jers	424169198	
UNIT-IV		CURVEV AND MAINTENANCE	12 Hours
Preparation by the	shin's crow	SORVET AND MAINTENANCE	12 110415
-Documentation f	or dock nrer	paration	
-Communication h	between the	shin company/crew and the dry dock personnel	
-Actions and preca	autions by th	he ship master before entering the dry dock	
Discuss the dry do	ck survey ar	nd maintenance requirements of the following based on harmonised	
survey system	5	1 0	
(a) Anti-Roll Stabil	izer Units/E	Bilge Keels and Appendages	
(b) Bow thruster L	Jnits		
(c) Propeller inclu	ding shippin	g and unshipping of keyless propellers and tail end	
shaft and stern tub	be		
(d) Rudder includi	ng shipping	and unshipping	
(e) Machinery and	equipment	related to anchor chain	
	DEDMITC	9.8 TO WODY	10 11
	PERMITS		12 Hours
Explain requireme	nts for vario	bus permits, Electrical isolation permit, High voltage permit, pressure vessel	isolation
permit, Enclosed s	pace entry p	permit, Working aloft permit, Hot work permit, Elevator work permit, Lock a	ind Tag
system. Explain UN	AS requirem	ents. Explain PMS,CMS	
Competency Numb	bers	9.1	
		Tota	l: 54 Hours
1. Text Book	<b>s:</b> Taylor D. A	A., Introduction to Marine Engineering, revised second edition, Butterworth	-
Heineman	n, 1999 ISBN	N 07506 25309.	
2. McGeorge	H. D., Marine	e Auxiliary Machinery, seventh edition, Butterworth-Heinemann, 1995 ISBN	0 7506
4398 6.			
3. Shipboard	Operations,	H. I. Lavery, 2nd edition, Published February 15, 1990 by Routledge.	
Original Equipmer	it Manufacti	irers Manuals For On Board Equipments.	



Program	B.E. – Marine Engineering										
Course code	Course	Name	umatics and Electrical	L	Т	Р	C				
Z41MEIA/4FA	Contro	ol System Laborat	ory	0	0	1	1				
Year / Semester	IV Year	r /VII Semester		Contact h	ours/Week	: 1 Hrs					
Course category	Huma	nities and Social Sciences	Management courses	Professi	onal Core	Professiona	l Elective				
Pre-requisite	Fluid r pumps service	nechanics fundame , Thermodynamics /control air systen	entals, Construction & Op of air compression, Cons n.	perating pr struction &	rinciples of operation o	positive disp of air compre	lacement ssors and				
	1	Identify hydraulie and application in	to underst	and their fun	ctionality						
	2	2 Analyze and interpret hydraulic circuits to comprehend the flow of fluid and interaction of various components. (K2)									
Course objectives	3	Apply appropriat system performation	e techniques to set the pr nce. (K3)	ressure of a	hydraulic p	oower pack fo	r optimal				
	4	Operate a 4/2 hand lever operated double-acting cylinder to understand its functioning and control mechanisms. (K2)									
	5	5 Evaluate the operation of a unidirectional flow control valve to regulate the flow rate in a hydraulic system. (K4)									
	On con	npletion of the cour	rse the student will be ab	ble to							
	C01	Identify and int understand their	erpret hydraulic symbo role and functionality in	ols, compo hydraulic s	nents, and systems. (K2	circuits in 2)	order to				
	C02	Apply appropriat system performation	e techniques to set the pr nce. (K3)	ressure of a	hydraulic p	oower pack fo	r optimal				
Course outcomes	CO3Demonstrate proficiency in operating different types of hydra double-acting cylinders, flow control valves, non-return valves, a (K2)										
	CO4	Analyze and eva bidirectional flo configurations. (H	luate the speed control w control valves and (3)	l mechanis flow con	ms of hyd trol valves	raulic cylind in differer	ers using It circuit				
	C05	Apply the principles of pneumatic systems to operate single and double-act cylinders using various control valves. (K3)									
	CO6 Understand and apply electro-pneumatic principles to operate cylinders using solen valves and design electro-pneumatic circuits for multiple cylinder sequencing. (K1)										

POs/COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	2	2	2	-	-	2	-	3	2	3	-	-	3	2	-
CO2	3	3	2	-	-	2	-	3	2	3	-	-	3	2	-
CO3	3	3	3	-	-	2	-	3	2	3	-	-	3	2	-
CO4	3	3	-	-	-	2	-	3	2	3	-	-	2	2	-
CO5	3	3	3	-	-	2	-	3	2	3	-	-	2	2	-
C06	3	3	3	-	-	2	-	3	2	3	-	-	3	2	-



Average	3	3	3	-	-	2	-	3	2	3	-	-	3	2	-
Correlation	level		1.	Slight (	Low)		2. M	loderat	e (Mec	lium)		3. Sı	ubstantia	al (High)	

		LIST OF EXPERIMENTS	18 Hours						
		CYCLE-I							
		HYDRAULICS							
S.No	Experiments								
1	Study of hydrau	ulic symbols & components							
2	Reading a Hydr	raulics circuits							
3	Setting pressur	e of the hydraulic power pack							
4	Study and oper	ration of a 4/2 hand lever operated double acting cylinder							
5	Study and oper	ation of unidirectional flow control valve							
6	Study and oper	ation of speed control of cylinder with Bidirectional flow control valve							
7	Study and oper	ation of non-return valve (check valve)							
8	Study and oper	ation of sequence valve							
		CYCLE-II							
		PNEUMATICS							
9	Operation of a s	single acting cylinder using 3/2 spring return DCV							
10	Operation of a	double acting cylinder using 3/2 hand lever operated DCV							
11	Operation of a	double acting cylinder using memory valve							
12	Automatic Ope	ration of a double acting cylinder using limit switches							
13	Operation of a	double acting cylinder using pilot operated spring returned 4/2 DCV							
14	Speed control of	of the double acting cylinder using flow control valve (Meter in circuit)							
15	Speed control of	of the double acting cylinder using flow control valve (Meter out circuit)							
16	Multiple cylind	ers operation normal sequencing (Two cylinders –A+ B+ A- B-)							
		CYCLE-III							
		ELECTRO PNEUMATICS							
17	Operation of a s	single acting cylinder using single solenoid valve							
18	Operation of a	double acting cylinder using single solenoid valve							
19	Operation of a	double acting cylinder using double solenoid valve							
20	Multiple cylind circuit	ers normal sequencing operation (Two cylinders –A+ B+ A- B-) using electro pne	umatic						
		Total Ho	urs: 18 Hours						
		6- Operate electrical, electronic and control systems							
		6.2.2 Features of hydraulic and proumatic control equipment							
Compete	ency Numbers	b.3.2- Features of hydraulic and pheumatic control equipment							
Sompen		9- Maintenance and repair of ship board machinery and equipment							
		9.7- The interpretation of piping, hydraulic and pneumatic diagrams							



Program		B.E. – Marine Engineering										
Course code	Course N	lame		L	Т	SIC	С					
241MEIA//PD	Snipino	Lampus - I		0	0	18	9					
Year / Semester	IV Year	/VII Semeste	r	Contact ho	urs/Week	18	hrs					
	Humai Social	nities and Sciences	Management courses	Professio	nal Core	Professional	Elective					
Course category	Basic	Science	Engineering Science	Open E	lective	Mandatory/EEC/AC						
Pre requisite												
	1	1 Analyze main propulsion engines to identify maintenance andrepair requirements. (K3)										
	2	Apply app clearances.	ropriate techniques to (K3)	measure an	nd adjust o	deflection and	bearing					
Course objectives	3	Evaluate the performance of Boilers and its auxiliaries, troubleshoot common issues. (K3)										
	4	Demonstrate proficiency in conducting maintenance and repair tasks on main propulsion engines. (K3)										
	5	Interpret te maintenan	echnical manuals and do ce. (K2)	ocumentation	n related to	dry docking a	nd deck					
	6	Develop a procedures	comprehensive unders for main refrigeration	standing of systems (K2	safety prot )	tocols and em	ergency					
	On comp	letion of the	course the student will	be able to								
	C01	Assess and (K2)	identify maintenance a	nd repair ne	eds for mai	n propulsion e	ngines.					
	C02	Develop sk clearances.	tills in accurately meas (K2)	uring and a	djusting de	eflection and b	earing					
Course outcomes	CO3	Demonstra and its aux	te the ability to diagno iliaries. (K2)	ose and trou	ibleshoot c	ommon issues	Boilers					
	CO4	Develop pr main Refrig	actical experience in p geration systems. (K2)	erforming n	naintenance	e and repair ta	asks on					
	C05	Interpret to maintenan	echnical manuals and dc ce. (K3)	ocumentation	n related to	dry docking a	nd deck					
	C06	Understan working w	d and apply safety pritter and compre	rotocols an essors (K1)	d emerger	ncy procedure	s when					



POs/COs	P01	PO2	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
C01	3	3	3	3	-	3	3	3	-	-	-	3	3	3	-
CO2	3	3	3	3	-	3	3	3	-	-	-	3	3	3	-
CO3	3	3	3	3	-	3	3	3	-	-	-	3	3	3	-
C04	3	3	3	3	-	3	3	3	-	-	-	3	3	3	-
C05	3	3	3	3	-	3	3	3	-	-	-	3	3	3	-
C06	3	3	3	3	-	3	3	3	-	-	-	3	3	3	-
Average	3.00	3.00	3.00	3.00		3.00	3.00	3.00				3.00	3.00	3.00	
Correlation	ı level		1.5	Slight (	Low)		2. M	odera	te (Me	dium)		3. Su	ıbstantia	al (High)	)
	LIST OF TASKS TOTAL HOURS: 324														
1. <b>T</b>	1. <b>Task 1</b> - Main Propulsion Engines, Maintenance and Repair & Deflection And Bearing Clearances.														
2. Task 2 - Main and Auxiliary Boiler and Economizer															
3. <b>T</b>	3. Task 3 - Air Compressors Maintenance and Over Hauling & Type of Compressors														
4. <b>T</b>	4. <b>Task 4</b> - Fresh Water Generators														
5. T	5. Task 5 - Centrifuges														
6. <b>T</b>	ask 6 -	Turbo	Charg	ers, Ma	aintena	ance a	nd Rep	air & S	Safety A	And Eme	ergency	Proced	ures		
7. <b>T</b>	ask 7 -	Refrig	eratio	n Princ	ciple o	fWork	ing An	d Over	haulin	g	0 5				
8 Т	ask 8 -	Shafti	ng and	l Prone	llers	-	0			0					
9 T	ask 9	Drv D	ocking	, ,											
10 <b>T</b>	ash ) ack 1(	Decl	z Mach	inorio	-										
10. <b>I</b>	ask 10 selz 11	Marn		ution I	o Fauinn	aont ((	ואינין								
11. 10	15K 11				- quipi		Jwsj								
		9.4 - Ma	aintena	nce and	d repair	r, such a	asdism	antling	, adjus	tment a	nd reass	embling	; of mach	inery an	d
		equipn	ient.	afa an	doffort	ivo mo	intono		dropo	n nno ao	dunaa D	anning	mainta	0	
Competen	cy	9.0 - Ma renairs	inage s	ding st	atutor	v and	rlass v	nce an erifica	u repai tions	ii proced	lures, Pl	anning	mainter	lance &	
Numbers	Numbers 4 1 10 – Deck machineries														
	5.3 - Oily-water separators(or-similar equipment) requirements and operation														
	9.9 - Detection of machinery malfunction														
			9.9 - Detection of machinery malfunction												



Program	B.E. – Marine Engineering													
Course code	Course	Name		L	Т	Р	С							
241ME1A82TE	Interna Interna	tional Maritim tional Conver	ne Organization and ntion	2	0	0	2							
Year / Semester	IV Year	/ VIII Semester		Contact h	ours/Week	2	hrs							
	Hum Socia	anities and al Sciences	Management courses	Professio	onal Core	Profes Elec	sional tive							
Course category	$\checkmark$													
	Bas	ic Science	Engineering Science	Open ]	Elective	Mandatory								
Pre requisite														
	1	Identify the s codes, and re	structure, functions, and ecommendations. (K1)	activities o	of IMO, inclu	ding conver	ntions,							
	2	Analyze the s impact on shi	afety-related conventions p construction and operation	s, such as SOLAS and MARPOL, and their ration. (K3)										
Course objectives	3	3 Understand the role and responsibilities of classification societies, international labor organizations, and other regulatory bodies in ensuring maritime safety and compliance. (K1)												
	4	Explore the k control, and l	ey aspects of maritime sa oad line requirements. (I	afety regulat K2)	tions, includi	ng ISPS, poi	rt state							
	5	Examine the manning in the	importance of health and ne shipping industry. (K2	safety regul 2)	lations, hour	s of work, re	est, and							
	On com	On completion of the course the students will able to												
	C01	Identify and out its convention	explain the structure, org ns, codes, and recommen	ganization, a dations. (Ki	and function: 1)	s of IMO, in	cluding							
	CO2	Analyze and oby SOLAS, MA	evaluate the compliance i ARPOL, and other releva	requirement nt conventi	ts and safety ons. (K3)	standards i	mposed							
	CO3	Understand t organizations	he role of classification so in ensuring maritime sa	ocieties, flag afety and en	g states, and forcing regu	internationa lations. (K1)	al labor							
Course outcomes	CO4	Apply the kn assess and er	owledge of ISPS, port st hance maritime safety	ate control measures. (	, and load li K3)	ne regulatio	ons to							
	C05	Evaluate the manning on operations. (I	impact of health and sa the well-being of seafa <3)	fety regulat rers and tl	tions, hours ne overall s	of work, re afety of ma	est, and aritime							
	C06	<ul> <li>Demonstrate knowledge and understanding of international health remedical guidelines, and drinking water quality standards as they rela</li> <li>maritime industry (K2)</li> </ul>												



POs/COs	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3			
C01	-	-	-	-	-	3	3	-	2	-	-	2	3	-	-
C02	-	-	-	-	-	3	3	3	2	-	-	3	3	-	-
CO3	-	-	-	-	-	3	3	3	2	-	-	3	3	-	-
C04	-	-	-	-	-	3	3	3	2	-	-	3	3	-	-
C05	-	-	-	-	-	3	3	3	2	-	-	3	3	-	-
C06	-	-	-	-	-	3	3	3	2	-	-	3	3	-	-
Average						3.00	3.00	3.00	2.00			2.83	3.00		
Correlation level         1.Slight (Low)         2. Moderate (Medium)         3										. Substa	antial (F	ligh)			
UNIT-I IMO STRUCTURE AND ITS ROLE											10	Hours			
- function - activities - conventions - codes - recommendations and guideline. Protocols, amendments, Acceptance, Approval, Tacit acceptance, Pilmsol act.															
Competency numbers     15.1(Pg N0124)       UNIT II     SAFETY DELATED CONVENTIONS       12 hours															
UNIT-	Solas 1974 history safety construction LSA Initial Intermediate and Renewal of survey and certificates.											hours			
Emergen Emergen Bulk carr Requiren Survival o and Docu	cy Tov cy bilg ier. UN nents, craft, N ments	ving re e pum MS Shij Noise Jainter Requi	quiren p, Safe p and S protection nance of red to	nents, ty requ Safety ction, of Falls carry	Safe A uireme Requin Variou s, Aban on Boa	ents in c ccess, V ents in c cements is com idon Sh ard, Late	Vater ti case of s. Steer munica ip Drill est Reg	floodin floodin ing Gea ition d , HRU, ulation	ors, Do g, Wat ar Alar evices, Weath s: FAL	or alarr er Ingre m and S Emerg er Routi Polar c	n and cl ess Alarr Safety re ency po ings, Van ode, LL,	osing tin n , Pumj equirem ower re rious can SAR.	me, Ro- ping rec lents, Sh equirem rgo code	Ro ship quireme nip Vent ents, H es, Certi	safety, nts for ilation elipad, ficates
Competer	ncy Nu	imbers		15.1	l (Pg N	lo 124)	0								
UNIT-	II				MAI	RPOL R	ELATE	D CON	VENTI	ONS				10	hours
Double h 73/78, V Response member claims co Internatio	Double hull. Various Amendments, Passenger ship safety, MSC and its duties, Colreg 1972, Oil pol 1954, Marpol 73/78, Various Amendments, Accidents, Incidents, intervention, Convention 69, Oil pollution preparedness, Response and Co-operation Convention 1990 (OPRC-199C))- OPRC -HNS act 2000, MEPC and its function, IMO member state audit scheme. Liability related conventions Civil liability convention 1969, fund 1971, maritime claims convention 1976, oil pollution compensation fund 1992(IOPC) LLMC 1996.									Marpol edness, n, IMO aritime					
Competer	ncy Nu	imbers		15	.1 (Pg	No 124	)								
UNIT-	IV			I	OTH	ER IMP	ORTA	NT INS	TRUM	ENTS				10	hours
IMDG coo GMDSS, b etc.	des, IB oulk ca	C Code	es, IGC afety,	C, INF, enhan	HSC ( ced su	high sp rvey, IN	eed cr 40 gra	aft) ST in regu	CW 95 lation,	-2010, membe	VDR, Al er regula	IS, EPIR ation, IG	P, SAR O, NGO	Γ, , other (	codes
Competency Numbers 15.2 (Pg.no 125)															



UNIT-V		MARITIME SAFETY AND REGULATION	12 Hours									
ISPS, CSO, SSO, S labour organizati shipping (minimu and safety, Docur held on 31.5.201 facility, ITF. CLAS Various Certifica International Me Drinking water q	Ising, Coo, Soo, Security levels, inspection, log entry, training, piracy, port state control, load line. International labour organization Role of International Labour Organization, its importance and relevance to shipping, merchant shipping (minimum standards convention) 1976 and its related conventions, Hours of work, rest, manning, health and safety, Document Prepared in Board of studies held on 24.4.2018 Document Approved in Academic Council held on 31.5.2018 Controlled Copy Rev 00/01.10.2012 accommodation, medical contract, leave' leave and other facility, ITF. CLASSIFICATION SOCIETY Various Classification society and Requirements for Ship, IACS, Flag state, Various Certificate, Documents required on board. WHO'S International Health Regulation 2005 (IHR 2005) International Medical Guide for Ship (IMGS), International Medical First Aid Guide (MFAG) WHO'S Guidance for Drinking water quality.Competency Numbers15.3 & 15.4 (Pg.no 126 & 127)											
Competency Nun	nbers	15.3 & 15.4 (Pg.no 126 & 127)										
			Total: 54 Hours									
Text Books:												
1. Revised MA 2. ISPS Code 2	ARPOL Annex 2003 Edition	: VI 2009										
Reference Book	S:											
1. SOLAS Cons 2. ILO Maritin 3. FSS Code, 2 4. International International 5. Marine auxili 0750643986 6. Marine Eng	solidated Edi ne Labour Co 015 Edition, Safety Guide Ltd. ISBN-1 ary machine	ition 2009, FSS Code 2007 Edition ode 2006 IMO Publication. for Oil Tanker and Terminals (ISGOTT), 6th edition, Witherby Se 0 1856099180 ry - H.D GEORGE, 7th edition, Butterworth-Heinemann Ltd, ISBN	eamanship I-10									
7. Inert Gas S 8. General Eng	ystem - G.S.H gineering Kn	eredia. owledge Reeds Volume VIII, Thomas Reed Publication.										



Program			B.E. – Marine Engineering												
Course co 241ME1A	ode \84TY	Cou Ma	irse Na rine A	ame <b>lternat</b>	e fuel a	and En	ergy		L 2		T		P	C 2	
Voon / So	mostor		Irces	VIII Cor	noston				2	nto at ha	U III	alt	0	2 2 hrs	
rear / se	mester		ear /	v III Sei	nester					ntact no	urs/we	ек		ZIIIS	
		Hu So	manit cial Sc	ies and iences	М	anager	nent co	ourses		Professi	onal Coi	re	Profes	sional El	ective
Course											$\checkmark$				
category		В	asic So	cience	E	nginee	ring Sc	ience		Open	Elective		Ν	landator	у
Pre requi	site								•			•			
			1	To exp Future	lain tł Trenda	ne prop s. (K2)	perties	of Alte	ernate	fuel and	energy	source	s, Appli	cations a	nd
Course			2	То ехр	lain tł	ne prop	perties	of fuel	cells,	Applicat	tions an	d Futur	e Trenc	ls. (K2)	
objectives			3	То ехр	lain tl	ne Con	structio	on and	opera	tion of V	Wind an	d Solar	energy	sources.	(K2)
			4	To ex	plain	the Co	nstruct	ion an	d opei	ation of	Autono	omous s	hips. (ŀ	(2)	
			5	То ехр	olain ha	andling	g and st	orage	of alte	rnate fu	els. (K2)				
		CO	01	Explair	the	Benefi	ts and (	Challer	nges of	fAlterna	ate fuel a	and ene	rgy sou	irces (K2	)
		CC	02	Explai	n the p	proper	ties of f	fuel ce	lls. (KZ	2)					
Course		CC	03	Explai	n the	Constr	uction	and op	peratio	on of Wi	nd and S	Solar en	iergy so	ources (K	(2)
outcomes		CO	04	Explai	n the (	Constru	iction a	and op	eratio	n of Aut	onomou	ıs ships	. (K2)		
		CO	)5	Explai	n the h	nandlin	g and s	torage	ofalte	ernate fi	uels (K2)	)			
		CO	06	Summ (K3)	arize 1	the dev	elopme	ents in	n alte	rnate	fuels a	and au	tonor	nous sh	ips.
POs/	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2	PSO3
COs															
C01	3	3	3								2				
CO2	3	3	3							3	2	2			
CO3	3 2	3 2	3 2	-	-	-	-	2	2	-	-	-	3 2	2	2
COF	े २	3 2	े २	-	-	-	-	2	2		-	-	2 2	2	2
C06	3	3	3	-	_	_	_	2	2	-	-	-	3	2	2
Average	3.00	3.00	3.00					2.00	2.00				3.00	2.00	2.00
Correlation	n level		1.Slight (Low)2. Moderate (Medium)								3. S	ubstant	tial (High	l)	



UNIT-I	FUEL PROP	ERTIES & PERFORMANCE IN ENGINES	6 Hours
Properties of methan emission characterist	ie, ethylene, a ics.	ammonia, hydrogen and biofuel blends. Combustion c	haracteristics and
Competency Numbers	5	4.1.1 , 4.4 , 4.2	
UNIT-II	<b>Fuel Cells</b>		6 Hours
Introduction to Fuel ( Studies and Examples	Cell Systems, , Future Direc	Components of Fuel Cell Systems, Construction Process ctions and Innovation. Advantages and Challenges of Fue	of Fuel Cells, Case el Cells.
Competency Numbers	5	4.1.1 , 4.4 , 4.2	
UNIT-III	Wind and S	olar energy Sources	6 Hours
Introduction to Wind Mountings for Wind a sources, Advantages a	d and Solar and Solar End and Challenge	Energy sources, Key Components of Wind and Solar ergy sources, Operation and Control Systems for Wind s of Wind and Solar Energy.	• Energy Sources, and Solar Energy
Competency Numbers	5	4.1.1 , 4.4 , 4.2	
UNIT-IV	Autonomou	is Ships and IOT	12 Hours
Basics of IOT, Auton Advantages and challe	omous ships enges faced in	construction and operation, Remote operation of ves Autonomous ships, IMO guideline for Autonomous ship	sels through IOT, s.
Competency Numbers	5	4.1.1 , 4.4 , 4.2	
UNIT-V	Storage , b sources	ounkering and handling of Alternate Fuel Energy	6 Hours
Fuel Handling System	, procedures,	precautions and preventions for handling of alternate fu	iels.
Competency Numbers	5	4.1.1 , 4.4 , 4.2	
TOTAL			36 Hours
<b>Reference Books:</b> 1. Alternate Fuels and A Engines-Akhilendra Pra 2. Smart Ship 1 <sup>st</sup> Edition	Advanced Con atap Singh- Sp n 2022 Soft bo	mbustion Technique as Sustainable Solutions for Interna pringer publication. pund.	l Combustion



Program	B.E. – Marine Engineering															
Course code		Course Name								L	Γ	r	SIC		С	
241ME1A87PG		Ship In Campus - II							-	-		20		10		
Year / Semester		IV Y	IV Year / VIII Semester						Con	Contact hours/Week			20 hrs			
Course category		Humanities and Social Sciences			d S	Ма	anagem course	ient es	Pr	Professional Core			Professional Elective			
			Basic Science				ngineer Scienc	ing e		Open Elective			Mandatory/EEC			
		Chin	Chin In Come of L													
Pre requisite		Ship	Snip in Campus – I													
Course objectives		1	1     Apply principles of auxiliary engine maintenance. (K1)													
		2	A	Analyze pump performance in pumping systems. (K3)												
		3	E	Evaluate piping components for system integration. (K2)												
		4	E	Examine different types of piping systems. (K3)												
		5		Demonstrate knowledge of heat exchanger operation. (K2)												
		6	6 Identify functions and types of steering gear. (K1)													
Course outcomes		Onc	Un completion of the course the students will be able to													
		<u> </u>		Plan maintenance tasks on auxiliary engines. (K2)												
		CO.	2 (	Compare pump performance in pur					imping systems. (K2)							
		CO.	CO3 Select appropri				riate piping components for system design. (K2)									
		C04	CO4 Construct effe				ctive hydraulic and pneumatic piping systems. (K2)									
		CO	5 C	Describe the operation of various heat exchanger types. (K3)												
		CO	6 E	xplain	the fu	inction	s and c	listingı	ish b	etween	types o	of steer	ing gear	∵(K2)		
POs/COs	P01	PO2	P03	P04	РО 5	P06	P07	P08	P09	P010	PO1 1	PO1 2	PSO1	PSO 2	PSO 3	
C01	3	3	3	3		2		3				3	3	3		
CO2	3	3	3	3		2		3				3	3	3		
CO3	3	3	3	3		2		3				3	3	3		
CO4	3	3	3	3		2		3				3	3	3		
CO5	3	3	3	3		2		3				3	3	3		
C06	3	3	3	3		2		3				3	3	3		
Average	3.00	3.00	3.00	3.00		2.00	0.00	3.00				3.00	3.00	3.00		
Correlation level			1.Slight (Low)					2. Mod	erate	rate (Medium)			3. Substantial (High)			



LIST OF TASKS

**TOTAL HOURS: 378** 



#### **Department of Marine Engineering**

- 1. TASK 1 Auxiliary Engines Prepare and Maintenance.
- 2. TASK 2 Pumps and Pumping Systems.
- 3. TASK 3 Piping Components (Valves, Filters, Piping Systems, Hydraulic, Pneumatic, Etc.)
- 4. TASK 4 Heat Exchangers and Its Types.
- 5. TASK 5 Steering Gear, Function of Steering Gear and Type of Steering Gear.

	9.4 - Maintenance and repair, such as dismantling, adjustment and reassembling of machinery and equipment.
Competency	equipment
	9.8 - Manage safe and effective maintenance and repair procedures, Planning maintenance
Numbers	and repairs including statutory and class verifications.
	5.4 - Operation and maintenance of machinery, including pumps and piping systems.
	9.9 - Detection of machinery malfunction
	8.4-Methods for carrying out safe temporary/emergency repairs