

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

**COURSE CURRICULUM
COURSE TITLE: SHIP BUILDING & SHIP RECYCLING
(COURSE CODE: 3385504)**

Diploma Programme in which this course is offered	Semester in which offered
Fabrication Technology	8 th Semester

1. RATIONALE

The basic purpose of ship building and ship recycling subject taught for giving basic knowledge of ship building and recycling. Students will get the exposure of classification of society and codes and standard related to ship building. Students will get the knowledge of ship building parts, the hull construction. Students will be able to understand the various types of welding processes and cutting and forming processes used in fabrication of ship building/recycling. This course will also give the knowledge of introductory part of ship launching. Students will get the knowledge of coating and painting of ship building.

2. LIST OF COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop required skill in the students so that they are able to acquire following competency:

- Use the knowledge of constructions, inspections, painting and coating in ship building industry.
- Learn recycling importance and how it is help to save environment and energy.

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes-

- Describe scope of ship building as fabrication industries.
- Describe scope of ship recycling as fabrication industries.
- Describe the construction, cycles and terminology of ship building industries.
- Understand the importance of various code and standard used for ship building and ship recycling.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
4	-	2	6	70	30	20	30	

Legends:L-Lecture;T-Tutorial/TeacherGuidedStudentActivity;P-Practical;C-Credit;;ESE-EndSemesterExamination;PA- Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-Topics
Unit – I INTRODUCTION TO SHIP	1a. Describe terminology of ship building 1b. Describe classification of ship building 1c. Describe the various scientific laws related to ship building	INTRODUCTION TO SHIP 1.1 Definition of ship building 1.2 Introduction to Ship 1.3 Ship yard layout 1.4 Shipbuilding Process 1.5 Classification of Ship Based on various Criteria, 1.6 Ship Dimension Principal 1.7 Specification of various types of ship. 1.8 Terminology of ship building / Glossary 1.9 Comparisons of Steel and FRP ship 1.10 MISC Scientific/rules which is related to Ship 1. Newton Third Law of motion 2. Archimedes Law of Buoyancy 3. PASCAL’s Law of Fluid Pressure 4. Law Fluid displacement and weight of displacement of fluid 1.11 5P learning of this subject 1.12 Soft and Hard Skill Requirement of Ship Building Supervisor 1.13 Introduction To (1) Dry Cargo Ship, (2) Bulk Carrier, (3) Oil Tanker, (4) Passenger Ship 1.14 Prepare a C.V. Ship Building Engineer 1.15 Simple fabrication calculation for SB and SRT
Unit- II CODES, STANDARDS, CLASSIFICATION SOCIETY & TPI	2a. Describe role of classification of society & TPI 2b. Describe the role of code and standard in ship building 2c. Describe the role of IMO and SOLAS	CODES, STANDARDS, CLASSIFICATION SOCIETY & TPI 2.1 Introductions of the followings SHIP Classification Society Its Classification 2.2 Introduction role of competent authority 2.3 IACS (International Association Of Classification Society) 2.4 IRS (Indian Register Of Shipping), INDIA 2.5 BVQI - (Bureau Of Veritas), FRANCE,

		<p>2.6 DET NORSKE VERITAS - NORWAY NIPPON KAIJI KYOKAI JAPAN</p> <p>2.7 ABS (American Bureau Of Shipping), USA</p> <p>2.8 LRS (Lloyd's Register Of Shipping) - GREAT BRITAIN</p> <p>2.9 IMO -International Maritime Organization</p> <p>2.10 SOLAS certificates (Safety of Life at Sea)</p> <p>2.11 Role of TPI in ship</p>
<p>Unit- III SHIP DRAWING AND DESIGN</p>	<p>3a. Understand the various types of ship drawing</p> <p>3b. Understand the basic design ship spiral</p> <p>3c. Describe the lofting work used in ship building industry</p>	<p>SHIP DRAWING AND DESIGN</p> <p>3.1 Introduction/Importance of Iron Ship Drawing</p> <p>3.2 Classification of VARIOUS TYPES OF Ship Drawing</p> <p>3.3 Introduction to Basic design of ship</p> <p>3.4 Preparation of the design</p> <p>3.5 Information provided by designer</p> <p>3.6 Ship Design spiral</p> <p>3.7 Purchase of new vessel</p> <p>3.8 Ship contractors</p> <p>3.9 Material Selection Criteria for Ship</p> <p>3.10 Ship design Consideration fo various types of stress</p> <p>3.11 Introduction lofting</p> <p>3.11.1 Hull forms and lines plan</p> <p>3.11.2 Lines plan and full size body plan</p> <p>3.11.3 Templet of ship building</p> <p>3.12 Loft work</p> <p>3.13 Calculation of gross & net tonnage</p>
<p>Unit -IV SHIP HULL CONSTRUCTION & PRE FABRICATION AND ERECTION</p>	<p>4a. Describe the method of hull construction</p> <p>4b. Describe the various types of frame structure</p> <p>4c. Describe the various type of Bulk-head and its construction</p>	<p>SHIP HULL CONSTRUCTION & PRE FABRICATION AND ERECTION</p> <p>4.1 Typical Ship Building Yard Layout Study</p> <p>4.2 Typical Consideration of Ship Building Lay-out at Pipavav/ Hazira Bandar /Port Facility and Location Study</p> <p>4.3 Ship hull Construction Methods</p> <p>4.3.1 Definition of keels</p> <p>4.3.2 keels Classification/ Different Types</p> <p>4.3.3 Kill laying and Sequential Frame Structure Erection</p> <p>Ship unit Construction Method</p> <p>4.3.4 Ship Hull Block Construction Methods</p> <p>4.3.5 Building Block Erection drawing</p>

		<p>4.4 Types of Bottom Structure</p> <p>4.5 Classification of Frame on various bases</p> <p>4.6 Definition Bulk-head its types</p> <p>4.7 TYPES OF BULK HEAD,</p> <p>4.8 Construction of Bulk-head</p> <p>4.9 Ship and shell Plating</p> <p>4.9.1 Ship Inner Bottom / Side &</p> <p>4.9.2 Deck plating</p> <p>4.10 Construction of Tank</p> <p>4.11 Construction of Bulbous Bow Drawing</p> <p>4.12 Construction of Deck & Hatches</p> <p>4.13 Types of Hatches, Folding Hatch Cover, Single pull Hatch Cover, Ship Out Fitting</p> <p>4.14 Definition of Winch, Drawing, Function</p> <p>4.15 Propellers- Definition, Function, types of Material Used</p> <p>4.16 Fabrication Sequence of typical iron Ship</p>
<p>Unit – V</p> <p>SHIP INSPECTION / TESTING ,TRIALS & LAUNCHING OF SHIP</p>	<p>5a. Describe the ship inspection methods</p> <p>5b. Describe the various type of launching of ship</p> <p>5c. Describe the various type of ship trials</p>	<p>SHIP INSPECTION / TESTING, TRIALS & LAUNCHING OF SHIP</p> <p>5.1 Ship Launching</p> <p>5.1.1 Introduction</p> <p>5.1.2 Definition & of Ship Launching</p> <p>5.1.3 Classification of various types of launching</p> <p>5.1.4 Introduction of various types of launching method</p> <p>5.1.5 Typical case studies of 75000 bulk carrier.</p> <p>5.2 Ship Trials</p> <p>5.2.1 Definition, Introduction and meaning of ship trial</p> <p>5.2.2 Classification of Trials</p> <p>5.2.3 Activities Before During & after Trial</p> <p>5.2.4 Acceptance of Trial and Inspection of ship</p> <p>5.2.5 Schedule of Trials (p-130)</p> <p>5.3 Ship testing</p> <p>5.3.1 Ship Inspection, Raw Material Inspection</p> <p>5.3.2 Non Destructive Testing</p>
<p>Unit - VI</p> <p>WELDING,CUTTING AND FORMING PROCESS OF S.B & S.R.T</p>	<p>6a. Describe the various welding and cutting processes used for ship building</p>	<p>WELDING,CUTTING AND FORMING PROCESS OF S.B & S.R.T</p> <p>6.1 Introduction</p> <p>6.2 Ship Welding Practices</p> <p>6.3 Slot / doubler Plate</p>

	<p>6b. Describe the various forming processes used in ship building</p> <p>6c. Describe the ship welding sequence</p>	<p>6.4 Ship Welding Sequences</p> <p>6.5 Joining of metallic material Hull steel welding</p> <p>6.6 WPS, WPQ, PQR As per LRS</p> <p>6.7 Under Water Wet Welding</p> <p>6.8 Under Water Dry Welding</p> <p>6.9 Comparison arc welding process SMAW & SAW</p> <p>6.10 Comparison GTAW & GMAW</p> <p>6.11 Types of welding discontinuities</p> <p>6.12 Ship Cutting process</p>
<p>Unit- VII</p> <p>SHIP RECYCLING & SHIP BREAKING</p>	<p>7a. Describe the concept of ship recycling</p> <p>7b. Describe the ship recycling yard layout</p> <p>7c. Identify deferent elements of ship recycling lay out</p> <p>7d. Describe the process of ship dismantling</p> <p>7e. Describe the Safety and health issues in ship braking</p> <p>7f. Describe the factors affecting ship life</p>	<p>SHIP RECYCLING & SHIP BREAKING</p> <p>7.1 Definitions & Introduction of ship recycling Meaning Concept of Ship Recycling</p> <p>7.2 Ship Recycling yard lay-out</p> <p>7.3 Ship recycling scenario</p> <p>7.4 Age profiles of different categories of ship.</p> <p>7.5 Merit/ advantages of ship recycling / breaking</p> <p>7.6 Process of ship braking</p> <p>7.7 Locations & concern area of ship braking</p> <p>7.8 Concern areas & Conclusion</p> <p>7.9 Ship braking/ dismantling process</p> <p>7.9.1 Introduction need / Causes of Ship recycling</p> <p>7.9.2 Procedure of Ship Recycling / Ship Recycling Stages</p> <p>7.9.3 Ship dismantling</p> <p>7.9.4 Positioning for ship braking</p> <p>7.9.5 Procedure followed while dismantling vessels including cutting process</p> <p>7.10 Disposals of material an hazards materials (Hazardous west disposal methods)</p> <p>7.10.1 Environmental issues in the disposals of hazards materials</p> <p>7.10.2 Dangerous of ship braking</p> <p>7.10.3 Safety and health in ship braking / Safety in Ship Recycling</p> <p>7.10.4 List OUT THE Requirement OF tools/equipment accessories to prevent Accident for Safety</p> <p>7.11 Role of G.P.C.B</p> <p>7.12 Factor affecting Ship Life</p> <p>7.13 Material Handling in Ship</p>

		<p>7.14 REPORTING OF Different types of Accident Occurs in Ship Recycling</p> <p>7.15 Precautionary measures in Ship Recycling</p> <p>7.16 Basic requirement of fire fighting in ship</p> <p>7.17 Mechanical cutting & thermal cutting</p> <p>7.18 Compare of gas cutting & plasma cutting</p>
<p>Unit- VIII SHIP COATING TREATMENT</p>	<p>8a. Describe the various type of coating methods and its functions</p> <p>8b. Describe the role of paints in ship building industries</p> <p>8c. Describe the ideal properties of ship paints</p>	<p>SHIP COATING TREATMENT</p> <p>8.1 Ship Coating</p> <p>8.1.1 Definition of Coating / Introduction and concept</p> <p>8.1.2 Types/ Classification of Coating</p> <p>8.1.3 Various Methods of Coating</p> <p>8.1.4 Definition of Paint</p> <p>8.1.5 Introduction /General protection by pain</p> <p>8.2 Ship Painting</p> <p>8.2.1 Classifications of paint / Generic types of paint</p> <p>8.2.2 Paint ingredients/component Composition Pigment/ Base / of Solvents</p> <p>8.2.3 Major paints used in ship Building</p> <p>8.2.4 Classification various methods & painting application</p> <p>8.2.5 Selection of paint</p> <p>8.2.6 Check point for Paint Qualities & Paint Life / Paint Failure in Iron Ship</p> <p>8.2.7 Defects in painting</p> <p>8.2.8 Ideal Properties requirement of good paints to be studied</p> <p>8.2.9 Paints systems in ship</p> <p>8.2.10 Calculation Coating /Painting Cost of Ship Component</p>

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I	Introduction to ship	4	0	0	7	7
II	Codes, standards, classification society & TPI	4	0	0	7	7
III	Ship drawing and design	6	0	6	0	6
IV	Ship hull construction & pre fabrication and erection	12	7	7	0	14
V	Ship inspection / testing ,trials & launching of ship	10	3	7	0	10
VI	Welding, cutting and forming process of S.B. & S.R.T	8	7	0	0	07
VII	Ship recycling & ship breaking	8	7	7	0	14
VIII	Ship coating treatment	4	0	0	5	05
	TOTAL	56	24	27	19	70

Legends: R = Remember; U = Understand; A = Apply and above levels
(Bloom's Revised taxonomy)

NOTE:- Suggested specification table shall be treated as a general guidance for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED LIST OF EXERCISE/PRACTICAL/EXPERIMENTS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, If these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus overall development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes

S. No.	Unit No.	Exercise /Practical (Outcomes in psychomotor domain)	Approx. Hrs. Required
1.	1	Prepare (i) a neat sketch of typical ship building layout plan and label its elements (ii) a chart for classification of ship on various criteria/bases.	2
2.	1	Demonstration of fluid displacement and weight displacement of water (Archimedes law).	2
3.	1	Understand meaning of typical terminology used in typical ship model.(aft peak, for peak, midship, starboard side, port side, etc.)	2
4.	1	Demonstration of Newton's third law of motion.(Optional)	2
5.	3	Study of typical types of drawing used in ship building industries.	2
6.	4	Prepare a layout plan and template for midship frame of typical ship.	2
7.	4	Prepare a layout plan and template for peak frame of typical ship.	4
8.	4	Prepare a layout plan and template for aft peak frame of typical ship.	4
9.	4	Prepare a layout plan and template for bulk head of typical ship.	2
10.	5	Demonstrate the typical ship launching arrangement for ship launching. And Study of typical ship trial.	4
11.	7	Prepare typical ship recycling yard layout plan and lable its various elements.	2
12.	8	Demonstrate the typical ship painting process.	2
Total Hrs.			28

8. SUGGESTED LIST OF PROPOSED STUDENTACTIVITIES

Following is the list of proposed student activities:

- 8.1 Prepare sketchbook of drawing of various topics of syllabus
- 8.2 Prepare a question bank.
- 8.3 10 min PPT presentation on the given topic from the syllabus or beyond the syllabus
- 8.4 Report writing on various topics from syllabus and beyond syllabus
- 8.5 Prepare a model of ship.
- 8.6 Download the various ship building and ship recycling videos.
- 8.7 Download the various ship launching videos.
- 8.8 Download the various ship painting videos.
- 8.9 Prepare a various frame drawing using AutoCAD.
- 8.10 Prepare a report on the topic mentioned in table 8.9.1

Table 8.9.1 Report writing topics

Sr. No.	Unit. No.	Description of report writing
1	1	Prepare a neat sketch of typical ship model drawing and label all its elements <u>from given model.</u>
2	2	Prepare a report of Role of TPI (third party inspection agency) in ship <u>building industry.</u>
3	2	Prepare a report Role of classification society of ship building.
4	3	Describe the ship design spiral
5	4	Draw a neat sketch of deck construction and its elements
6	7	Prepare a typical labor accident report of ship recycling yard.
7	4	Prepare a typical ship block erection drawing for typical drawing of ship.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- Arrange industrial visit of ship building and ship recycling industries.
- Arrange expert lecture on ship building and ship recycling topic.
- Show video films/animation films/photographs of different automated manufacturing process and discuss their features.

10. SUGGESTED LEARNING RESOURCES**A. List of Books**

S.No.	Title of Books	Author	Publication
1.	Merchant ship Construction	D. A. Taylor	Butterworth, 1980
2.	Ship Design and Construction	R. TAGGART	Society of Naval Architects and Marine Engineers, 1980
3.	Ship Construction	D.J.EYRES	Butterworths & Heinemann
4.	Naval Architecture for marine engineers	W. MUCKLE BY ERIC C TUPPER	Butterworths & Heinemann
5.	Rules and regulations for Constructions and Classification of steel ship	IRS	INDIAN REGISTER OF SHIPPING
6.	American Bureau of shipping (Rules Books)	ABS	AMERICAN BUREAU OF SHIPPING
7.	Ship Recycling A Handbook for Mariners	Purnendu Misra Anjan Mukherjee	NAROSA PUBLISHING HOUSE
8.	Ship Stability for Masters and Mates	CAPTAIN D.R.DERRETT DR C.B.BARRASS	Butterworths & heinemann

B. List of Major Equipment/Instrument

- i. Marking and measuring tools
- ii. Ship models
- iii. Model of ship launching arrangement
- iv. Gas cutting equipment with Flash back arrester

C. List of Software/Learning Websites

a. Learning software

- (1) Autocad
- (2) Creo
- (3) Catia

b. Learning websites

- (1) <http://www.parl.ns.ca/woodenships/terms.htm>
- (2) <http://forshipbuilding.com/>
- (3) <http://www.abs-group.com>
- (4) <http://ww2.eagle.org/en/what-we-offer.html>
- (5) <http://forshipbuilding.com/category/ship-construction/>

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. P. B. Pathak**, I/C HOD, Deptt. of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. B. K. Gandhi**, Sr. Lecturer, Deptt. of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. S. Y. Merchant**, Sr. Lecturer, Deptt. of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. A. M. Gohil**, Lecturer, Deptt. of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. N. M. Bhangale**, Lecturer, Deptt. of Fabrication Technology, Sir B.P.I., Bhavnagar

Co-coordinator and Faculty Members from NITTTR Bhopal