

Subject Code: 1ET4020604	Subject Title: Fabrication Technology
Pre-Requisite	--

RATIONALE:

This course focuses on fabrication of different machine parts and process equipment used in various engineering application. This course would help students to learn application of different tools, equipment & machineries used in fabrication of process equipment and various fabrication works in deferent engineering application. This course also tries to develop safety consciousness in students for fabrication work. Students also become conversant with related manufacturing codes & standards of process equipment e.g. ASME, TEMA, BIS - 2825, BS - 5500. This also provides opportunity for hands on practice for student to develop skills and to understand basic technical requirement for process equipment fabrication. This course thus provides necessary knowledge and skills required in fabrication industry, and hence it is a key course for mechanical engineers.

Course Objective:

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

Plan and supervise fabrication of different process equipment using appropriate methods, various fabrication standards, codes and safety norms.

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment
3	--	2	4	60	40	20	30

Subject Contents			
SR. NO.	TOPIC	TOTAL HOURS	WEIGHTAGE (%)
1.	Introduction to Fabrication Technology Need and scope of fabrication technology in industries. Weldability-concept, meaning, definition and factors affecting it and its importance. Power source-classification, advantages, limitations, features, applications and selection criteria. List of national and international fabrication industries and third party inspection agencies.	04	12
2.	Fabrication Processes and Safety Equipment/machines used for edge preparation, their working & features. Preheating and inter-pass: need, method and applications. Post heating-need, method and applications. Post Weld Heat Treatment (PWHT)-need, methods, applications and selection criteria. Methods of relieving thermal stresses. Arc welding parameters-setting criteria: i. Voltage. ii. Current. iii. Welding speed. iv. Welding feed. v. Arc length. Advance welding methods and their applications. i. Ultrasonic welding. ii. Laser beam welding. iii. Electron beam welding. iv. Friction stir welding. Welding automation. Fabrication steps/stages of: i. Electrical power/communication transmission tower. ii. Pressure vessel. iii. Heat exchanger. Need, precautions and safety norms during welding and fabrication process.	08	20
3.	Drawing Interpretation Welding location of elements, welding general nomenclature, welding symbols as per IS: 696-1972, welding supplementary symbols, abbreviations used for welding processes and welding position. Interpretation and method to work out bill of material for following types of drawings: i. Welding / fabrication. ii. Process and instrumentation. iii. Piping isometric. Types, sketch, edge preparation and applications of weld - square butt, groove, fillet, plug, Types of joint butt, lap, corner, tee and edge, Types of weld edge preparation Welding documents - Weld Test Plan (WTP) and Shop Weld Plan (SWP).	14	28

	Introduction to ASME section IX Welding Procedure Specification (WPS) and Welder Performance Qualification (WPQ). Need and application areas of different codes used in fabrication industries remaining ASME sections, ASTM, AWS, IS, BIS, JIS, EN, DIN, TEMA, EJMA.		
4.	Inspection and Testing Common weld defects, their causes and remedies; Thermal distortion-concept, meaning, definition, causes, effect and types. Methods and equipments used to control thermal distortion. Weld quality-concept, meaning, definition, importance and affecting factors Introduction to inspection and testing. Stages of inspection. Types, methods of testing and importance of destructive testing (DT). (Tensile test, compressive test, impact test, bend test, hardness test.) Types, methods of testing and importance of Non Destructive Testing (NDT). (Liquid penetrate testing, Magnetic Particle Testing, Ultrasonic Testing, Radiography Testing, Eddy Current Testing) Special types of test like Hydro test, Pneumatic test, and Leak test by soap water and helium gas.	08	20
5.	Surface preparation, Finishing and Coating Methods Surface preparation methods, sand blasting and ball blasting. Surface finishing methods, brushing and grinding. Surface colour coating by brush, roller and spray applications.	04	10
6.	Installation, Erection and Commissioning Erection steps for common fabrication structure. Erection steps for equipment to be fabricated. Erection steps for piping. Installation and commissioning procedures for plant machineries and fabricated equipment.	04	10

Course Outcome:

The students will be able to

1. Interpret the fabrication drawings and plan the fabrication processes requirements and calculate the materials requirements.
2. Develop welding documents like WPS, WPQ, SWP and WTP
3. Suggest steps for erection, installation and commissioning of fabricated equipment
4. Follow safety norms during fabrication process.

List of Practical/Experiments:

1. Interpretation of fabrication drawing and one piping drawing for interpretation.
2. Prepare WPS and WPQ: Prepare one WPS (Welding Procedure Specification) and one WPQ Welder Performance Qualification) based on given variables and data.
3. Complex job as mini project work: Fabricate one complex job by using welding processes in group of 4 to 6 students.
4. Prepare SWP and WTP: Prepare one Shop Weld Plan (SWP) and one Weld Test Plan (WTP) for typical pressure vessel job.
5. Liquid penetrate testing: Demonstrate liquid penetrate testing of weldment.

List of References:

1. Production Technology, R.K. Jain and S.C. Gupta, Khanna publication
2. Workshop Technology I & II, Raghuwanshi, Dhanpat Rai and Sons
3. Elements of Workshop Technology Volume No. II Machine Tools, Hajra Choudhary, Bose S. K., Roy Nirjhar, Media promoters and publishers pvt. Limited
4. Production Technology, HMT, Tata Mcgraw-Hill Publishing Co.

List of Software/Learning Websites:

1. <http://nptel.iitm.ac.in/video.php?subjectId=112105126>
2. <http://www.youtube.com/watch?v=H0AyVUfl8-k&list=PLEFE7D1579523C45D>
3. <http://www.youtube.com/watch?v=81Fdif5e85c>
4. <http://www.youtube.com/watch?v=THVgkBnjLq0>
5. <http://www.youtube.com/watch?v=fGqc9mZS0YI>
6. <http://www.youtube.com/watch?v=Mn9jpqI8rao>
7. <http://www.youtube.com/watch?v=8SuoH5aL1SY>