



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

**COURSE NAME : MECHANICAL ENGINEERING GROUP**

**COURSE CODE : AE / ME / PG / PT / MH / PS / FE / MI / MH**

**DURATION OF COURSE : 6 SEMESTERS for ME/PG/PT/AE/PS ( 8 SEMESTERS for MH/MI/FE ) WITH EFFECT FROM 2012-13**

**SEMESTER : SECOND**

**DURATION : 16 WEEKS**

**PATTERN : FULL TIME - SEMESTER**

**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*	Applied Science	Physics	APH	17202	02	--	02	50	100	40	25@	50	20	--	--		--	--
		Chemistry	ACH	17203	02	--	02	50			25@			--	--		--	--
3	Engineering Mechanics β ✓	EGM	17204	03	01	02	03	100	40	--	--	--	--	25@	10		50	
4	Engineering Drawing	EDG	17205	01	--	04	04	100	40	--	--	--	--	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	WPC	17011	--	--	04	--	--	--	50#	20	--	--	50@	20			
<b>TOTAL</b>				<b>14</b>	<b>02</b>	<b>18</b>	--	<b>500</b>	--	<b>100</b>	--	<b>50</b>	--	<b>150</b>	--	<b>50</b>		

Student Contact Hours Per Week: 34 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 and 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, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

\* Applied Science is divided into two parts - Applied Science (Physics) and Applied Science (Chemistry). Theory examination of both parts as well as practical examination of both parts will be conducted on separate days. Sum of theory marks of both parts shall be considered for passing theory examination of Applied Science. Similarly it is also applicable to practical examination. It is mandatory to appear theory and practical examination of both parts. Remaining absent in any examination of any part will not be declared successful for that examination head.

\* Candidate remaining absent in examination of any one part of Applied Science subject i.e. Physics, Chemistry will be declare as Absent in Mark List and has to appear for examination. The marks of the part for which candidate was present will not be processed or carried forward.

# Communication Skills [CMS]

F.Y. Diploma : Sem. II  
[All Branches]

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## EVALUATION SYSTEM

	Time	Marks
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical Exam</b>	–	–
<b>Oral Exam</b>	–	25#
<b>Term Work</b>	–	25@
<b>Sessional Work (Two Test)</b>	–	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](http://www.mindtools.com/page8.html-99k)
6. Website: [www.khake.com/page66htm/-72k](http://www.khake.com/page66htm/-72k)
7. Website: [www.BMConsultant India.Com](http://www.BMConsultantIndia.Com)
8. Website: [www.letstak.co.in](http://www.letstak.co.in)
9. Website: [www.inc.com/guides/growth/23032.html-45k](http://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
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical Exam</b>	–	–
<b>Oral Exam</b>	–	–
<b>Term Work</b>	–	–
<b>Sessional Work (Two Test)</b>	–	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](http://www.khan.academy)



# Applied Physics [APH]

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

## EVALUATION SYSTEM

	Time	Marks
Theory Exam	2 Hrs.	50
Practical Exam	–	25@
Oral Exam	–	–
Term Work	–	–
Sessional Work (Two Test)	–	25 (each)

@ - Internal Assessment

## SYLLABUS

### Topic 1 Motion

#### Specific Objectives:

- State equations of motion.
- Apply laws of motion to solve problems.
- Differentiate between linear and circular motion,
- State meaning of centripetal acceleration, centripetal force

#### 1.1 Rectilinear and Angular Motion

- Equations of motion:- $V=u+at$ ,  $S=ut+1/2at^2$ ,  $V^2=u^2+2as$  (no derivation), distance traveled by particle in  $n^{\text{th}}$  second, (only equation), Uniform velocity, uniform acceleration and uniform retardation, equations of motion for motion under gravity.
- Definition of angular displacement, angular velocity, angular acceleration, relation between angular velocity and linear velocity, three equations of angular motion (no derivation) angular distance traveled by particle in  $n^{\text{th}}$  second (only equation).

#### 1.2 Kinetics and Work Power Energy

- Definitions of momentum, impulse, impulsive force with formulae, statements of Newton's laws of motion with equations, applications of laws of motion—recoil of gun.
- Definition of work, power and energy, equations for potential energy. kinetic energy, work -energy principle.

#### 1.3 Projectile Motion and circular motion

- Definition of a projectile motion, angle of projection, trajectory, time of flight and range with formulae.
- Definition of a circular motion, centripetal acceleration, centripetal force, definition of centrifugal force, and its applications.

### Topic 2 Nondestructive Testing of materials

#### Specific Objectives:

- Describe the method of production of ultrasonic waves
- Use NDT methods for quality testing of materials in industry

#### 2.1 Ultrasonic

- Ultrasonic waves-properties, production of ultrasonic waves by piezoelectric method.

#### 2.2 Non –destructive testing methods

- Destructive and Nondestructive testing, advantages of NDT, limitations of N.D.T., different N.D.T. Methods used in industries, criteria for selection of NDT method, Liquid penetration Testing (LPT): principle, procedure and applications, Ultrasonic testing methods:-principle, procedure and applications.

### Topic 3 Thermocouple

#### Specific Objectives

- State meaning of thermoelectricity.
- State characteristics of thermocouple.
- Concept of EMF, thermoelectricity, Seebeck effect; measurement of thermo emf, Peltier effect, Seebeck series; examples with different pairs of metals,
- Variation of thermo emf with temperature, graph; neutral temperature, inversion temperature, Joule effect, comparison of Seebeck effect, Peltier effect and Joule effect.

### Topic 4 Modern physics

#### Specific objectives

- State the concept of photocell
- State applications of X – ray
- State properties of LASER

#### 4.1 Photo electricity

- Photon (quantum), Plank’s hypothesis, energy of photon, properties of photons.
- Photo electric effect: Circuit diagram, process of photoelectric emission, definitions:- threshold frequency, threshold wavelength, stopping potential, characteristics of photoelectric effect.
- Work function, Einstein’s photoelectric equation, photo resistor (LDR) –symbol, principle, applications, photoelectric cell:- principle, applications.

#### 4.2 X-rays

- Origin of X-rays, production of X-rays using Coolidge’s X-ray tube, minimum wavelength of X-ray, properties of X-rays, applications of X- rays: engineering, medical and scientific.

#### 4.3 Laser

- Laser, properties of laser, spontaneous and stimulated emission, population inversion, optical pumping, engineering applications of Laser.

#### Reference :

1. Engineering Physics (*R.K.Gaur and S.L.Gupta*) Dhanpat Rai Publication, New Delhi.
2. Fundamental of Physics (*Resnick and Hailday*) Wisley Toppan Publishers – England.
3. Engineering Physics (*V. Rajendran*) Tata McGraw-Hill Publications.
4. Physic, IGNOU-School of Engineering & Technology.
5. Physics- Std XI, Std XII, HSC board/c CBSE Board.
6. Conceptual Physics (*P.G.Hewitt*) Pearson Education, (10<sup>th</sup> edition).
7. A text book of engineering Physics (*M.N. Avadhanulu, P.G. Kshirsagar*) S.Chand & co. Ltd
8. Websites : <http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html>, <http://physics.info>,  
<http://physics.org>, <http://about.com>, <http://classroom.com>, <http://101science.com>
9. Videos : <http://www.youtube.com/watch?v=ZmhuCIL5BqQ>: work power energy  
<http://www.youtube.com/watch?v=8kOSth5QgF4>: motion in one dimension, rectilinear motion  
<http://www.youtube.com/watch?v=SsIaL3L6Jg4> :projectile motion  
<http://www.youtube.com> Laser cutter  
<http://www.cmslaser.com>
10. CDs : Educational Cd of NCERT, Educational cd of Pearson education India
11. PPT : [www.dboccio.com/Physics%20PowerPoints/Work,%20Energy](http://www.dboccio.com/Physics%20PowerPoints/Work,%20Energy),  
[www.slideshare.net/donpraju/laser-ppt](http://www.slideshare.net/donpraju/laser-ppt)  
[www.research.usf.edu/cs/rad/laser-ppt](http://www.research.usf.edu/cs/rad/laser-ppt)  
[www.studyvilla.com/laser-ppt-ruby](http://www.studyvilla.com/laser-ppt-ruby) laser  
[www.khanacademy.com](http://www.khanacademy.com)



# Applied Chemistry [ACH]

F.Y. Diploma : Sem. II

[AE/FE/ME/MH/MI/PG/PT/PS]

## EVALUATION SYSTEM

	Time	Marks
Theory Exam	2 Hrs.	50
Practical Exam	–	25@
Oral Exam	–	–
Term Work	–	–
Sessional Work (Two Test)	–	25 (each)

@ - Internal Assessment

## SYLLABUS

### Topic 1 Metallurgy

#### Specific Objectives

- Explain the process of extraction of iron from its ore.
- Explain different processes of Heat treatment.
- State effects of alloying elements on properties of steels.

#### 1.1 Metallurgy

- Definitions of metallurgy, ores of iron.
- Extraction of pig iron by smelting in Blast furnace with chemical reactions in different zones, products of blast furnace- composition, properties and applications of pig iron, slag and flue gases.
- Properties and applications of commercial forms of iron- pig iron, cast iron, wrought iron.

#### 1.2 Steels

- Definition of steel, preparation of steel from pig iron using open hearth process, basic oxygen process.
- Classification of plain carbon steel- low carbon, medium carbon, high carbon steels with their properties and applications.
- Alloy Steels: Effects of alloying elements C, Ni, Co, V, Mo, W, Cr on properties of steel, composition, properties and applications of heat resisting steel (nichrome), magnetic steel (alnico), 18-8 stainless steel, 18-4-1 high speed steel.
- Heat Treatment of steels: Definition and purposes of -hardening, tempering, annealing, normalizing.

### Topic 2 Corrosion

#### Specific Objectives

- Explain Mechanism of atmospheric corrosion and immersed corrosion.
- Describe different methods of protection of metal from corrosion

#### 2.1 Corrosion

- Corrosion, Types of corrosion
- Atmospheric Corrosion: Definition, mechanism of oxidation corrosion, types of oxide films and their significance, factors affecting rate of atmospheric corrosion.
- Immersed Corrosion: Definition, mechanism of immersed corrosion by galvanic cell action- with evolution of hydrogen gas and absorption of oxygen gas, factors affecting immersed corrosion.



## 2.2 Protection of metals by

- Modification of environment, modification of properties of metal, electrochemical protection by sacrificial anodic protection and impressed current cathodic protection, use of protective coatings.
- Application of metallic coatings: By galvanising, tinning, metal spraying, electroplating, metal cladding, cementation- sherardizing, chromising, colourising.
- Application of non-metallic coatings: paint-definition, characteristics, constituents of paint and their functions.

## Topic 3 Fuels

### Specific Objectives

- State characteristics of a good fuel.
- Write significance of proximate analysis of a fuel.
- Explain fractional distillation of crude petroleum.

### 3.1 Properties of fuels

- Definition of a fuel, calorific value and ignition temperature. Characteristics of a good fuel, Classification of fuels with suitable examples, advantages and disadvantages of solid fuels, liquid fuels and gaseous fuels.

### 3.2 Classification of fuels

- Solid fuels: Analysis of solid fuel - proximate analysis for determination of moisture, volatile matter, ash and fixed carbon, significance of proximate analysis, determination of gross calorific value by using Bomb calorimeter.
- Liquid fuels: Origin, fractional distillation of crude petroleum, boiling range, composition, and applications of petroleum fractions obtained, composition, properties, applications of-Biodiesel.
- Gaseous fuels: Composition, properties, applications of- Biogas, LPG, CNG.

## Topic 4 Lubricants

### Specific Objectives:

- Write functions of lubricants
- Describe the mechanism of lubrication.
- State characteristics of Lubricants.

Lubricant: definition of lubricant, functions of lubricants.

- Classification of lubricant: Solid lubricants- characteristics and applications of graphite and molybdenum disulphide. Liquid lubricants – characteristics and applications of synthetic fluid (silicone oil), water as a lubricant (coolant). Semisolid lubricant- characteristics and applications of grease (plastic lubricant).
- Mechanism of Lubrication: Definition of lubrication, mechanism of fluid film lubrication, boundary lubrication, extreme pressure lubrication.
- Characteristics: Physical characteristics of lubricants -viscosity, viscosity index, oiliness, volatility, flash and fire point, cloud and pour point. Chemical characteristics of lubricants-acid value or neutralization number, emulsification, saponification value.
- Selection of Lubricants for road rollers, steam engines, sewing machine, concrete mixer, I.C engine, cutting tools, gears.

**Reference :**

1. Engineering Chemistry (*Jain & Jain*) Dhanpat Rai and Sons.
1. Engineering Chemistry (*S.S. Dara*) S. Chand Publication.
3. Engineering Chemistry (*R. Sivasankar and N. Sivakumar*) Tata McGraw-Hill Publishing Company Limited.
4. Engineering Materials and Metallurgy (*R. Srinivasan*) Tata McGraw-Hill Education Private Limited.
5. Polytechnic Chemistry (*Vedprakash Mehta*) Jain brothers
6. Websites : [http://www.substech.com/dokuwiki/doku.php?id=full\\_index\\_of\\_articles\\_on\\_metals](http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_metals)  
[http://www.substech.com/dokuwiki/doku.php?id=full\\_index\\_of\\_articles\\_on\\_ceramics](http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_ceramics)  
[http://www.substech.com/dokuwiki/doku.php?id=full\\_index\\_of\\_articles\\_on\\_polymers](http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_polymers)  
[http://www.substech.com/dokuwiki/doku.php?id=full\\_index\\_of\\_articles\\_on\\_composites](http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_composites)  
[http://www.substech.com/dokuwiki/doku.php?id=full\\_index\\_of\\_articles\\_on\\_fluids](http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_fluids)  
<http://www.ausetute.com.au/corrosion.html>  
<http://www.youtube.com/watch?v=8s8rcnxqLIw>  
[http://www.sherardizing.com/resources/files/9\\_Sherardizing\\_Corrosion.pdf](http://www.sherardizing.com/resources/files/9_Sherardizing_Corrosion.pdf) (Sherardizing)  
[http://www.galvanizeit.org/aga/animation/4728?keepThis=true&TB\\_iframe=true&height=480&width=6](http://www.galvanizeit.org/aga/animation/4728?keepThis=true&TB_iframe=true&height=480&width=6) (Galvanizing)  
[http://www.ehow.com/list\\_6725219\\_different-types-metal-cladding.html](http://www.ehow.com/list_6725219_different-types-metal-cladding.html) (Metal Cladding)



# Engineering Mechanics [EGM]

F.Y. Diploma : Sem. II

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

## 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.)

### References :

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@

@ - 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, pramid, 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, 24<sup>th</sup> 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.



# Development of Life Skills [DLS]

F.Y. Diploma : Sem. II

[All Branches]

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## 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
1	<ul style="list-style-type: none"><li>➤ To appreciate the importance of <b>Carpentry</b> in engineering works</li><li>➤ To select the proper wood material for the job undertaken</li><li>➤ To identify and use various marking, measuring, cutting, striking and inspection tools used in Carpentry section.</li></ul>	<b>CARPENTRY SHOP :</b>  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"><li>1] One job of standard size (Saleable article shall be preferred)</li><li>2] Batch size should be selected depending on volume of work. Max. 4 students.</li><li>3] Job allotted should comprise of 6-8 hours of actual working</li><li>4] Student shall calculate the cost of material and labor cost for their job from the drawing.</li></ol>

<p><b>2</b></p>	<ul style="list-style-type: none"> <li>➤ To appreciate the importance of Welding in engineering works</li> <li>➤ To select the proper Steel material and proper welding machine for the job undertaken</li> <li>➤ To identify and use various marking , measuring, cutting, striking and inspection tools used in Welding</li> </ul>	<p><b>WELDING SHOP</b></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><b>Note:</b></p> <ol style="list-style-type: none"> <li>1] One job of standard size (Saleable/marketable article shall be preferred)</li> <li>2] Batch size should be selected depending on volume of work. Max. 4 students</li> <li>3] Job allotted should comprise of 6-8 hours of actual working operations.</li> <li>4] Student shall calculate the cost of material and labor required for their job from the drawing.</li> </ol>
<p><b>3</b></p>	<ul style="list-style-type: none"> <li>➤ To appreciate the importance of Fitting operations in engineering works</li> <li>➤ To select the Proper material and tools of Fitting section for the job undertaken.</li> <li>➤ To identify and use various marking, measuring, cutting, striking and inspection tools used in Fitting section</li> </ul>	<p><b>FITTING SHOP:</b></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><b>4</b></p>	<ul style="list-style-type: none"> <li>➤ To appreciate the importance of black smiths operations in engineering works</li> <li>➤ To select the proper material and tools and processes required for the job undertaken.</li> <li>➤ To identify and</li> <li>➤ and use various marking, measuring, cutting, striking and inspection tools used in Smithy section</li> </ul>	<p><b>SMITHY SHOP</b></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><b>Note:</b></p> <ol style="list-style-type: none"> <li>1] One job of standard size ( Saleable / marketable article shall be preferred)</li> <li>2] Job allotted should comprise of 4-6 hours of actual working operations.</li> <li>3] Student shall calculate the cost of material and labor required for their job from the drawing.</li> </ol>

**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](http://www.npkauto.com) for Workshop Tool Manual

