GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN FABRICATION TECHNOLOGY

SEMESTER: V

Subject Name: **Welding Inspection and Testing**

Sr. No.	Course Content
1	**Welding Inspection and Third Party Inspection:** 1.1 Scope, application 1.2 Symbols 1.3 Ethical and essential repairment of welding inspector 1.4 Welding inspection operation 1.5 Quality assurance 1.6 Welding metallurgy 1.7 Need of TPI 1.8 Various TPI agencies in field of fabrication 1.9 Record, report and format used by TPI 1.10 Final testing & certification 1.11 Responsibilities of welding inspector 1.12 WPS, WPQ, and PQR 1.13 Test plan and weld plan 1.14 QA and QC plan 1.15 Need, importance of parameter slip 1.16 Drawing reading
2	**Introduction to NDT:** 2.1 Weld defects types, causes, remedies 2.2 Selection criteria for NDT methods 2.3 Codes & standards used in NDT 2.4 Concept of root cause analysis with format 2.5 Definition to NDT 2.6 Need for NDT and its application 2.7 Types of NDT techniques 2.8 Benefits from NDT 2.9 Application of defect & discontinuities method 2.10 Nature of flaws 2.11 Various steps involved in NDT 2.12 Comparison of NDT & DT 2.13 Welding inspection operations 2.14 Special Testing Methods
3	**Visual Inspection & LPT:** 3.1 Basic principle, defects can be detected, optical aids of Visual inspection 3.2 Introduction & historical background of LPT 3.3 Principle of LPT 3.4 Procedure for LPT as per ASME sec- V 3.5 Penetrant Testing materials(Inspection kit)

	3.6 Industrial application of LPT 3.7 Penetrant testing methods 3.8 Precautions, advantages, limitations & sensitivity 3.9 Related standards 3.10 Acceptance criteria of LPT as per ASME sec-VIII
4	**Radiography Testing:** 4.1 Introduction 4.2 Basic principle 4.3 Properties & production of X-rays 4.4 Electromagnetic Radiation Sources 4.5 Working principle of X-rays radiography & gamma ray radiography 4.6 Comparison of X-ray & gamma ray 4.7 Effect of Radiation on film 4.8 Radiography Imaging 4.9 Radiography Inspection Technique 4.10 Advantages, limitations & applications of RT 4.11 Safety in RT related standard (ASME) 4.12 Exposure time & SFD calculation & safety related calculation 4.13 Types of IQI (Impag Quality Indicator)
5	**UT & Ecostic Emmission:** 5.1 Introduction & principle of UT 5.2 Ultrasonic Transducer (Types & probes) 5.3 Inspection methods 5.4 Types of waves, frequency of waves & generation of ultrasonic waves 5.5 Normal beam inspection 5.6 Angle beam inspection 5.7 Ultrasonic flaw detection equipment 5.8 Mode of display 5.9 Standard test block & evaluation flaw size 5.10 Ultrasonic Thickness measurement 5.11 Advantages, limitations & application of UT 5.12 Related standards ASME sec- V, VIII 5.13 Basic definition of Velocity, Wavelength, etc 5.14 Introduction, definition & principle of Acostic emmission 5.15 Technique of AET 5.16 Instrumentation 5.17 Advantages, limitations, application & sensitivity 5.18 Related standards
6	**MPT & EDDY Current Test:** 6.1 Magnetization • Basic definition and principle of MPT 6.2 Magnetizing Techniques 6.3 Procedure used for Testing component 6.4 Equipment used for MPT 6.5 Sensitivity 6.6 Materials to be magnetized 6.7 Advantages, limitations, & applications 6.8 Related standard Eddy Current Test

	6.9 Principle 6.10 Instrumentation of ECT 6.11 Techniques 6.12 Sensitivity 6.13 Advantages, limitations, & applications 6.14 Related standard
7	**Mechanical Testing of Weldments:** 7.1 Principle, equipment, procedure, specimen as per std. codes & std. used below process • Tensile test • Bend test • Izod impact test • Charpy test • Hardness test

Laboratory Experience:

Experience No.	Description of Laboratory Experience
1.	**Demonstration & Study (Report/Observation Writing):** 1. Study of process equipments drawings 2. Demonstration & study of welding safety equipment & clothing 3. Demonstration & study of marking & measuring equipment & tools for D'end support 4. Demonstration & study of various types of D'end forms of metals 5. Study of material test certificate (MTC) with typical example of plate material used in process equipment industry 6. Demonstration of cutting of various commercial forms of metal by using various tool, equipments & machines
2.	**Job Preparation (Write Sequence and Perameters of Operation):** 1 Generate weld defect and mention causes and remidies 2 Prepare QA plan for given drawing of product 3 Prepare QC plan for given drawing of product 4 Prepare report on drawing reading as per the view of welding inspection approved 5 Prepare inspection procedure as per ASME sec-V and Acceptance criteria As per ASME sec-VIII for given job for following NDT methods • LPT • MPT • UT • RT 6 Prepare report on RT film viewing and mention different types of defects 7 Prepare QA plan for given job 8 Prepare QC plan for given job 9 Prepare WPS, WPQ and PQR 10 Prepare report on Visual inspection

	11 Prepare Test plan and Weld plan 12 Study, responsibility of welding inspector before, during and after welding with real Causley • Demonstrate mechanical tests • Prepare report on special testing methods
3.	**Seminar & Presentation & Group Discussion:** 1. Prepare a Seminar Using Power Point Presentation/Transparencies on The Topic Covered in Syllabus/Beyond The Syllabus 2. Give 10 minutes Presentation 3. Group Discussion
4.	Preparation of Models, Charts, Quiz Competition & Slogans(Group/Individual)
5.	**Industrial Visit:** Term Work content of Industrial Visit Report Should Also Include Following a) Brief Detail of Industry Visited b) Type, location, product, rough lay-out, Human resource etc. of industry c) Details, Description, Broad Specification of machinery/Process Observed d) Safety Norms and Precautions observed e) Student on Observation on Industrial Environment, Culture and Attitude f) Any Other Detail/Observation asked by accompanying faculty. 1. Industrial visit of Structural Fabrication Industry
6.	**Sheet & Sketch Work:** 1. Prepare a sheet base on fabrication calculation (geometric problem) 2. Prepare a sheet for mensuration 3. Prepare a sheet for commercial form of metal 4. Prepare a sheet for one typical process equipment drawing
7.	**Report Writing:** 1. Write a report on storing and handling of material 2. Write a report on structural joining process 3. Write a report on BIS – 800 4. Write a report on Lining , leveling & plumbing 5. Write a report on different cutting methods used in structural fabrication
8.	**Beyond Syllabus Activities (Develop Creative & Innovative Ideas Among Students):** Display article, information, sketch, under knowledge zone(K-Zone), inspiration zone(I- Zone) & Creative zone(C-zone)
9.	**Literature Survey:** 1. Library assignment 2. Internet surfing 3. Refer product pamphlets 4. Technical magazines

10.	**Shop Talk:** Ten minutes presentation on shop floor/Laboratory during the presentation of job/laboratory experience by the students
11.	**Audio Visual Aids:** 1 Prepare audio cassette 2 Photograph lab manual 3 Technical video download
12.	**Paper Solutions:** 1 Write a paper solution of last five examination papers
13.	**School Within School:** 1. Guiding / Sharing / Mentoring the know-how by meritorious students to lower performing students
14.	**Self Learning:** 1. Contact with field expert, seniors, alumni and get further know-how individually or in a group. 2. Read related book / magazine / article / literature and share the content

Notes:

1. Term work report content of each experience should also include following.
   a) Experience description/ data and objective.
   b) A skill which is/are expected to be developed in student after competition of experience.
   c) Drawing of experience / set up with labels / nomenclature to carry out the experience.
   d) The specification of machine / equipment / devices / tools / instruments/items / elements which is / are used to carry out and to check experience**.**
   e) Process parameters / set up settings values applied to carry out experience
   f) Steps / process description to execute the experience.
   g) Observation
   h) Information on resent machine / equipment / devices / tools/ instrument/ item available. In market to carry out the experience.
   i) Special / additional notes or remarks.
2. Term work report of student of regular more should exclude distance learning manual, photocopy, printed content, etc. focus should be on developing the term work as original efforts of student.
3. Term work content of industrial visit report should also include following
   a) brief detail of industry visited
   b) Type, location, product, rough layout, human resource, etc of industry.
   c) Details, description and broads specification of machinery / process observed.
   d) Safety norms and precautions observed
   e) Student on observation on industrial environment, culture and attitude
   f) Any other detail /observation asked by accompanying faculty.
4. Term work also include experience logbook duly certified by subject teacher.

Reference Books:

Sr. No.	Book Name	Author Name
1.	Practical NDT	Baldev Raj
2.	Welding Inspection	AWS. 671, AME. 21992
3.	Welding Technology for engineers	Baldev Raj – 671 / 27528
4.	NDT Handbook Vol. 1 & 3	ASNT – 671 / 21994
5.	Non destructive examination Handbook	Knud. Co. Bowing – 669 / 24025
6.	Non destructive Testing Techniques	Ravi Prakash – 669 / 27584
7.	Welding engineering & Technology	R.S. Parmar
8.	ASME Sec. – II, V, VIII, IX	
9.	ASTM code	
10.	Welding Technology	O.P Khanna
11.	Mech. Design & fabrication of Process Equipment	B. E. Bhattacharya
12.	Science & technology of Ultrasonic	Baldev Raj
13.	Practical Ultrasonic	C.V. Subramanium
14.	Practical emission	Baldev Raj
15.	Transducer for Ultrasonic flaw detection	V.N. Bindal