GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Fabrication Technology

Subject Code: DI04055021

Subject Name: Fabrication Design

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	PCC

Prerequisite:	-
Rationale:	Fabrication is one of the major manufacturing processes which is extensively used in producing process equipments, steel structures and piping projects. This course develops capability to interpret and draft fabrication design & drawings using basic knowledge and skill attained through this course. The students will be able to apply this knowledge and skill in their real life application throughout their career in the world of work. Student will develop his lifelong learning skill in stress calculation, design of riveted joint, welded joint, main parts of pressure vessel and structural elements.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Design simple machine parts	U
02	Design riveted joints	U
03	Design welded joints	U
04	Describe basic considerations in process equipment design and drafting.	U
05	Describe design considerations of steel structures.	U

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA(M)	PA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Machine design and stresses in machine parts** 1.1 Definition 1.2 Classification of machine design 1.3 General considerations in machine design 1.4 General procedure in machine design 1.5 Fundamental units & its conversion 1.6 Load, Stress, Strain 1.7 Tensile, compressive, shear stress & strain 1.8 Young's modulus 1.9 Shear modulus 1.10 Bearing stress 1.11 Stress strain diagram 1.12 Working stress 1.13 Factor of safety and its selection criteria 1.14 Thermal stress 1.15 Linear and lateral strain 1.16 Poisson's ratio 1.17 Volumetric strain 1.18 Bulk modulus 1.19 Relation between bulk modulus and young's modulus 1.20 Relation between young's modulus and modulus of rigidity 1.21 Impact stress 1.22 Resilience 1.23 Torsion shear stress 1.24 Bending stress 1.25 Principal stress and principal plane 1.26 Application of principal stress in designing machine members 1.27 Cyclic stresses 1.28 Fatigue and endurance limit 1.29 Effect of different factors on endurance limit 1.30 Stress concentration & methods of reducing stress concentration 1.31 Notch sensitivity	15	34
2.	**Design of Riveted Joints** 2.1 Introduction & methods of Riveting 2.2 Material of rivet	8	18

	2.3 Essential qualities of rivet 2.4 Types of rivets 2.5 Types of riveted joint 2.6 Important terms used in riveted joint 2.7 Failures of a riveted joint 2.8 Strength of riveted joint 2.9 Efficiency of riveted joint 2.10 Riveted joint for structural use – joint of uniform strength (Lozenge joint)		
3.	**Design of Welded Joints** 3.1 Introduction 3.2 Advantages and disadvantages of welded joint over riveted joint 3.3 Types of welded joint 3.4 Strength of transverse fillet welded joint 3.5 Strength of parallel fillet welded joint 3.6 Special cases of fillet welded joint 3.7 Strength of butt welded joint 3.8 Stresses for welded joint 3.9 Stress concentration factor for welded joint 3.10 Axially loaded unsymmetrical welded sections	7	15
4.	**Basic Consideration in Process Equipment Design and Drafting** 4.1 Design codes 4.2 Factors affecting process equipment design 4.3 Maximum working pressure 4.4 Design pressure 4.5 Design temperature 4.6 Design stress & factor of safety 4.7 Corrosion allowance 4.8 Weld joint efficiency factor 4.9 Design loadings 4.10 Stress concentration 4.11 Thermal stress 4.12 Criteria of failure 4.13 Failures in pressure vessel 4.14 Cylindrical shell design 4.15 Design of heads & closures 4.16 Compensation for opening in process equipment 4.17 Types & design criteria of flange 4.18 Gasket & its selection	7	15

	4.19 Design consideration & types of support for pressure vessel 4.20 AutoCAD 2D drafting		
5.	**Design considerations of steel Structure** 5.1 Factors governing structural layout 5.2 Structural design 5.3 Steps in design 5.4 Load analysis 5.5 Minimum thickness 5.6 Plans and drawings 5.7 Design considerations 5.8 Methods of structural design 5.9 Simple design 5.10 Semi-rigid design 5.11 Fully rigid design 5.12 Experimentally based design 5.13 Slenderness ratio 5.14 Corrosion protection 5.15 Increase of stresses 5.16 Fluctuation of stresses 5.17 Resistance to horizontal forces 5.18 Stability of the structure 5.19 Industrial building 5.20 Steel Bridges 5.21 Web stiffeners & its types 5.22 Roof trusses 5.23 Transmission line tower 5.24 Bending moment & shear force diagram 5.25 Cantilever beam with point load at end 5.26 Cantilever beam with uniformly distributed load 5.27 Simply supported beam with point load at mid-point 5.28 Simply supported beam with uniformly distributed load	8	18
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
13 %	47%	40%	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	A text book of machine design	R. S. Khurmi J. K Gupta	Euresia Publishing House (Pvt.) Ltd.
2	Pressure Vessel Design manual	Deniss Moss	Gulf professional publishing
3	Design and Analysis of Steel structures	V.N.Vazirani M.M.Ratwani Honey Mehra	Khanna Publishers
4	Chemical equipment design	B.C.Bhattacharya	CBS Publishers & Distributers
5	Process Equipment Design	V.V.Mahajani S. B. Umreji	Macmillan Publication
6	Pressure vessel design – Guide & procedure	Mr. Ghader Ghanbari Mr. Mohammad Ali Liaghat	-
7	Strength of material	R.S.Khurmi	S.Chand & Company (Pvt.) ltd

(b) Open source software and website:

- https://youtu.be/U7CPRj1T5n8
- https://youtu.be/t6NTK7DNbQo
- https://youtu.be/C5ZPaCvoigw
- https://youtu.be/4TOpgLFXvWE
- https://youtu.be/7b1bd-lgra0
- https://youtu.be/LQpxTqHB_p8
- https://youtu.be/Y1m7_RAsmdI
- https://youtu.be/m2B8t8vzeUE

- https://youtu.be/8U9kf6D1-ig
- https://youtu.be/d2-D8dTrEWM
- https://youtu.be/rpfqPAM_kRE
- https://youtu.be/FBtARm2TT1o
- https://youtu.be/tM5hsUiNpGA
- https://youtu.be/ITuWnrl3aKI
- https://youtu.be/l_xTyy4wqtw
- https://youtu.be/nNcfzNjIifU
- https://youtu.be/q3c-ig5G3bA
- https://youtu.be/IWYKfzx-M1E

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Interpret process equipment drawing.	4	2
2	Draw orthographic drawing by using AutoCAD – 2D.	4	10
3	Calculate stress & strain for given load and job conditions.	1	2
4	Design the shaft.	1	2
5	Design simple riveted joints.	2	2
6	Design riveted joint for structural use (lozenge joint).	2	2
7	Design simple welded joint.	3	2
8	Design Axially loaded unsymmetrical welded sections.	3	2
9	Study design consideration of Industrial Shade and Transmission Line Tower.	5	2
10	Study design consideration of Roof struts and Steel bridge.	5	2
11	Study S.F & B.M diagram for cantilever & simple supported beam for Point and Uniformly distributed load.	5	2
	TOTAL HOURS.		**30**

Note

i. *More **Practical Exercises** can be designed and offered and can be changed 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. *Boiler suit, safety shoes, other safety items& hand tools are compulsory while attending laboratory and has to be brought by students.*

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
1.	Necessary Stationary set, Graph paper, Calculator, etc.
2.	Desktop Computer

Suggested Project List:

1. Prepare a quiz on topic given faculty members.
   Chart making: Prepare the charts on different topic given by faculty.
2. Video Preparation: Student has to prepare his/her video on explaining different topics of subjects given by faculty.
3. E-learning projects: Students have to use internet and other online resources for preparation of report and/or download video on the topic given by the subject teacher within the syllabus or beyond the syllabus.
4. Report preparation: Student has to use different books, technical magazine, journals etc. for preparation of a report on the topic given by the subject teacher within the syllabus or beyond the syllabus.
5. Power point presentation: Students has to prepare a power point presentation of 10 to 15 slides on the topic given by the subject teacher within the syllabus or beyond the syllabus. In the end of presentation student has to ask at least 3 to 5 MCQ based question to identify the gain of listeners at the end presentation.

Suggested Activities for Students:

1. Prepare sketchbook of drawing of various topics of syllabus

2. Prepare a question bank.
3. 10 min PPT presentation on the given topic from the syllabus or beyond the syllabus
4. Report writing on various topics from syllabus and beyond syllabus
5. Prepare a demonstration model, charts, Projects etc. by topic given by faculty.

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ANNEXURE-1: SAMPLE SAFETY CONTRACT

(To be filled by the students and submitted to concerned faculty/staff)

-- Use for reference purposes only --

1. You have to read and sign the safety contract.
2. The safety contract says that you understand that safety is your responsibility.
3. The safety contract to be signed before you carry out any work in the laboratory and if you don't observe and obey the safety rules, you will not be allowed in the laboratory.

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Safety Contract

Date: _____

Name of Institute: _____

Name of Course with Code: Fabrication Design (_____)

Name of Faculty/Staff with Designation: 1. _____

2. _____

3. _____

I RECOGNIZE THAT:

1. Safety is my responsibility when using a tool.
2. Safety regulations have been provided to me.
3. The possibility of accident and injury increases if I do not follow all the safety guidelines.
4. I must act responsibly to ensure my own safety & the safety of others in the work area.

I AGREE TO:

1. Never work in the shop without my faculty's/ Instructor's supervision.
2. Read and practice all the safety regulations that have been distributed to me in this course or have been posted in the work areas.
3. Act in a responsible manner at all times in the laboratory.
4. Follow all instructions given by the faculty/Instructor.
5. Immediately report any unsafe condition or activity to my faculty/Instructor.
6. Wear eye protection at all times when working with tools or working anywhere near someone who is using tools.
7. Cut or Tie back long hair, remove jewellery, secure loosed clothing, and wear boiler suit & safety shoes in the laboratory.
8. Clean all work areas and put equipment away before leaving the laboratory.

I, _____, have read and agree with all the safety instructions.

Particulars:

Programme : _____

Batch No. : _____

Enrolment No.: _____

Student Signature

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