4332 - WELDING IN SHIP CONSTRUCTION - I

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)			
					Theory		Practical Ex.	Total
Lectures	Practical	Credits						
3	2	5	25	25	3 Hrs	100	-	150

Pre-requisite	Source
Nil	SHB

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	25	–	125

RATIONALE :-It is essential that a technician involved in shipbuilding, ship repair industry should have a thorough knowledge of different welding processes, which plays a very vital role in fabricating different metals and non-metals. Hence an attempt has been made in Welding Engineering-I to brief out different welding processes, welding processes, types of welding joints, etc.

COURSE CONTENTS	Hrs	Mks
1. INTRODUCTION TO WELDING	2	6
Definition of Welding. Classification of different welding process. Advantages and disadvantages of welding. Comparison of welding with respect to riveting and casting.		
2. PHYSICS OF WELDING	7	14
Welding arc, arc initiation, arc structure and mechanism, arc stability and factors governing it, arc blow and factors affecting it, types of arc blow, effect and remedies of arc blow, metal transfer and its types, forces affecting metal transfer, weld bead geometry.		
3. METALLURGY OF WELDING	4	8
Temperature distribution in welds, metallurgical effects of welding, heat affected zone, corrosion of welds, weld cracking-types, weld decay and its prevention, weld dilution and factors affecting it.		
4. WELDING PROCESSES/EQUIPMENT		
Manual metal arc welding-Process (type of joints used). Power sources (AC/DC) for arc welding, selection and specification of power source, welding transformers (AC/DC).	6	12
Gas welding- Process gas welding equipment, oxygen gas cylinder, acetylene gas cylinder, acetylene gas generator manifolding system, single and two stage gas regulator, oxygen and acetylene gas hoses, hose connections, hose clamps and hose couplers, welding torches, trolleys and cutting torches.	6	14
Brazing and soldering- Process, types (in detail) and equipment.	4	6
5. WELDING DEFECTS IN SHIP BUILDING	6	11
Cracks, incomplete penetration, distortion, porosity and blowholes, poor fusion, poor weld bead appearance, spatter, undercutting slag inclusion and overlapping.		

6. WELDING DISTORTION AND RESIDUAL STRESSES Introduction, concept of distortion, types and control of welding distortion, minimising distortion in repair work. Residual stresses- Definition and concept, types and control of residual welding, methods of reducing residual stresses.	4	8
7. WELDING ELECTRODES AND CONSUMABLES Types of welding electrodes (consumable and non consumable), classification of electrodes, electrode coating-Ingredients and their function. Selection of electrodes care and storage of electrodes. Classification and coding of MS and low alloy steel electrodes. Types of shielding gases and filler metals used.	5	12
8. THERMAL CUTTING OF METALS- Types of cutting processes- Oxy-fuel gas (flame cutting), Stack cutting, Arc cutting- Tungsten arc cutting, Plasma arc cutting.	4	9
Total	48	100

PRACTICALS

JOB NO.1: Stringer bead in horizontal position.
JOB NO. 2: Stringer bead in vertical position.
JOB NO.3: Gas cutting and gas welding.

REFERENCE BOOKS

1) Welding Technology by O. P. Khanna.
2) Welding Engineering by Boniface E. Rossi
3) Welding Principles & Practices by Raymond Sacks
4) Modern Arc Welding by Nadkarni
5) Welding hand book by American Welding Society (AWS)
6) Welding Engineers Hand Book by J.A.Oates.