



MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : DIPLOMA IN CHEMICAL ENGINEERING

COURSE CODE : CH

DURATION OF COURSE : SIX SEMESTERS

WITH EFFECT FROM 2012-13

SEMESTER : SECOND

DURATION : 16 WEEKS

FULL TIME / PART TIME : FULL TIME

SCHEME : G

SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17200)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)			
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Communication Skills	\$	CMS	17201	02	--	02	03	100	40	--	--	25#	10	25@	10	50
2	Engineering Mechanics	β	EGM	17204	03	01	02	03	100	40	--	--	--	--	25@	10	
3	Engineering Drawing		EDG	17205	01	--	04	04	100	40	--	--	--	--	50@	20	
4	Fundamentals of Chemical Engineering		FCE	17206	04	--	02	03	100	40	50#	20	--	--	50@	20	
5	Engineering Mathematics	\$	EMS	17216	03	01	--	03	100	40	--	--	--	--	--	--	
6	Development of Life Skills	\$	DLS	17010	01	--	02	--	--	--	--	--	25@	10	--	--	
7	Workshop Practice		WPS	17011	--	--	04	--	--	--	--	--	--	--	50@	20	
Total					14	02	16	--	500	--	50	--	50	--	200	--	50

Student Contact Hours Per Week: **32 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks : **850**

@ - Internal Assessment, # - External Assessment, No Theory Examination, \$ - Common to All Branches, β - Common to CE,ME,EE & CH Groups

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Communication Skills [CMS]

F.Y. Diploma : Sem. II

[All Branches]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25#
Term Work	–	25@
Sessional Work (Two Test)	–	25 (each)

@ - Internal Assessment; # - External Assessment

SYLLABUS

Topic 1 Introduction to Communication

Specific Objective

- Describe the process of communication.

Content

- Definition of communication
- Process of communication
- Types of communication -- Formal, Informal, Verbal, Nonverbal, Vertical, Horizontal, Diagonal

Topic 2 Effective communication

Specific Objective

- Identify the principles and barriers in the communication process

Content

- Principles of communication.
- Barriers to communication
 - (a) **Physical Barrier:**
 - Environmental (time, noise, distance & surroundings)
 - Personal (deafness, stammering, ill-health, spastic, bad handwriting)
 - (b) **Mechanical :** Machine oriented
 - (c) **Psychological:** Day dreaming, prejudice, emotions, blocked mind, generation gap, phobia, status inattentiveness, perception.
 - (d) **Language :** Difference in language, technical jargons, pronunciation & allusions.

Topic 3 Non verbal & Graphical communication

Specific Objective

- Effective use of body language & nonverbal codes
- View and interpret graphical information precisely.

Contents

3.1 Non- verbal codes:

- Proxemics
- Chronemics
- Artefacts

3.2 Aspects of body language (Kinesics)

- Facial expression
- Eye contact
- Vocalics, paralanguage
- Gesture
- Posture
- Dress & appearance
- Haptics

3.3 Graphical communication

- Advantages & disadvantages of graphical communication
- Tabulation of data & its depiction in the form of bar graphs & pie charts.

Topic 4 Listening

Specific Objective

- Effective use of listening

Contents

- Introduction to listening
- Listening versus hearing
- Merits of good listening
- Types of listening
- Techniques of effective listening

Topic 5 Formal Written Communication

Specific Objectives

- Use different formats of formal written skills.

Contents

- Office Drafting: Notice , memo & e-mail
- Job application with resume.
- Business correspondence: Enquiry letter, order letter ,complaint letter, adjustment letter.
- Report writing: Accident report, fall in production, investigation report.
- Describing objects & giving instructions

Reference :

1. Text book of Communication Skills, (*MSBTE Mumbai*) MSBTE, Mumbai.
2. CD On Communication Skills, (*MSBTE*) MSBTE, Mumbai.
3. Communication Skills (*Joyeeta Bhattacharya*) Reliable Series.
4. Communication Skills (*Sanjay Kumar, Pushpa Lata*) Oxford University Press.
5. Website: www.mindtools.com/page8.html-99k
6. Website: www.khake.com/page66htm/-72k
7. Website: [www.BMConsultant India.Com](http://www.BMConsultantIndia.Com)
8. Website: www.letstak.co.in
9. Website: www.inc.com/guides/growth/23032.html-45k



Engineering Mathematics [EMS]

F.Y. Diploma : Sem. II

[AE/CD/CE/CH/CM/CO/CR/CS/CV/CW/DE/ED/EE/EI/EJ/EN/EP/ET/EV/EX/
FE/IC/IE/IF/IS/IU/ME/MH/ MI/MU/PG/PS/PT]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	–
Sessional Work (Two Test)	–	25 (each)

SYLLABUS

Topic 1 Complex number

- **Complex number**

Specific objectives

- Find roots of algebraic equations which are not in real.
- Definition of complex number, Cartesian, polar and exponential forms of complex number.
- Algebra of complex number such as equality, addition, subtraction, multiplication and division.
- De- Moivre's theorem with simple examples.
- Euler's form of circular functions, hyperbolic functions and relation between circular and hyperbolic functions.

Topic 2 Differential Calculus

2.1 Function

Specific objectives

- Identify the function and find the value of function.
- Definition of function, range and domain of function.
- Value of function at a point.
- Types of functions and examples.

2.2 Limits

Specific objectives

- To evaluate limit of function.
- Concept and definition of limit.
- Limits of algebraic, trigonometric, logarithmic and exponential functions with examples.

2.3 Derivatives

Specific objectives

- Find the derivatives by first principle.
- Solve problems using rules and methods of derivatives
- Definition of derivatives, notation, derivatives of standard function using first principle.

- Rules of differentiation such as, derivatives of sum or difference, product, and quotient with proofs.
- Derivative of composite function with proof (Chain rule)
- Derivatives of inverse trigonometric functions using substitution
- Derivatives of inverse function.
- Derivatives of implicit function.
- Derivatives of parametric function.
- Derivatives of one function w.r.t another function.
- Logarithmic differentiation.
- Second order differentiation.

Topic 3 Numerical Method

3.1 Solution of algebraic equation

Specific objectives

- Find the approximate root of algebraic equation
- Bisection method
- Regula falsi method
- Newton Rapshon method

3.2 Numerical solution of simultaneous equations

Specific objectives :

- Solve the system of equations in three unknowns.
- Gauss elimination method
- Jacobi's method
- Gauss Seidal method

Reference :

1. Mathematics for Polytechnic (*S.P. Deshpande*) Pune Vidyarthi Griha Prakashan – Pune.
2. Calculus : Single Variable (*Robert T. Smith*) Tata McGraw Hill.
3. Advanced Engineering Mathematics (*Dass H.K.*) S. Chand Publication – New Delhi.
4. Fundamentals of Mathematical Statistics (*S.C. Gupta & Kapoor*) S. Chand Publications – New Delhi.
5. Higher Engineering Mathematics (*B.S. Grewal*) Khanna Publication – New Delhi.
6. Applied Mathematics (*P.N. Wartikar*) Pune Vidyarthi Griha Prakashan – Pune.
7. Websites : www.khan.academy



Engineering Mechanics [EGM]

F.Y. Diploma : Sem. II

[AE/CE/CH/CR/CS/CV/EE/EP/FE/ME/MH/MI/PG/PS/PT]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	25@
Sessional Work (Two Test)	–	25 (each)

@ - Internal Assessment

SYLLABUS

Topic 1 Simple Machines

Specific Objectives:

- Calculate velocity ratio for given machine.
- Find Efficiency of given machine.

Contents

1.1 Definitions

Simple machine, compound machine, load, effort, mechanical advantage, velocity ratio, input of a machine, output of a machine efficiency of a machine, ideal machine, ideal effort and ideal load, load lost in friction, effort lost in friction.

1.2 Analysis

Law of machine, maximum mechanical advantage and maximum, efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self locking machine. Simple numerical problems.

1.3 Velocity Ratio for simple machines

Simple axle and wheel, differential axle and wheel, Weston's differential pulley block, single purchase crab, double purchase crab, worm and worm wheel, geared pulley block, screw jack, calculation of mechanical advantage, efficiency, identification of type such as reversible or not etc.

Topic 2 Force Systems

Specific Objectives :

- Define related terms in mechanics.
- Calculate Components of forces.

Contents

2.1 Fundamentals and Force systems

Definitions of mechanics, Engineering mechanics, statics, dynamics, Kinetics, Kinematics, rigid body, classification of force system according to plane coplanar and non coplanar, sub classification of coplanar force system- collinear, concurrent, non concurrent, parallel, like parallel, unlike parallel, general etc. Definition of a force, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility.

2.2 Resolution of a force and Moment of a force

Definition, Method of resolution, along mutually perpendicular direction and along two given direction. Definition of moment, S. I. unit, classification of moments, sign convention, law of moments Varignon's theorem of moment and its use, definition of couple, S.I. unit, properties of couple with example.

Topic 3 Composition of Forces

Specific Objectives:

- Calculate resultant analytically for given force system.
- Calculate resultant graphically.

Contents

3.1 Analytical method

Definition of Resultant force, methods of composition of forces, Law Of parallelogram of forces, Algebraic method for determination of resultant for concurrent and non concurrent, parallel coplanar force system.

3.2 Graphical method

Space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent and parallel force system only.

Topic 4 Equilibrium

Specific Objectives:

- State conditions of equilibrium for given force system.
- Calculate reactions of beams for different static loading.

Contents

4.1 Equilibrant and Lami's Theorem

Definition of equilibrant, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. Analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram. Statement and explanation of Lami's theorem, Application of Lami's theorem for solving various engineering problems.

4.2 Beams

Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, inclined point load, uniformly distributed load. Analytical method to determine reactions of simply supported, cantilever and over hanging beam subjected to point loads and UDL and graphical method to determine reactions for beams subjected to vertical point loads & udl only.

Topic 5 Friction

Specific Objectives

- Define terms related to friction.
- Apply conditions of equilibrium for forces acting on a body associated with friction.

Contents

5.1 Definition

Friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction, angle of repose and coefficient of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages.

5.2 Equilibrium of body on Horizontal and inclined plane

Equilibrium of body on horizontal plane subjected to horizontal and inclined force.
Equilibrium of body on inclined plane subjected to forces applied parallel to the plane only. Concept of ladder fraction.

Topic 6 Centroid and Centre of Gravity

Specific Objectives:

- Calculate centroid of composite plain figures.
- Calculate centre of gravity of composite solids.

Contents:

6.1 Centroid

Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure with not more than three geometrical figures.

6.2 Center of gravity

Definition, center of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids with not more than Two simple solids. (Hollow solids are not expected.)

Reference :

1. Engineering Mechanics (*R.S.Khurmi*) S. Chand & Company Ltd.
2. Engineering Mechanics (*Shames and Rao*) Pearsion Education.
3. Engineering Mechanics (*R.C.Hibbeler*) Pearsion Education.
4. Applied Mechanics (S. Ramamruthum) Dhanpat Rai & Sones, Delhi.
5. Essentials of Engg. Mech. (S Rajasekaran) Vikas Publishing House Pvt. Ltd.



Engineering Drawing [EDG]

F.Y. Diploma : Sem. II
[AE/CH/FE/ME/MH/MI/PG/PT/PS]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	4 Hrs.	100
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	50@
Sessional Work (Two Test)	–	25 (each)

@ - Internal Assessment

SYLLABUS

Topic 1 Projection of Lines and Planes

Specific Objectives

- Understand and draw the projections of lines and planes.

- 1.1 Lines inclined to both reference plane and limited to both ends in one quadrant.
- 1.2 Projection of simple planes of circular, square, rectangular, rhombus, pentagonal, and hexagonal, inclined to one reference plane and perpendicular to the other.

Topic 2 Projection of Solids

Specific Objectives

- Visualize and draw the projection of regular solids on HP, VP and auxiliary plane

- 2.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other.
- 2.2 Projections of same solids on auxiliary plane.

Topic 3 Sections of Solids

Specific Objectives

- Visualize and draw the projection of different cut models of regular solids

- 3.1 Cone, Pyramid and Tetrahedron resting on their base on Horizontal Plane.
- 3.2 Prism, Cylinder
 - a) Axis parallel to both the reference plane
 - b) Resting on their base on HP.
- 3.3 Section plane inclined to one reference plane and perpendicular to other.

Topic 4 Developments of Surfaces.

Specific Objectives

- Develop the lateral surfaces of various solids and understand its engineering applications

- 4.1 Developments of Lateral surfaces of cube, prism, cylinder, pyramid, cone
- 4.2 Applications such as tray, funnel, Chimney, pipe bends etc.

Topic 5 Sectional Orthographic and missing views (First angle method)

Specific Objectives

- Visualize and draw missing views and sectional views of different objects

- 5.1 Types of sections and Conversion of pictorial view into sectional orthographic views.(complete object involving slots, threads, ribs etc)
- 5.2 Draw missing view from the given Orthographic views

Topic 6 Free Hand Sketches of m/c elements

Specific Objectives

- Prepare proportionate free hand sketches of given m/c elements.
- Understand function and use of machine element

Free hand sketches of machine elements such as nuts, bolts, set screws, rivet heads, riveted joints, locking arrangements for nuts, threads, foundation bolts, Flange coupling, pulleys.

References :

1. Engineering Drawing (*N. D. Bhatt*) Charotar Publishing House, 2010.
2. Engineering Drawing (*D. Jolhe*) Tata McGraw Hill Edu., 2010.
3. Engineering Drawing (*M.B.Shah, B.C. Rana*) Pearson, 2010.
4. Engineering Drawing (*R. K. Dhawan*) S. Chand Co., Reprint 2010.
5. Text Book on Engineering Drawing (*K.L.Narayan, P.Kannaiah*) Scitech Publications, 24th Reprint August 2011.
6. Engineering Drawing and Graphics + AutoCAD (*K. Venugopal*) New Age Publication, Reprint 2006.
7. Engineering Drawing practice for schools and colleges (IS Codes SP – 46.)
8. Instructional / Learning CD developed by ARTADDICT.



Fundamentals of Chemical Engineering [FCE]

F.Y. Diploma : Sem. II
[CH]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	50#
Oral Exam	–	–
Term Work	–	50@
Sessional Work (Two Test)	–	25 (each)

@ - Internal Assessment; # - External Assessment

SYLLABUS

Topic 1 Introduction to Chemical Engineering

Specific Objectives

- To calculate different parameters of chemical engg.
- To convert units in desired units.

Contents

- Historical background, scope of chemical engineering, types of Industries - nature & size of industries (Large, Medium, Small scale).
- Units, dimensions, conversions & Conversion factors.
- Basic concepts & Basic chemical calculations: concept of mole, weight percentage, mole percentage, normality, Molarity, Molality, vapor pressure, partial pressure,
- Dalton's law, Amagat's law. (Only statements & elementary problems.)

Topic 2 Unit Operations

Specific Objectives:

- To draw symbols of various unit operations.
- To state the principles of various unit operations.

Contents

Definitions, purpose & principles of unit operations like

- Mechanical Operation - Size reduction, Size separation, Filtration, Sedimentation, Mixing
- Mass Transfer - Gas absorption, Desorption
- Mass and Heat transfer – Distillation, Drying

Symbols of –

- Jaw crusher, Screen, Ball mill, Rotary dryer, plate and frame, filter press, ribbon blender, pressure filter, gravity settling, absorber, stripper, plate column, pack column, centrifugal pump
- Heat Transfer - Modes of heat transfer
- Fluid Flow - Fluid handling

Topic 3 Unit Processes

Specific Objectives:

- To write chemical reaction of various unit processes.
- To define various unit processes.

Contents :

- Unit processes with simple examples (with reactions) like - Sulphonation, Oxidation, Reduction, Hydrogenation, Hydration, Saponification, Esterification, Nitration, Chlorination, and Cracking/pyrolysis.

Topic 4 Basic Concepts of Chemical Processes**Specific Objectives:**

- To write reactions involved in manufacturing processes.
- To draw the symbols involved in process flow sheet.

Contents :

- Definition of Conversion, yield, reaction efficiency
- Flow sheets, block diagrams, reaction, properties & uses of sulphuric acid, nitric acid.

Topic 5 Process Instrumentation & Safety**Specific Objectives:**

- Describe the process of measurement of various parameters.

Contents :

- Temperature scales, measurement of temperatures using mercury thermometer.
- Pressure scales, units, measurement of pressure using manometers.
- Level measurement using direct methods like bob & tape, float & tape, sight glass.
- Flow measurement using rotameter.
- Measurement of viscosity by using Redwood viscometer & density by using specific gravity bottle.
- Personal Protective Equipment (PPE).

References :

1. Introduction to Chemical Engineering (*Walter. L. Badger, Julius T. Banchero*) McGraw Hill International.
2. Unit Operations of Chemical Engineering (*McCabe, W. L. Smith, Harriott*) McGraw Hill Inc.
3. Introduction to Chemical Engineering (*Ghosal S.K, Shyamal.K.Sanyal, Datta.S*) Tata McGraw Hill Publications.
4. Industrial Instrumentation & Control (*S.K.Singh*) Tata McGraw Hill Publications 1.



Development of Life Skills [DLS]

F.Y. Diploma : Sem. II

[All Branches]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	–	–
Practical Exam	–	–
Oral Exam	–	25@
Term Work	–	–

@ - Internal Assessment

SYLLABUS

Topic 1 SELF ANALYSIS

Specific Objectives

- To introduce oneself.

Contents

- 1.1 Need of Self Analysis
- 1.2 Attitude and types (positive, negative, optimistic and pessimistic) Guidelines for developing positive attitude.

Topic 2 STUDY TECHNIQUES

Specific Objectives

- To identify different process and strategies.
- To improve reading, listening and notes taking skills.

Contents

- 2.1 Learning strategies
- 2.2 Learning process
- 2.3 Organization of knowledge
- 2.4 Reading skills
- 2.5 Listening skills
- 2.6 Notes taking
- 2.7 Enhancing memory

Topic 3 INFORMATION SEARCH

Specific Objectives

- To search information as per the need.

Contents

- 3.1 Sources of information
- 3.2 Techniques of information search (library, internet, etc)

Topic 4 SELF DEVELOPMENT

Specific Objectives:

- To set primary goals using SMART parameters.
- To Priorities the work effectively.
- To cope up with stress effectively.

Contents

- 4.1 Goal setting and its importance.
- 4.2 Characteristics of Goal setting (**SMART**- Specific, Measurable, Attainable, Realistic, Time bound)
- 4.3 Time Management - Importance, prioritization of work, time matrix, time savers, and time wasters.
- 4.4 Stress Management - Definition, types of stress, causes of stress, managing stress, and stress busters.

Topic 5 PRESENTATION TECHNIQUES

Specific Objectives

- To plan for presentation.
- To prepare contents for presentation.

Contents

- 5.1 Importance of presentation.
- 5.2 Components of effective presentation (Body language, voice culture , rehearsal, etc)
- 5.3 Preparing for presentation.
- 5.4 Use of audio/video aids. (audio, video, transparency's, PowerPoint presentations, etc)
- 5.5 Performing presentation (Seminars, paper presentations, compering, etc)

Topic 6 GROUP DISCUSSION

Specific Objectives

- To understand the concept of group discussion
- To know the purpose of group discussion

Contents

- 6.1 Group discussion concept and purpose
- 6.2 Method of conduction

Reference :

1. Target setting and goal achievement (*Richard Hale and Peter Whitlam*) Kogan Page.
2. Successful Presentation Skills (*Andrew Bradbury*) The Sunday Times – Kogan
3. Effective Presentation (*Ros Jay and Antony Jay*) Pearson – Prentice Hall.
4. Handbook on Development of Life Skills (*Subject Experts – MSBTE*) MSBTE
5. Effective Communication and Soft Skills (*Nitin Bhatnagar and Mamta Bhatnagar*) Pearson
6. Business Communication and Soft Skills (*D. Sudha Rani*) Pearson.
7. Personality Development and Soft Skills (*Barak K Mitra*) Oxford University Press
8. Soft Skills for Managers (*Dr. T. Kalayani Chakravarti and Dr. Latha Chakravarti*) Biztantra



Workshop Practice [WPC]

F.Y. Diploma : Sem. II
[AE/CH/FE/ME/MH/MI/PG/PT/PS]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	–	–
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	50@

@ - Internal Assessment

SYLLABUS

Practical

Skill to be developed:

Intellectual Skills:

- 1) Ability to read job and interpret drawing and plan operations
- 2) Ability to identify and select proper material, tools, equipments and machine.
- 3) Ability to select proper parameters (like cutting speed, feed, depth cut use of lubricants) in machine

Motor Skills:

- 1) Ability to set tools, work piece, and machines for desired operations.
- 2) Ability to complete job as per job drawing in allotted time.
- 3) Ability to use safety equipment and follow safety procedures during operations.
- 4) Ability to inspect the job for confirming desired dimensions and shape.
- 5) Ability to acquire hands-on experience.

Sr. No	Topic Objectives	Details of Practical Contents
01	<ul style="list-style-type: none">➤ To appreciate the importance of Carpentry in engineering works➤ To select the proper wood material for the job undertaken➤ To identify and use various marking, measuring, cutting, striking and inspection tools used in Carpentry section.	CARPENTRY SHOP : Any one composite job from the following involving different joint, turning and planning, surface finishing by emery paper, varnishing etc. like square stool, tea table, center table, chaurang, table lamp bed sofa-set, book rack. Cabinet, notice board, shows cases, tables chairs etc. Note: <ol style="list-style-type: none">1] One job of standard size (Saleable article shall be preferred)2] Batch size should be selected depending on volume of work. Max. 4 students.3] Job allotted should comprise of 6-8 hours of actual working4] Student shall calculate the cost of material and labor cost for their job from the drawing.

<p>02</p>	<ul style="list-style-type: none"> ➤ To appreciate the importance of Welding in engineering works ➤ To select the proper Steel material and proper welding machine for the job undertaken ➤ To identify and use various marking , measuring, cutting, striking and inspection tools used in Welding 	<p>WELDING SHOP</p> <p>Any one composite job from involving butt joint lap joint welding process, from the following like</p> <p>Grill, door, window frame, waste paper basket, Chappel stand, Corner flower stand chair , table frame (square pipe 25 mm) cooler frame (folding type)</p> <p>Note:</p> <ol style="list-style-type: none"> 1] One job of standard size (Saleable/marketable article shall be preferred) 2] Batch size should be selected depending on volume of work. Max. 4 students 3] Job allotted should comprise of 6-8 hours of actual working operations. 4] Student shall calculate the cost of material and labor required for their job from the drawing.
<p>03</p>	<ul style="list-style-type: none"> ➤ To appreciate the importance of Fitting operations in engineering works ➤ To select the Proper material and tools of Fitting section for the job undertaken. ➤ To identify and use various marking, measuring, cutting, striking and inspection tools used in Fitting section 	<p>FITTING SHOP:</p> <p>Demonstration of different fitting tools and drilling machines and power tools.</p> <p>Demonstration of different operations like chipping, filing, drilling, tapping, cutting etc.</p> <p>One simple fitting job (Male/female assembly type) involving practice of chipping, filing, drilling, tapping, cutting etc.</p>
<p>04</p>	<ul style="list-style-type: none"> ➤ To appreciate the importance of black smiths operations in engineering works ➤ To select the proper material and tools and processes required for the job undertaken. ➤ To identify and ➤ and use various marking, measuring, cutting, striking and inspection tools used in Smithy section 	<p>SMITHY SHOP</p> <p>Demonstration of different forging tools and Power Hammer.</p> <p>Demonstration of different forging processes, likes shaping, caulking fullering, setting down operations etc.</p> <p>One job like hook, peg, flat chisel or any hardware item.</p> <p>Note:</p> <ol style="list-style-type: none"> 1] One job of standard size (Saleable / marketable article shall be preferred) 2] Job allotted should comprise of 4-6 hours of actual working operations. 3] Student shall calculate the cost of material and labor required for their job from the drawing.

References :

- 1) Workshop Technology (*S. K. Hajara Chaudhary*) Media Promoters and Publishers, New Delhi
- 2) Workshop Technology (*B.S. Raghuwanshi*) Dhanpat Rai and sons, New Delhi
- 3) Workshop Practice (*H.S.Bawa*) Tata McGraw Hill Publishers, New Delhi
- 4) Mechanical Engineering Hand book (*Kent's*) John Wiley and Sons, New York
- 5) Workshop Manual (*P. Kannaiah and K. L. Narayana*) SCITECH Publications
- 6) Electronics Trade & technology Development Corporation.(A Govt. of India undertaking) Akbar Hotel Annex, Chanakyapuri, New Delhi- 110 021
- 7) CDs, PPTs Etc.:
 - Learning Materials Transparencies and CDs, CBT Packages developed by N.I.T.T.E.R. and other organizations
 - Workshop Manual by P. Kannaiah and K. L. Narayana , SCITECH Publications
- 8) Websites:
 - Refer website www.npkauto.com for Workshop Tool Manual

