GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2022 (COGC-2022)
Semester-IV

Course Title: Marine System Line Diagram
(Course Code: 4341806)

Diploma programme in which this course is offered	Semester in which offered
Marine Engineering	4th semester

1. RATIONALE

For every Marine engineer officer, preliminary theoretical knowledge of day-to-day operations and piping & line systems is important for taking cognizance of complicated machinery operations. The hierarchy on board further defines and demands the engineers in their first stint onboard to trace the piping diagrams in order to have thorough understanding of different symbols and lines from the facsimiles provided onboard.

Usually, a typical line diagram would look like a printed labyrinth and could be difficult to understand. It is hence suggested to keep them for reference and trace them physically.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency.

Junior engineer can successfully take in charge of daily transfers related to sludge and bilge waters under the directions of second engineer.

2. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the student for the achievement of the following COs:

a) Trace out different lines used on board.
b) Identify various pipe material and pipe corrosion.
c) Use various pipe fitting for ship piping system.
d) Simulate ship piping system.
e) Performance of repairing and testing of piping system.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
0	0	2	1	-	-	25	25	50

Legends: ***L****-Lecture;* ***T*** *– Tutorial/Teacher Guided Theory Practice;* ***P*** *-Practical;* ***C*** *– Credit,* ***CA*** *- Continuous Assessment;* ***ESE*** *-End Semester Examination.*

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs. Some of the PrOs marked '*' are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Trace all lines physical or in computer based simulator and make separate charts for each lines traced by students , lines include all the working lines onboard (fuel ,water ,steam ,air ,lub oil, sludge etc.)	I	4
2	Identifying pipes sizes and its material ,corroded pipes and their classified types wear down of galvanic corrosion ,wear down of water hammering ,wear down of erosion	II	4
3	Practically showing the usage of flanges to connect pipes and different types of elbows varying according to the angles and other fittings mentioned above.(charts to be made according to the practical done with detailed diagrams)	III	5
4	All the ships piping system to be traced in computer simulator which contains all the details of ballast system ,bilge water system ,fire fighting system, sprinkler system,Co2 system etc.(charts to be made by students at the end of practical of each lines traced)	IV	4
5	a. Pipe repair to be done practically both temporary and permanent with binding ,clamping , doublers ,cement boxes ,clamps ,plastic resin. b. Pressure testing & NDT tests & use of supports. c. Pipe maintenance & inspection	V	5
6	Micro Project as suggested in section no. 4	ALL	4
7	SCHOOL WITHIN SCHOOL: Each student will prepare and present report on: a. His/her observation for the jobs made. b. PPT on topic assigned by teacher.	ALL	02
	Total hours		**28 Hrs.**

Note

i. *More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

ii. *The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency.*

Sr. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Identify components (Knowledge)	10
2	Prepare experimental setup. (Procedure followed)	20
3	Perform the experiment with accuracy. (Quality of job/report)	40
4	Follow safety practices. (Safety followed)	10
5	Submit the report. (Timely submission / Quality of report)	20
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

This major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practicals in all institutions across the state.

Sr. No.	Major Equipments	PrOs. No.
1	Simulator	1,4
2	Different types of pipes and pipe fittings (size, material, condition etc)	2,3
3	Repairing and maintenance tool(different size spanners, pipe benders , pressure guage, NDT kit etc.)	5

7. AFFECTIVE DOMAIN OUTCOMES

The following sample Affective Domain Outcomes (ADOs) are embedded in many of the above mentioned COs and PrOs. More could be added to fulfill the development of this competency.

a) Work as a leader/a team member.

b) Follow safety practices while using equipment.

c) Realize the importance of green energy. (Environment related)

The ADOs are best developed through the laboratory/field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below: i. 'Valuing Level' in 1st year ii. 'Organization Level' in 2nd year. iii. 'Characterization Level' in 3rd year

8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit – I Introduction	1.a Understanding the different lines and types. 1.b Tracing of lines	1.1 Basic knowledge of lines and various types of lines used onboard. 1.2 Identify each type of lines with the line diagram. 1.3 Tracing and Drawing each line according to its setup. 1.4 Understanding the color code.(bilge ,ballast , seawater, fresh water, steam ,fuel , lubricating oil, etc.).
Unit – II Safety for pipe laying and survey	2.a Safety during laying of the various pipes 2.b Different types Testing methods. 2.c Surveys, Its types and its period.	2.1 Safety against static electric charges(use of bonding strips etc.). 2.2 Pipe corrosion and failure due to various reasons).Types of corrosion (internal and external corrosion.) 2.3 Test carried out for the strength of pipe. 2.4 Pipe failure and its prevention. Annual survey, intermediate survey, Renewal survey.
Unit – III Pipes & Pipe Fittings	3.a Flanges 3.b Elbows 3.c Reducers 3.d Tees 3.e Union. 3.f Expansion 3.g Other Fittings	3.1 Uses of flanges its fitting and purpose of using flanges . Types of flanges. 3.2 Types & uses of elbows ,reducers tees ,union ,expansion etc.
Unit – IV Ship's piping system	4.b Draw different types of ships piping system which includes bilge,ballast,fire fighting system ,sprinkler system etc.	4.1 Prepare three charts in total from the list of all the piping system in detailed with mentioning parts and the direction of flow .
Unit -V Reasons for pipe failure & Pipe Repair	5a. Reasons for failure ,uniform corrosion ,pitting corrosion etc 5b. Methods to withstand pipe failure 5c. Pipe repair & Maintenance	5.1 Various reasons of failure and the reason for corrosion ,types of corrosion ,water hammering effect ,erosion etc. 5.2 Actions to be carried out during pipe failure ,methods to take for fuel pipe leakage ,steam pipe leakage etc. 5.3 Temporary repairs Binding & Clamping , maintenance of pipes ,inspections carried, 5.4 Permanent Repairs, pressure test ,supports for vibrations.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Not Applicable

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

Sr. No.	Activity.
1	Same mentioned above to prepare charts with diagram and the methods at the end of each practical unit and get it assessed by the concerned faculty.
2	Prepare a list of pipe fittings with drawing.
3	Collect pipes with different size and material used in ship.
4	Prepare a list of different methods used for testing of piping system.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/subtopics.
b) Guide student(s) in undertaking micro-projects.
c) ***'L' in section No. 4*** : Use different types of teaching methods that are to be employed by teachers to develop the outcomes.
d) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessed using different assessment methods.
e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
f) Guide students on how to address issues on environment and sustainability.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-projects are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contributions in the project work and give a seminar presentation of it before submission. The duration of the micro-project should be about **10**-**16** ***(ten to sixteen) student engagement hours*** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects can be added by the concerned course teacher:

a) Prepare a chart of pipe fittings with drawing.
b) Collect pipes with different size and material used in ship.
c) Prepare chart of different methods used for testing of piping system.
d) Prepare a model of piping system used in ship.

13. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1.	A Master Guide to Ship's Piping	Eric Murdoch (Chief Surveyor)	Charles Taylor &Co Ltd The Standard House
2.	Marine Piping System	K L Narayan	Ngee Ann Polytechnic

15. PO-COMPETENCY-CO MAPPING

Semester IV	Marine system line diagram (Course Code: 4341806)						
	POs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning
Competency							
(1) Trace out different lines used on board.	3						
(2) Identify various pipe material and pipe corrosion.	3	2		2			
(3) Use various pipe fitting for ship piping system.	3		2	3			
(4) Simulate ship piping system.	3			3			
(5) Performance of repairing and testing of piping system.	3			2			

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

Sr. No.	Name and Designation	Institute	Contact No.	Email
1.	I R MOMIN, L.M.E.	RCTI, AHMEDABAD	9586970802	Iqbal.momin786@gmail.com
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17. BOS Resource Persons

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