



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	17028	--	--	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.

Course Name : All Branches of Diploma in Engineering & Technology

**Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/
ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX**

Semester : Second

Subject Title : Communication Skills

Subject Code : 17201

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	--	02	03	100	--	25#	25@	150

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

In this age of globalization, competition is tough. Hence effective communication skills are important. Communication skills play a vital and decisive role in career development. The subject of Communication Skills introduces basic concepts of communication. It also describes the verbal, non-verbal modes and techniques of oral & written communication.

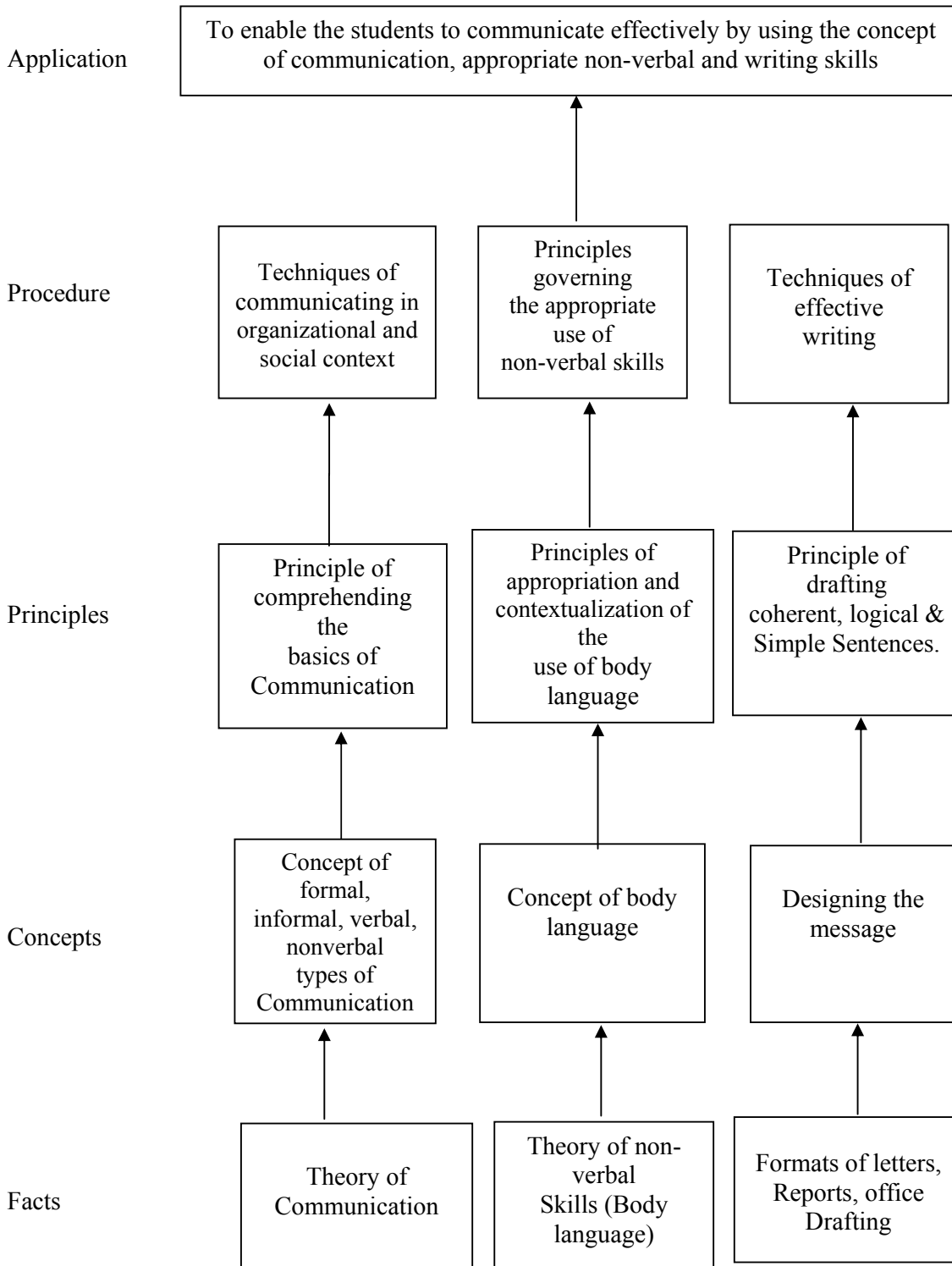
It will guide and direct to develop a good personality and improve communication skills.

General Objectives:

Students will be able to:

1. Utilize the skills necessary to be a competent communicator.
2. Select and apply the appropriate methods of communication in various situations.

Learning Structure:



Theory

Name of the Topic	Hours	Marks
<p>Topic 01 - Introduction to Communication:</p> <p>Specific Objective:</p> <ul style="list-style-type: none"> ➤ Describe the process of communication. <p>Contents:</p> <ul style="list-style-type: none"> • Definition of communication • Process of communication • Types of communication -- Formal, Informal, Verbal, Nonverbal, Vertical, Horizontal, Diagonal 	06	16
<p>Topic 02 - Effective communication</p> <p>Specific Objective:</p> <ul style="list-style-type: none"> ➤ Identify the principles and barriers in the communication process <p>Contents:</p> <ul style="list-style-type: none"> ❖ Principles of communication. ❖ Barriers to communication a. Physical Barrier: <ul style="list-style-type: none"> ❖ 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. 	08	20
<p>Topic 03 - Non verbal & Graphical communication:</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Effective use of body language & nonverbal codes ➤ View and interpret graphical information precisely. <p>Contents:</p> <p>3.1 Non- verbal codes: [08 Marks]</p> <ul style="list-style-type: none"> • Proxemics, • Chronemics • Artefacts <p>3.2 Aspects of body language (Kinesics) [10 Marks]</p> <ul style="list-style-type: none"> • Facial expression • Eye contact • Vocalics, paralanguage • Gesture • Posture • Dress & appearance 	08	28

<ul style="list-style-type: none"> • Haptics <p>3.3 Graphical communication [10 Marks]</p> <ul style="list-style-type: none"> • Advantages & disadvantages of graphical communication • Tabulation of data & its depiction in the form of bar graphs & pie charts. 		
<p>Topic 04 - Listening Specific Objective:</p> <p>➤ Effective use of listening</p> <p>Contents:</p> <ul style="list-style-type: none"> • Introduction to listening • Listening versus hearing • Merits of good listening • Types of listening. • Techniques of effective listening. 	02	08
<p>Topic 05 - Formal Written Communication Specific Objectives:</p> <p>➤ Use different formats of formal written skills.</p> <p>Contents:</p> <ul style="list-style-type: none"> • 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 	08	28
	32	100

Skills to be developed in practical:**Intellectual Skills:**

1. Analyzing given situation.
2. Expressing thoughts in proper language.

Motor Skills:

1. Presentation Skills focusing on body language.
2. Interpersonal skills of communication

Journal will consist of following assignments:

01: Draw the diagram of communication cycle for given situation.

State the type and elements of communication involved in it.

- 02: Graphics:-
- a) Draw suitable bar-graph using the given data.
 - b) Draw suitable pie-chart using the given data.

03: Role play: Teacher should form the group of students based on no. of characters in the situation. Students should develop the conversation and act out their roles.

04: Collect five pictures depicting aspects of body language from different sources such as magazines, newspapers, internet etc. State the type and meaning of the pictures.

NOTE: The following assignments should be performed by using Language Software.

05 Practice conversations with the help of software.

06 Describe people/personalities with the help of software and present in front of your batch.

07 Prepare and present elocution (three minutes) on any one topic with the help of software.

08 Describe any two objects with the help of software.

Learning Resources:

Sr. No.	Author	Title	Publisher
01	MSBTE, Mumbai.	Text book of Communication Skills.	MSBTE, Mumbai.
02	MSBTE, Mumbai.	CD On Communication Skills	MSBTE
03	Joyeeta Bhattacharya	Communication Skills.	Reliable Series
04	Communication Skills	Sanjay Kumar, Pushpa Lata	Oxford University Press

Web Sites for Reference:

Sr. No	Website Address
01	Website: www.mindtools.com/page8.html -99k
02	Website: www.khake.com/page66htm/ -72k
03	Website: www.BMConsultantIndia.Com
04	Website: www.letstak.co.in
05	Website: www.inc.com/guides/growth/23032.html -45k

Course Name : Civil, Chemical, Mechanical and Electrical Engineering Group

Course Code : AE/CE/CH/CR/CS/CV/EE/EP/FE/ME/MH/MI/PG/PT/PS

Semester : Second

Subject Title : Engineering Mechanics

Subject Code : 17204

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	01	02	03	100	--	--	25@	125

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

Rationale:

In day to day life we come across different structures, at the time design of the structures analysis plays an important role. Perfect analysis is possible only when one known the types and effect of forces acting on the structure.

This subject provides knowledge about the different types of forces/loads their effects while acting in different conditions/systems. The subject also provides the knowledge about basic concepts of laws of engineering, their application to different engineering problem.

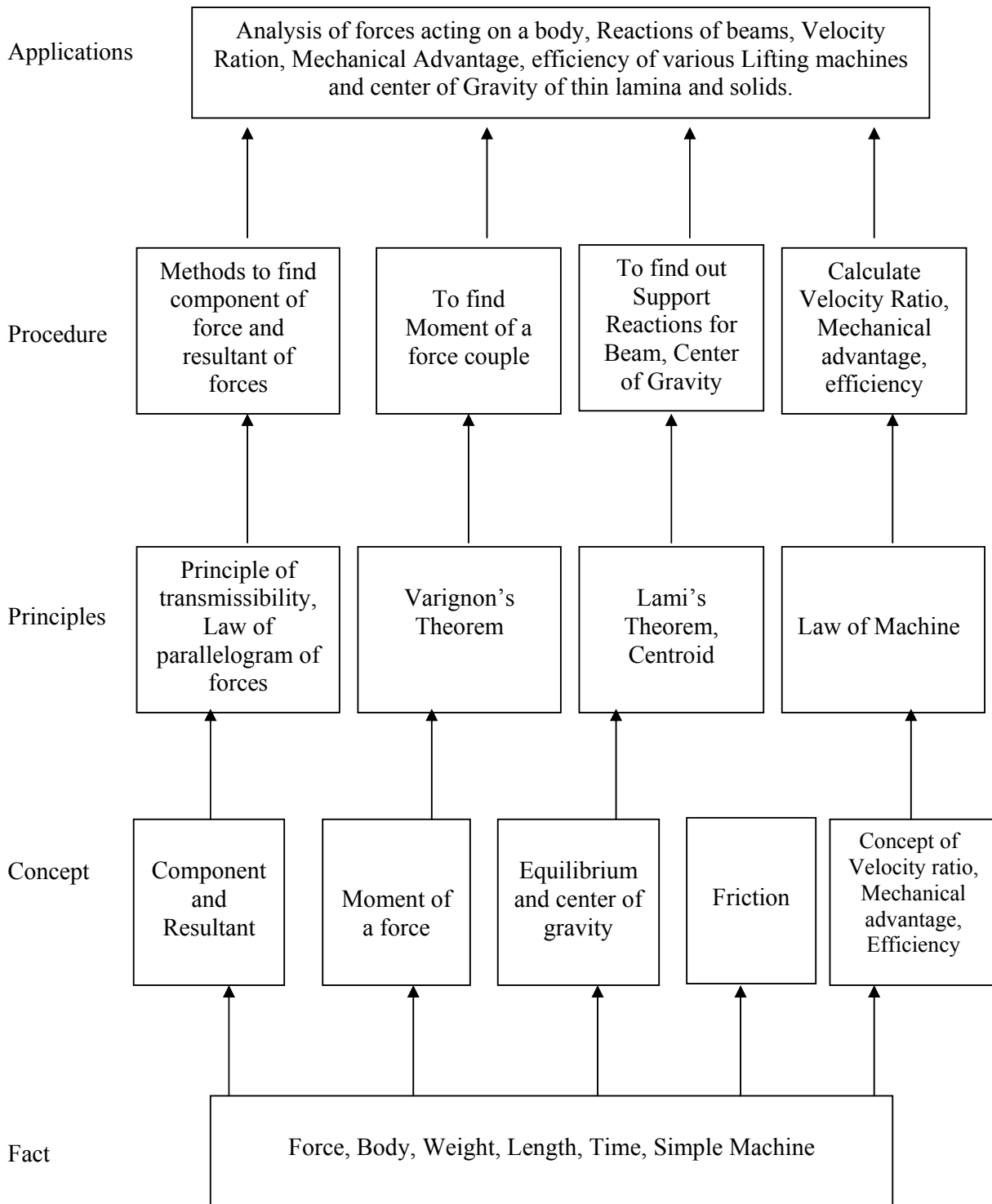
This subjects work as a prerequisite for future subjects such as MOS, SOM, DOS, TOM, DOM. Etc.

General Objectives:

The students will able to:

- Understand the effect of different types of coplanar forces.
- Apply Principles of equilibrium in finding reactions of different types of beams.
- Apply principles of equilibrium for locating centroid and centre of gravity for given solids.
- Understand working of different types of machines.

Learning Structure:



Theory

Topic and Contents	Hours	Marks
<p>Topic 1: Simple Machines</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Calculate velocity ratio for given machine. ➤ Find Efficiency of given machine. <p>Contents:</p> <p>1.1 Definitions : (06 Marks) 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.</p> <p>1.2 Analysis : (04 Marks) 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.</p> <p>1.3 Velocity Ratio for simple machines : (10 Marks) 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.</p>	08	20
<p>Topic 2 : Force systems</p> <p>Specific Objectives :</p> <ul style="list-style-type: none"> ➤ Define related terms in mechanics. ➤ Calculate Components of forces. <p>Contents:</p> <p>2.1 Fundamentals and Force systems: (04 Marks) 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</p>	06	12

<p>method. Characteristics of a force, effects of a force, principle of transmissibility.</p> <p>2.2 Resolution of a force and Moment of a force: (08 Marks)</p> <p>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.</p>		
<p>Topic 3 : Composition of Forces</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Calculate resultant analytically for given force system. ➤ Calculate resultant graphically. <p>Contents:</p> <p>3.1 Analytical method: (10 Marks)</p> <p>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.</p> <p>3.2 Graphical method: (10 Marks)</p> <p>Space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent and parallel force system only.</p>	<p>10</p>	<p>20</p>
<p>Topic 4: Equilibrium</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State conditions of equilibrium for given force system. ➤ Calculate reactions of beams for different static loading. <p>Contents:</p> <p>4.1 Equilibrant and Lami's Theorem: (12 Marks)</p> <p>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.</p> <p>4.2 Beams: (08 Marks)</p>	<p>08</p>	<p>20</p>

<p>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.</p>		
<p>Topic 5: Friction: Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Define terms related to friction. ➤ Apply conditions of equilibrium for forces acting on a body associated with friction. <p>Contents:</p> <p>5.1 Definition: (04 Marks) 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.</p> <p>5.2 Equilibrium of body on Horizontal and inclined plane:..... (08 Marks) 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.</p>	08	12
<p>Topic 6 : Centroid and Centre Of Gravity: Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Calculate centroid of composite plain figures. ➤ Calculate centre of gravity of composite solids. <p>Contents:</p> <p>6.1 Centroid:..... (08 Marks) 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.</p> <p>6.2 Center of gravity:..... (08 Marks) Definition, center of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of</p>	08	16

composite solids with not more than Two simple solids. (Hollow solids are not expected.)		
Total	48	100

Practicals:

Skills to be developed:

Intellectual Skills:

- Understand the forces acting on given structure.
- Interpret the results.

Motor Skills:

- Handle the equipment effectively.
- Draw graph for different relationships.

The term work consists of experiments from Group A and graphical solutions from Group B

Group A: To find MA, VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish law of machine. Calculate maximum efficiency and also check the reversibility of machines (Sr no. 1 to 4) :

- 1) Differential axle and wheel.
- 2) Single purchase crab or Double purchase crab
- 3) Weston's differential pulley block or worm geared pulley block
- 4) Simple Screw jack.
- 5) Verify law of moments.
- 6) Verify law of polygon of forces.
- 7) Verify of Lami's theorem.
- 8) Verify the Equilibrium of parallel forces – simply supported beam reactions.
- 9) Compare coefficient of friction on horizontal plane and inclined plane for the same surface.

Group B: Graphical solutions for the following on A4 Size Graph Paper.

- 1) Concurrent force system : Two problems
- 2) Parallel force system : Two problems
- 3) Reactions of beam : Two problems

List of Tutorials:

Form a group of five students. Each group shall be allotted three different types of problems on the following topics. Problems shall be submitted in separate note book. Teacher shall provide the feedback to the students on the submitted tutorials.

1. Calculation of M.A., V.R, Efficiency, law of machine for Simple machine.
2. Numerical on resolution of force/ Moment of force.
3. Calculation of resultant for different force system.
4. Numerical on law of parallelogram of forces.
5. Numerical on applications of Lami's Theorem.

6. Calculation of Reactions of beam subjected point load, UDL and inclined load.
7. Numerical on Friction body resting on horizontal Plane.
8. Numerical on Friction body resting on Inclined Plane.
9. Numerical on centroid of composite figures.
10. Numerical on centre of gravity of composite Solids.

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher
01	R.S.Khurmi	Engineering Mechanics	S. Chand & Company Ltd.
02	Shames and Rao	Engineering Mechanics	Pearsion Education.
03	R.C.Hibbeler	Engineering Mechanics	Pearsion Education.
04	S. Ramamruthum	Applied Mechanics	Dhanpat Rai & Sones, Delhi.
05	S Rajasekaran	Essentials of Engg. Mech.	Vikas Publishing House Pvt. Ltd

2. Cds, PPTs Etc:

3. IS, BIS and International codes:

4. Websites:

5. Implementation Strategy:

6. List of laboratory equipments :

Course Name : Mechanical Engineering Group/Chemical Engineering Group

Course code : AE/CH/FE/ME/MH/MI/PG/PT/PS

Semester : Second

Subject Title : Engineering Drawing

Subject Code : 17205

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
01	--	04	04	100	--	---	50@	150

NOTE:

- 1. Students should use two separate A3 size sketchbooks, one for class work practice and another for assignment.**
- 2. Students should solve assignment on each topic.**
- 3. Use approximately 570mm×380mm Size Drawing Sheet for Term Work.**

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

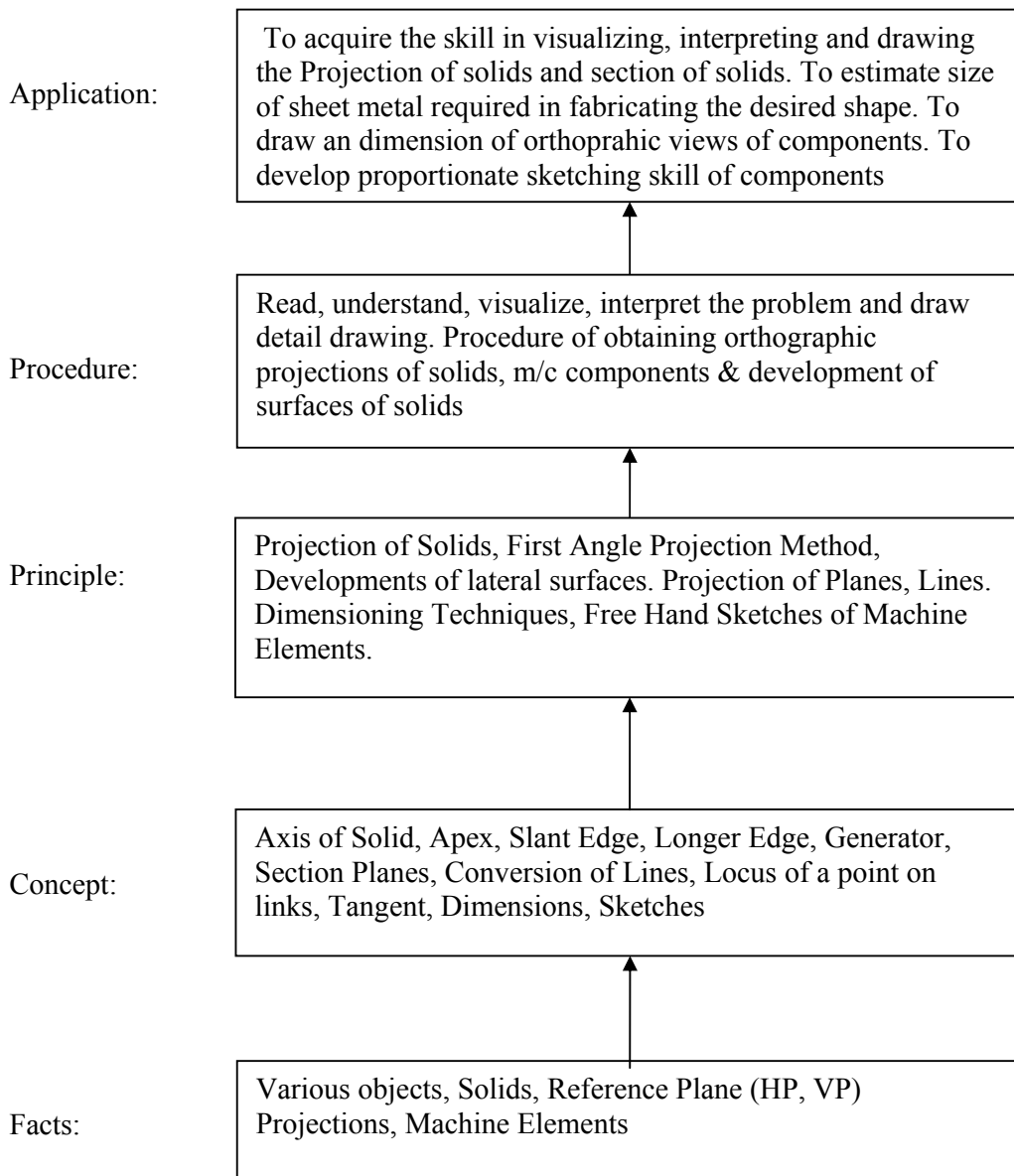
Rationale:

Engineering drawing is the graphical language of engineers. It describes the scientific facts, concepts, principles and techniques of drawing in any engineering field to express the ideas, conveying the instructions, which are used to carry out jobs in engineering field. This course aim for building a foundation for the further course in drawing and other allied subjects.

Objectives:

After studying this subject, the students will be able to:

1. Understand the basic concepts of projection of different entities.
2. Visualize and draw views of objects in different positions.
3. Develop lateral surfaces of different solids.
4. Prepare proportionate free hand sketches of basic machine elements.

Learning Structure:

Theory:

Topic and Content	Hours	Marks
<p>1. Projection of Lines and planes Specific Objectives Understand and draw the projections of lines and planes</p> <p>1.1 Lines inclined to both reference plane and limited to both ends in one quadrant.-----6 marks</p> <p>1.2 Projection of simple planes of circular, square, rectangular, rhombus, pentagonal, and hexagonal, inclined to one reference plane and perpendicular to the other. -----10 marks</p>	02	16
<p>2. Projection of Solids Specific Objectives Visualize and draw the projection of regular solids on HP, VP and auxiliary plane</p> <p>2.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other.-----10 marks</p> <p>2.2 Projections of same solids on auxiliary plane. -----6 marks</p>	02	16
<p>3. Sections of Solids. Specific Objectives Visualize and draw the projection of different cut models of regular solids</p> <p>3.1 Cone, Pyramid and Tetrahedron resting on their base on Horizontal Plane. -----5 marks</p> <p>3.2 Prism, Cylinder: -----6 marks</p> <p>a) Axis parallel to both the reference plane b) Resting on their base on HP.</p> <p>3.3 Section plane inclined to one reference plane and perpendicular to other. -----5 marks</p>	02	16
<p>4. Developments of Surfaces. Specific Objectives Develop the lateral surfaces of various solids and understand its engineering applications</p> <p>4.1 Developments of Lateral surfaces of cube, prism, cylinder, pramid, cone -----8 marks</p> <p>4.2 Applications such as tray, funnel, Chimney, pipe bends etc. -----8 marks</p>	02	16
<p>5. Sectional Orthographic and missing views (First angle method) Specific Objectives Visualize and draw missing views and sectional views of different objects</p> <p>5.1 Types of sections and Conversion of pictorial view into sectional orthographic views.(complete object involving slots, threads, ribs etc)-----10 marks</p> <p>5.3 Draw missing view from the given Orthographic views -----10 marks</p>	04	20
<p>6. Free Hand Sketches of m/c elements. Specific Objectives</p> <ul style="list-style-type: none"> • Prepare proportionate free hand sketches of given m/c elements. • Understand function and use of machine element <p>Free hand sketches of machine elements such as nuts, bolts, set screws, rivet heads, riveted joints, locking arrangements for nuts, threads, foundation bolts,</p>	04	16

Flange coupling, pulleys.-----		
Total	16	100

Skills to be developed for practical:**Intellectual skills**

- 1) To develop ability to differentiate between true length, shape and apparent length and shape
- 2) To interpret the position of lines, planes, solids with reference plane.
- 3) Able to interpret the development of surfaces of different solids.
- 4) To interpret the missing views from given orthographic views.
- 5) To identify various parts of machine like nuts, bolts, screws, different threads, couplings.
- 6) To understand the sequence of CAD commands

Motor Skills

- 1) Able to draw Orthographic Projections of line, planes and solids with given orientation
- 2) To develop ability to draw sectional orthographic views of given solids, when it is cut by section plane in different position with reference planes.
- 3) Ability to draw true shape of section.
- 4) Ability to draw the development of surfaces of different objects in different shapes.
- 5) Develop ability to draw sectional views and missing view from given orthographic views
- 6) Develop ability to draw orthographic views of different machine elements
- 7) Use of CAD software for preparing drawings and get the output.

Practical:

1. Projections of Lines and Planes-----6 hours Two problems on projection of lines and two problems on projection of planes (1 Sheet)
2. Projection of solids-----8 hours Two problems on two different solids, one by axis of solid inclined to HP and parallel to VP and another problem by axis of solid inclined to VP and parallel to HP. - (1 Sheet)
3. Section of solids-----8 hours Two problems on different solids. One problem, section plane inclined to HP and perpendicular to VP and in another problem, section plane inclined to VP and Perpendicular to HP. - (1 Sheet)
4. Development of surfaces-----8 hours Any two problems on development of surfaces of different objects.- (1 Sheet)
5. Sectional Orthographic and Missing view -----10 hours One problem on sectional views and one problem on missing views. - (1 Sheets)
6. Free Hand Sketches-----8 hours Any ten specified elements.- (1 Sheets)
7. Using CAD software-----16 hours Draw any two machine elements with dimensions

Learning Resources:**1. Books:**

Sr. No.	Title	Author	Publication
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, 24 th 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.	--

2. Video Cassettes / CD's

1. Instructional / Learning CD developed by ARTADDICT.

Course Name : Diploma in Chemical Engineering**Course Code : CH****Semester : Second****Subject Title : Fundamentals of Chemical Engineering****Subject Code : 17206****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	50#	--	50@	200

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head (SW) Sessional Work.

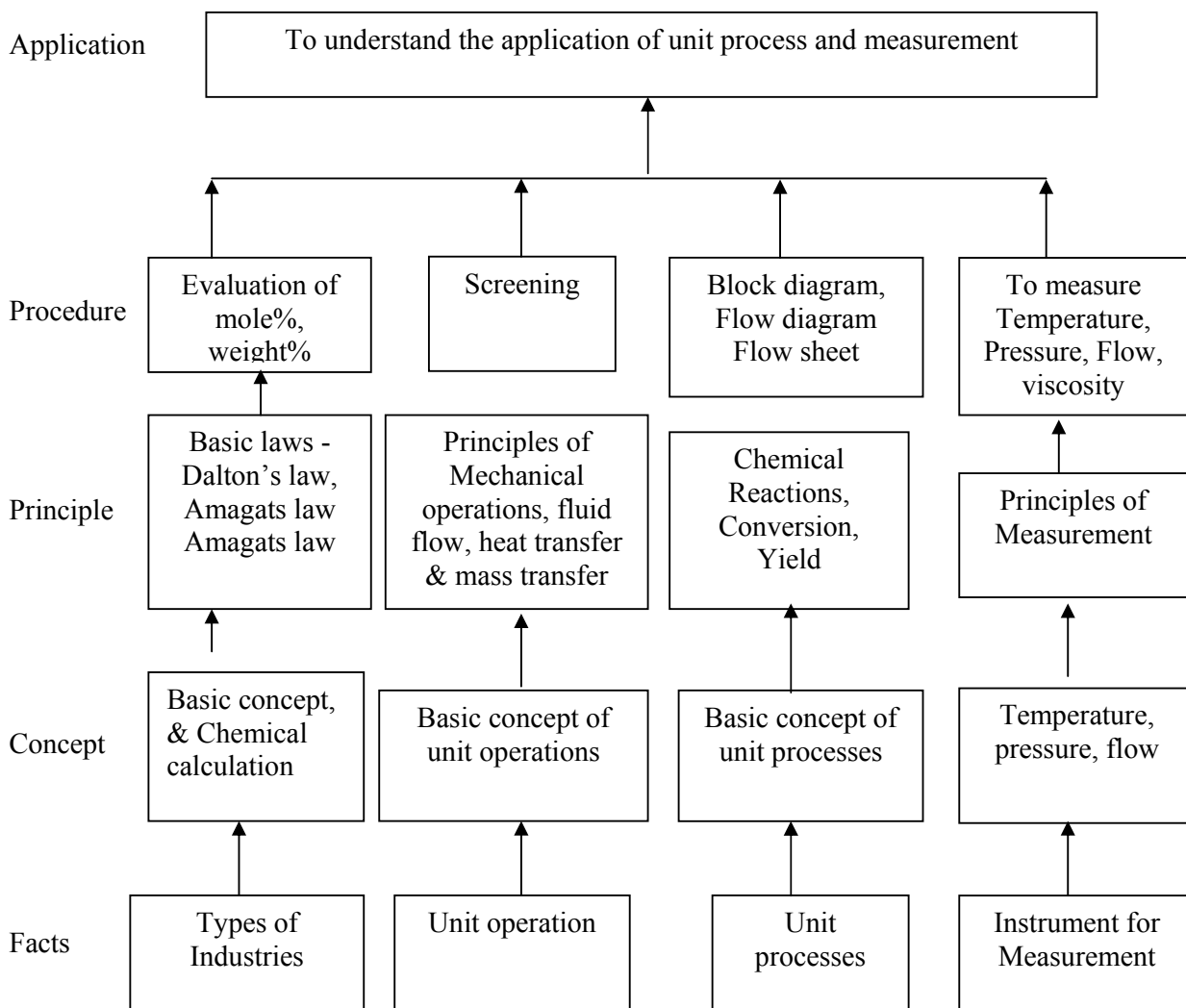
Rationale:

During last century, chemical industry was on very small scale. There has been tremendous growth in various fields of chemical industry. The knowledge of this development is useful in understanding the future needs of chemical industry. All the chemical industry basically require unit operations & unit processes. The basics of unit operation and unit process are covered in the contents, which will help in understanding the higher levels of subjects. Different types of chemical products requires the chemicals of desired concentrations, the basic calculation required for this solutions are covered in detail.

General Objectives:

To develop following skills:

1. Understand the unit operation in chemical industries
2. Know unit processes in chemical plants
3. List chemical processes
4. Understand instrumentation used in chemical processes
5. Know safety precautions in chemical plants

Learning Structure:

Theory:

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction to Chemical Engineering</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To calculate different parameters of chemical engg. ➤ To convert units in desired units. <p>Contents :</p> <ul style="list-style-type: none"> • 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.) 	20	30
<p>Topics 2 : Unit Operations</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To draw symbols of various unit operations. ➤ To state the principles of various unit operations. <p>Contents :</p> <p>Definitions, purpose & principles of unit operations like</p> <ul style="list-style-type: none"> • Mechanical Operation - Size reduction, Size separation, Filtration, Sedimentation, Mixing • Mass Transfer - Gas absorption, Desorption • Mass and Heat transfer – Distillation, Drying <p>Symbols of –</p> <ul style="list-style-type: none"> • 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 	14	24
<p>Topic 3 :Unit Processes</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To write chemical reaction of various unit processes. ➤ To define various unit processes. <p>Contents :</p> <ul style="list-style-type: none"> • Unit processes with simple examples (with reactions) like - Sulphonation, Oxidation, Reduction, Hydrogenation, Hydration, Saponification, Esterification, Nitration, Chlorination, and Cracking/pyrolysis. 	08	12
<p>Topic 4 : Basic Concepts of Chemical Processes</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To write reactions involved in manufacturing processes. ➤ To draw the symbols involved in process flow sheet. <p>Contents :</p> <ul style="list-style-type: none"> • Definition of Conversion, yield, reaction efficiency • Flow sheets, block diagrams, reaction, properties & uses of sulphuric acid, nitric acid. 	08	16

Topic 5 : Process Instrumentation & Safety Specific Objectives: ➤ Describe the process of measurement of various parameters. Contents : <ul style="list-style-type: none"> • 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). 	14	18
Total	64	100

Practical:**Skills to be developed:****Intellectual Skills:**

1. List the Chemical Processes
2. Select appropriate safety measures as per the situation
3. Identify various unit operations and processes

Motor Skills:

1. Handling of different chemicals safely.
2. Handling of different instruments properly & safely.
3. Calibrate chemical apparatus
4. Follow the given procedure carefully

List of Practicals:

- 1 & 2. To prepare the following solutions and standardize them: (Any two of the following)
 - (a) 1 normal, 1 molar & 1 molal solution of H_2SO_4
 - (b) 1 normal, 1 molar & 1 molal solution of NaOH
 - (c) 1 normal, 1 molar & 1 molal CH_3COOH
 - (d) 1 normal $Al_2(SO_4)_3$
 - (e) 1 normal $KMnO_4$
3. To determine weight percentage of solid mixture with the help of screen analysis.
4. To Calibrate glass thermometer.
5. To measure differential pressure by using U tube manometer.
6. To find out volumetric flow rate using rotameter.
7. To determine viscosity of given liquid using Redwood viscometer
8. To determine density of given liquid by using specific gravity bottle.
9. Demonstration of personal protective equipments.
10. To prepare any one compound with reference to unit processes given in theory contents.

Learning Resources:**1. Books:**

Sr. No.	Author	Title	Publisher
01	Walter. L. Badger Julius T. Banchero	Introduction to Chemical Engineering	McGraw Hill International
02	McCabe, W. L. Smith, Harriott	Unit Operations of Chemical Engineering	McGraw Hill Inc
03	Ghosal S.K, Shyamal.K.Sanyal, Datta.S	Introduction to Chemical Engineering	Tata McGraw Hill Publications
04	S.K.Singh	Industrial Instrumentation & Control	Tata McGraw Hill Publications 1

Course Name : All Branches of Diploma in Engineering and Technology.

**Course Code : CE/ME/IE/EJ/DE/ET/EX/EE/EP/MU/EV/IS/CO/CM/IF/PG/PT/AE/
CV/MH/FE/CD/ED/EI**

Semester : Second

Subject Title : Engineering Mathematics

Subject Code: 17216

Teaching and Examination Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	01	--	03	100	--	--	--	100

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

This subject is an extension of Basic mathematics of first semester and a bridge to further study of applied mathematics. The knowledge of mathematics is useful in other technical areas.

Differential calculus has applications in different engineering branches. For example concepts such as bending moment, curvature, maxima and minima.

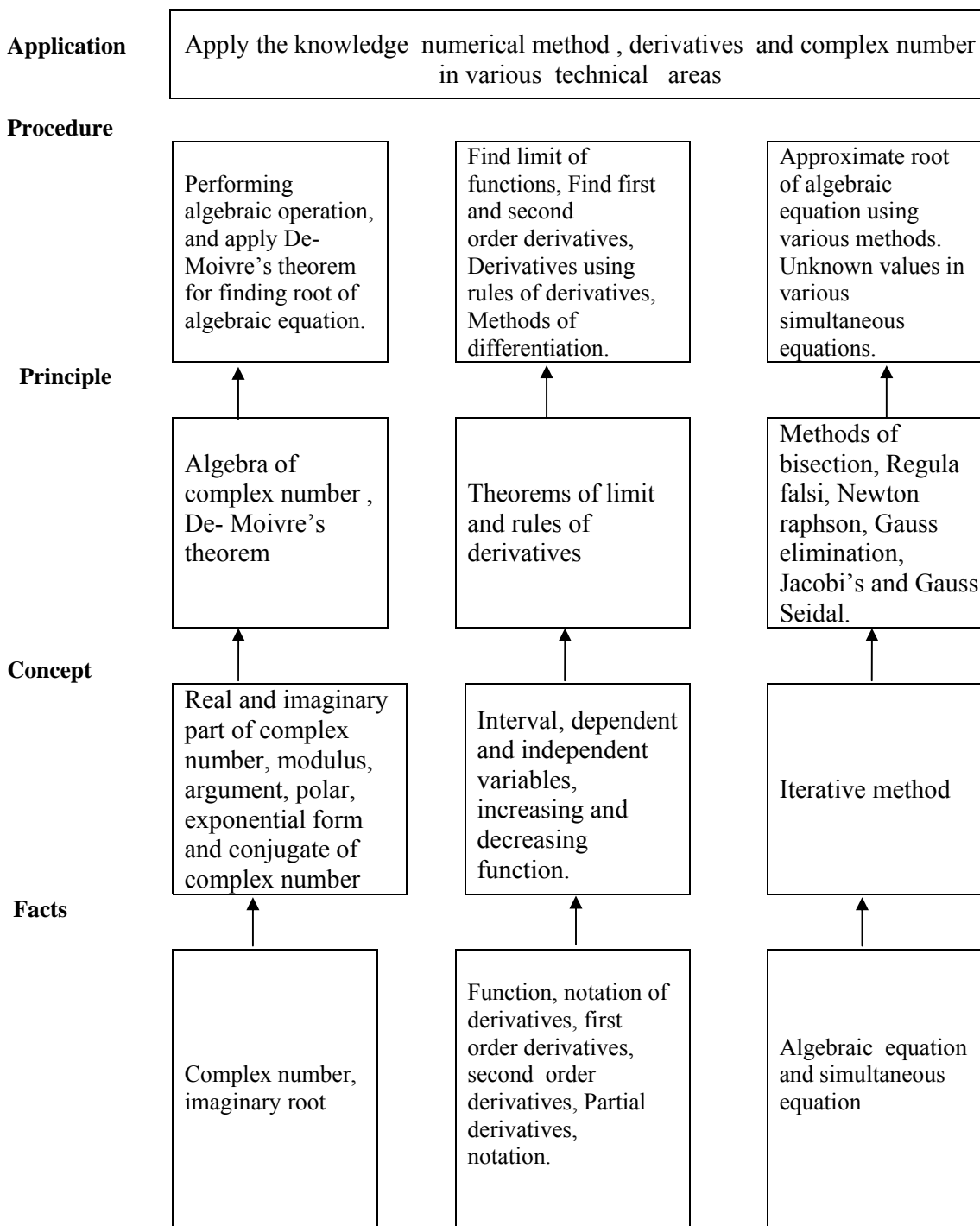
Numerical methods are used in programming as an essential part of computer engineering. For solution of problems in electrical circuits and machine performances complex number is used engineering mathematics lays the foundation to understand technical principles in various fields.

General objectives:

Student will be able to

- 1) Use complex numbers for representing different circuit component in complex form to determine performance of electrical circuit and machines.
- 2) Apply rules and methods of differential calculus to solve problems.
- 3) Apply various numerical methods to solve algebraic and simultaneous equations.

Learning Structure:



Content Theory:

Topic	Hours	Marks
Topic 1 - Complex number		
1.1 Complex Number ----- 14 Specific objectives : <ul style="list-style-type: none"> ➤ 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. 	08	14
Topic 2 - Differential Calculus		
2.1 Function ----- 14 Specific objectives : <ul style="list-style-type: none"> ➤ 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. 	08	58
2.2 Limits ----- 20 Specific objectives : <ul style="list-style-type: none"> ➤ To evaluate limit of function. • Concept and definition of limit. • Limits of algebraic, trigonometric, logarithmic and exponential functions with examples. 	08	
2.3 Derivatives ----- 24 Specific objectives : <ul style="list-style-type: none"> ➤ 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. 	12	
Topic 3 - Numerical Method		
3.1 Solution of algebraic equation ----- 14 Specific objectives : <ul style="list-style-type: none"> ➤ Find the approximate root of algebraic equation. • Bisection method • Regula falsi method • Newton Rapshon method 	06	28

3.2 Numerical solution of simultaneous equations ----- 14		
Specific objectives :		
<ul style="list-style-type: none"> ➤ Solve the system of equations in three unknowns. • Gauss elimination method • Jacobi's method • Gauss Seidal method 	06	
Total	48	100

Tutorials:

- 1) Tutorial are to be used to get enough practice.
- 2) In each tutorial make a group of 20 student students and for each group minimum 10 problems are to be given.

List of Tutorials:

Sr No.	Topic for Tutorial
1	Complex number (Examples based on algebra of complex numbers)
2	Complex number (Examples based on De Moivre's theorem and Euler's formulae)
3	Function
4	Limit (algebraic and trigonometric functions)
5	Limit (logarithmic and exponential functions)
6	Derivatives by first principle
7	Derivatives (Examples based on formulae of standard functions and rules)
8	Derivatives (Examples based on methods of differentiation)
10	Solution of algebraic equations
11	Solution of simultaneous equations

Learning Resources:**1) Books:**

Sr. No.	Title	Authors	Publication
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 and Kapoor	S. Chand Pablication New Delhi
5	Higher Engineering Mathematics	B. S .Grewal	Khanna publication New Delhi
6	Applied Mathematics	P. N. Wartikar	Pune vidyarthi Griha Prakashan, Pune

2) Websites: www.khan.academy

Course Name : All Branches of Diploma in Engineering and Technology

**Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/
ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX**

Semester : Second

Subject Title : Development of Life Skills

Subject Code : 17010

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	25@	--	25

Rationale:

Globalization has emphasized the need for overall development of technician to survive in modern era. Soft skills development in addition to technical knowledge; plays a key role in enhancing his/her employability.

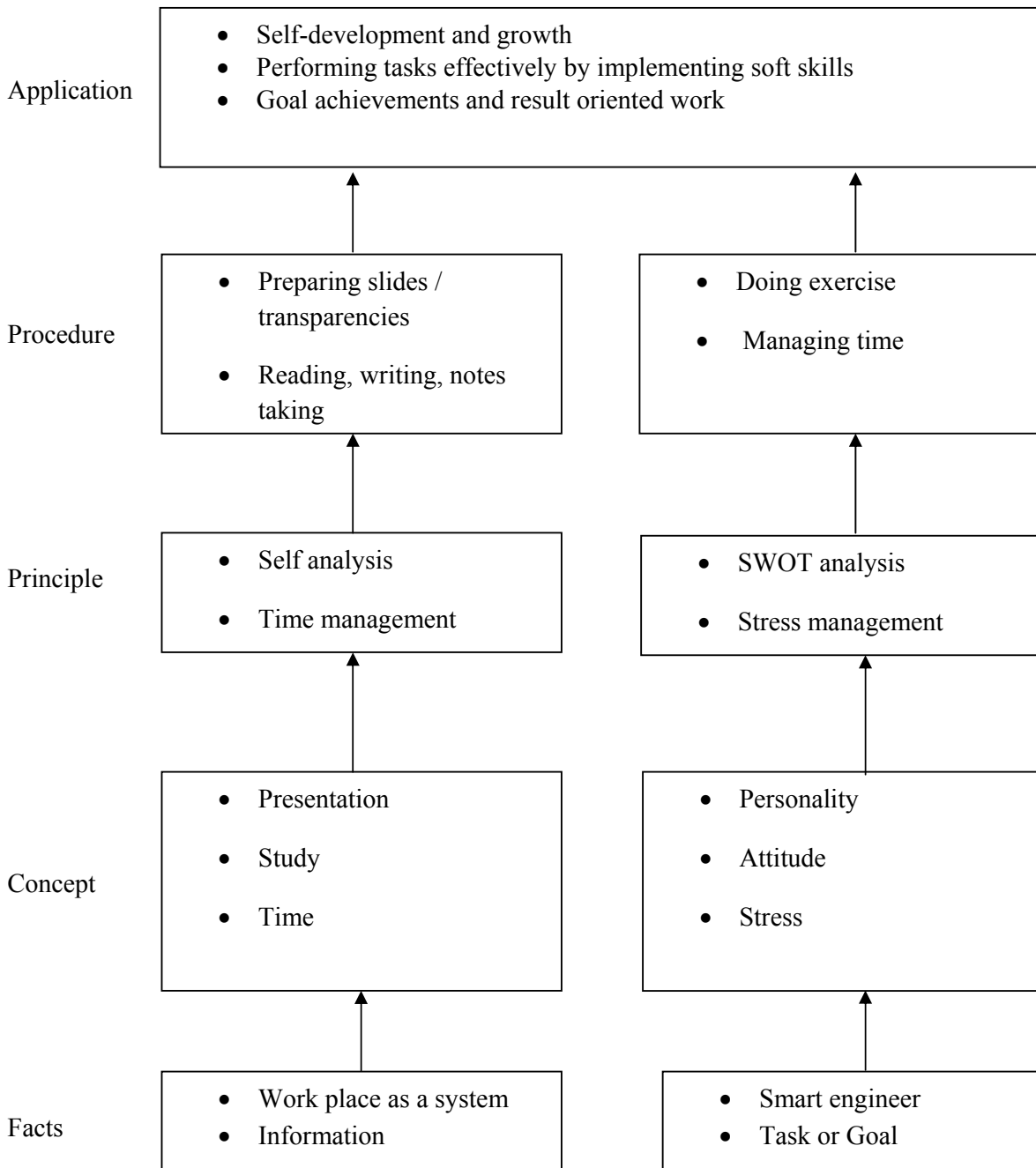
This subject aims to provide insights into various facets of developing ones personality in terms of capabilities, strengths, weakness, etc as well as to improve reading, listening and presentation skills. Also in this age fierce competition, the time and stress management techniques will immensely help the technician to live happy and purposeful life.

General Objectives:

After studying this subject, the students will be able to:

1. Understand and appreciate importance of life skills.
2. Use self-analysis and apply techniques to develop personality.
3. Use different search techniques for gathering information and working effectively.
4. Improve the presentation skills.

Learning Structure:



Theory:

Topic and Contents	Hours
<p>TOPIC 1: SELF ANALYSIS</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To introduce oneself. <p>Contents:</p> <p>1.1 Need of Self Analysis</p> <p>1.2 Attitude and types (positive, negative, optimistic and pessimistic)</p> <p>Guidelines for developing positive attitude.</p>	02
<p>TOPIC 2: STUDY TECHNIQUES</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To identify different process and strategies. ➤ To improve reading, listening and notes taking skills. <p>Contents:</p> <p>2.1 Learning strategies</p> <p>2.2 Learning process</p> <p>2.3 Organization of knowledge</p> <p>2.4 Reading skills</p> <p>2.5 Listening skills</p> <p>2.6 Notes taking</p> <p>2.7 Enhancing memory</p>	03
<p>TOPIC 3: INFORMATION SEARCH</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To search information as per the need. <p>Contents:</p> <p>3.1 Sources of information</p> <p>3.2 Techniques of information search (library, internet, etc)</p>	02
<p>TOPIC 4: SELF DEVELOPMENT</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To set primary goals using SMART parameters. ➤ To Priorities the work effectively. ➤ To cope up with stress effectively. <p>Contents:</p> <p>4.1 Goal setting and its importance.</p> <p>4.2 Characteristics of Goal setting (SMART- Specific, Measurable, Attainable, Realistic, Time bound)</p> <p>4.3 Time Management - Importance, prioritization of work, time matrix, time savers, and time wasters.</p> <p>4.4 Stress Management - Definition, types of stress, causes of stress, managing stress, and stress busters.</p>	05
<p>TOPIC 5: PRESENTATION TECHNIQUES</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To plan for presentation. ➤ To prepare contents for presentation. <p>Contents:</p>	02

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	02
Total	16

Practical:**Skills to be developed:****Intellectual Skills:****Student will be able to**

- Develop ability to find his capabilities.
- Select proper source of information.
- Follow the technique of time and stress management.
- Set the goal.

Motor Skills:**Student will be able to**

- Follow the presentation of body language.
- Work on internet and search for information.
- Prepare slides / transparencies for presentation.

List of Practicals/activities:

1. Giving self introduction. Observe the demonstration of self introduction given by the teacher and prepare a write up on the following points and introduce yourself in front of your batch in 5 minutes
 - Name
 - Native place
 - Background of school from where he / she passed
 - Family background

- Hobbies / salient achievements / idols if any for self development
 - Aims of life as an Engineer
2. Provide responses to the questions based on the moral story given in the assignment.
 3. Judge your attitude by responding to the tests given in the assignment and write comments on your score.
 4. Read any chapter from the subject of Engineering Physics / Engineering Chemistry and identify facts, concepts, principles, procedures, and application from that chapter
 5. Participate in the panel discussion on techniques of effective learning and provide the responses to the questions.
 6. Access the book on Biography of Scientists/Industrialist/Social leader/Sports Person from library. Read the book and note the name of author, publication, year of publication, and summarize the highlights of the book.
 7. Prepare notes on given topic by referring to books / journals / websites.
 8. Prepare 8 to 10 power point slides based on the notes prepared on the above topic. Present the contents for 10 minutes Group wise(Group will be of 4 students)

Note – Subject teacher shall guide the students in completing the assignments based on above practical.

Learning Resources:

Books:

Sr. No.	Author	Name of Book	Publication
1	Richard Hale and Peter Whitlam	Target setting and goal achievement	Kogan Page
2	Andrew Bradbury	Successful Presentation Skills	The Sunday Times - Kogan
3	Ros Jay and Antony Jay	Effective Presentation	Pearson – Prentice Hall
4	Subject Experts - MSBTE	Handbook on Development of Life Skills	MSBTE
5	Nitin Bhatnagar and Mamta Bhatnagar	Effective Communication and Soft Skills	Pearson
6	D. Sudha Rani	Business Communication and Soft Skills	Pearson
7	Barak K Mitra	Personality Development and Soft Skills	Oxford University Press
8	Dr. T. Kalayani Chakravarti and Dr. Latha Chakravarti	Soft Skills for Managers	Biztantra

Course Name : Chemical Engineering Group

Course Code : CH

Semester : Second

Subject Title : Workshop Practice

Subject Code : 17028

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	--	--	50@	50

Rationale:

Diploma Mechanical Engineer is expected to develop basic workshop skills in Carpentry, Welding, Fitting and Smithy operations.

Students are required to identify, select and use different kinds of tools, such as marking, measuring, cutting, supporting, striking and various holding devices.

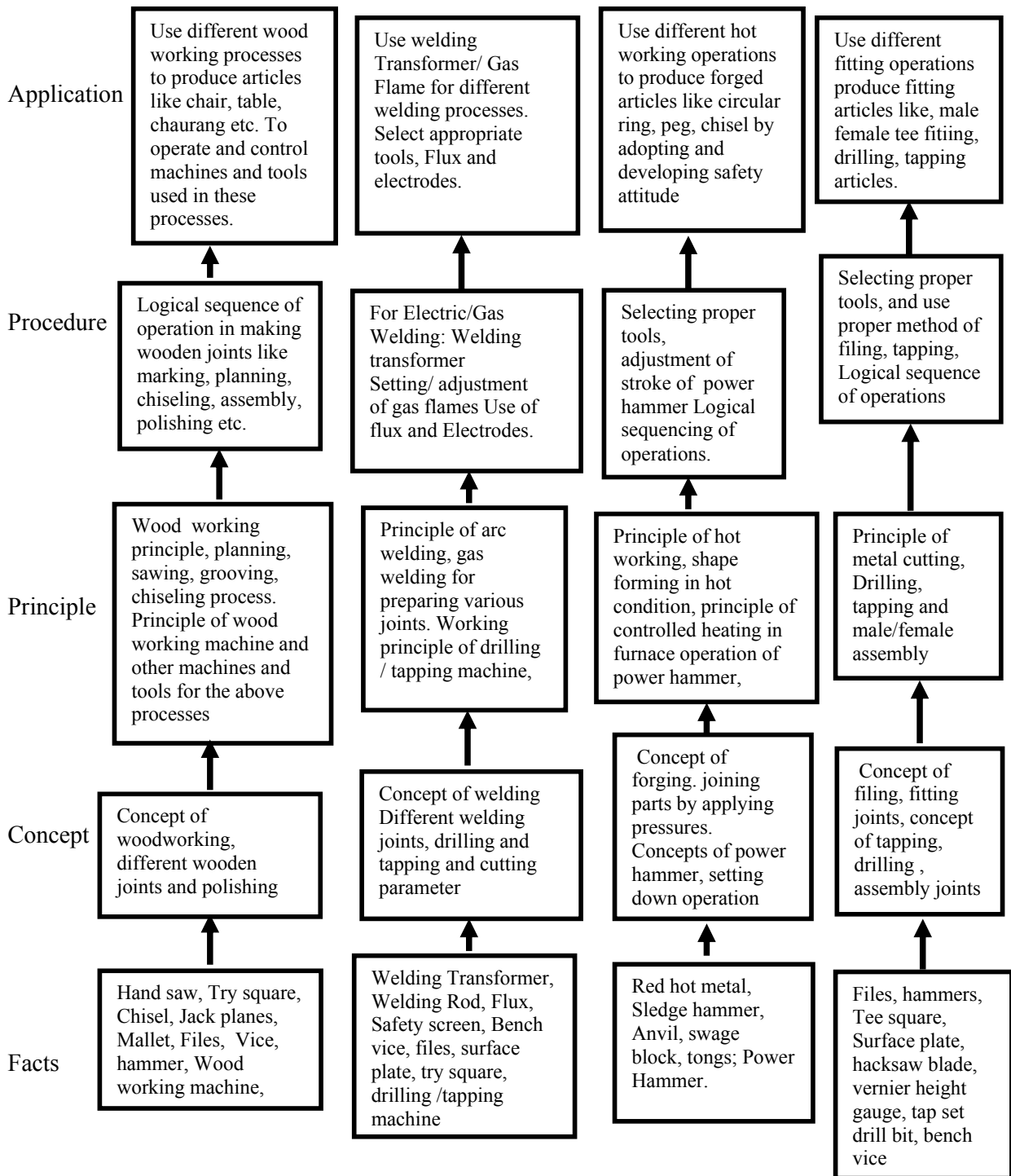
These workshop practices are commonly used in engineering industries. Knowledge of Basic Workshop Practice and Workshop Practice enables students to use in preparing composite jobs.

General Objectives:

The student will be able to

- Know basic workshop processes.
- Read and interpret job drawing, plan various operations and make assembly.
- Identify, select and use various marking, measuring, holding, striking and cutting tools & equipments.
- Operate, control different machines and equipment in respective shops.
- Produce and Inspect the job for specified dimensions
- Adopt safety practices while working on various machines.
- Know basic workshop processes.
- Read and interpret job drawing.
- Identify, select and use various marking, measuring, holding, striking and cutting tools & equipments.
- Operate, control different machines and equipment in respective shops.
- Inspect the job for specified dimensions
- Produce jobs as per specified dimensions.
- Adopt safety practices while working on various machines.

Learning Structure:



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. 	<p>CARPENTRY SHOP:</p> <p>Any one composite job from the following involving different joint, turning and planning, surface finishing by emery paper, varnishing etc.</p> <p>like square stool, tea table, center table, chaurang, table lamp bed sofa-set, book rack. Cabinet, notice board, shows cases, tables chairs etc.</p> <p>Note: 1] One job of standard size (Saleable article shall be preferred)</p> <p>2] Batch size should be selected depending on volume of work. Max. 4 students.</p> <p>3] Job allotted should comprise of 6-8 hours of actual working</p> <p>4] Student shall calculate the cost of material and labor cost for their job from the drawing.</p>
02	<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, 	<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: 1] One job of standard size (Saleable/marketable article shall be preferred)</p>

	striking and inspection tools used in Welding	<p>2] Batch size should be selected depending on volume of work. Max. 4 students</p> <p>3] Job allotted should comprise of 6-8 hours of actual working operations.</p> <p>4] Student shall calculate the cost of material and labor required for their job from the drawing.</p>
03	<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 ➤ 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>
04	<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: 1] One job of standard size (Saleable / marketable article shall be preferred)</p> <p>2] Job allotted should comprise of 4-6 hours of actual working operations.</p> <p>3] Student shall calculate the cost of material and labor required for their job from the drawing.</p>

Assignments: ----- 8 hours

A journal shall consist of one assignment each on the topics 1 to 4 mentioned above.

Each assignment shall consist of –

- Procedural steps in completing a given job
- Description with sketches of equipment/machinery used, write the specifications of equipment / machinery
- List of types of tools used in completing the job
- List of safety equipments used and safety rules observed

Notes:

- 1] The subject teacher should provide necessary theory inputs to students for all shops before start of practical sessions
- 2] The instructor shall give demonstration to the students by preparing a specimen job as per the job drawing.
- 3] The workshop diary shall be maintained by each student duly signed by instructor of respective shop
- 4] Workshop Tool Manual at institute level shall be provided to the students
- 5] Distribution of 50 marks allotted for Tern Work will be as follows
 - For completion of job (acceptable standard) = 40 Marks
 - For assignments given = 10 marks.

Guidelines for conducting Practical Examination for WORKSHOP PRACTICE 2nd semester

1. External examiner should be Workshop Superintendent or Teaching staff having 4-5 years of experience in teaching the work shop related subjects.
2. The job drawing must be jointly decided by the External and Internal examiner prior to one day in advance from the commencement of practical examination. Every student should be supplied the copy of job drawing before examination.
3. Time for practical hours should be of **two hours. OR (04)**
4. Practical examination of the students shall be from amongst the above 4 shops, ensuring the equal distribution of students in each shop. Students will perform the job as per allotted shop and as per the drawing provided to them.
5. Preferable Suggested specification of Jobs and its material are as follows.
 - For carpentry any type of Carpentry joint made from 50 m.m, Breadth's 37m.m. Thick wood.
 - For welding any type of welding joint made from 50 m.m, Breadth.x 37m.m. Thick M.S.Material.
 - For Fitting any Male & Female joint with Drilling and Tapping operation. from 75 m.m, Breadth.x 6 m.m. Thick M.S.Material.

- For Smithy Section any job like Peg, Hook, Chisel, Bolt head etc. from 12 m.m. M. S. round rod.

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher / Edition
01	S. K. Hajara Chaudhary	Workshop Technology	Media Promoters and Publishers, New Delhi
02	B.S. Raghuwanshi	Workshop Technology	Dhanpat Rai and sons, New Delhi
03	H.S.Bawa	Workshop Practice	Tata McGraw Hill Publishers, New Delhi
04	Kent's	Mechanical Engineering Hand book-	John Wiley and Sons, New York
05	P. Kannaiah and K. L. Narayana	Workshop Manual	SCITECH Publications
06	Electronics Trade & technology Development Corporation.(A Govt. of India undertaking) Akbar Hotel Annex, Chanakyapuri, New Delhi- 110 021		

2. 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

3. Websites:

- Refer website www.npkauto.com for Workshop Tool Manual