BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207.

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM
SYLLABUS (PROBIDHAN-2016)

MECHANICAL TECHNOLOGY

TECHNOLOGY CODE: **670**

2nd SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

MECHANICAL TECHNOLOGY (670)

2nd SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total
						Theory		Practical		
						Cont. assess	Final exam	Cont. assess	Final exam	
1	67021	Advanced Mechanical Engineering Drawing	0	6	2	0	0	50	50	100
2	67022	Machine Shop Practice -1	1	6	3	20	30	50	50	150
3	67023	Mechanical Workshop Practice	0	6	2	0	0	50	50	100
4	65712	English	2	0	2	40	60	0	0	100
5	65921	Mathematics -2	3	3	4	60	90	50	0	200
6	65912	Physics -1	3	3	4	60	90	25	25	200
7	65811	Social Science	3	0	3	60	90	0	0	150
Total			**12**	**24**	**20**	**240**	**360**	**225**	**175**	**1000**

67021 ADVANCED MECHANICAL ENGINEERING DRAWING

T	P	C
0	6	2

OBJECTIVES:

- To enable to constructing sectional drawing of machine parts.
- To enable to apply the ISO drawing conventions.
- To provide ability to draw screw threads.
- To understand concepts of tolerance, limit and fits according to ISO standard.
- To provide ability to draw gears.
- To appreciate the principle and techniques of producing working drawing.

SHORT DESCRIPTION:

Constructing sectional drawing; ISO drawing conventions; Drawing screw threads; Drawing the mating parts; Drawing Gears and dimensioning the working drawing.

DETAIL DESCRIPTION:

Practical :

1 Construct the sectional views of simple engineering parts.

1.1. Discuss different types of sectional views of engineering components.
1.2. Draw different types of sectional views from a selection of drawing (of industries)
1.3. Draw the cutting planes of engineering drawing.
1.4. Draw the 'full' and 'half' sectional views of engineering components.

2 Adopt ISO sectioning convention.

2.1 Discuss ISO standard.
2.2 Draw sectional symbols for different types of materials as per ISO conventions.

3 Prepare the drawing conventional screw threads.

3.1 State different types of screw threads.
3.2 Draw different type of screw thread profile with correct proportion.
3.3 Draw the square/hexagonal headed Bolt and Nut with proper proportions showing conventional and simplified thread form.

4 Understand the use of ISO standard limits and fits on engineering drawing.

4.1 Discuss the limits, fits, tolerance, allowances, clearances and interference of mating parts.
4.2 Draw the mating parts to show limits, fits, tolerance, allowances, clearances and interference (only for shafts & hole).

5 Prepared the working drawing of gears.

5.1 Perform the freehand sketching of different type of gears.
5.2 Draw the gear tooth profile (Spur, Helical & Bevel gear).
5.3 Build-up a working drawing of an involutes spur gears.

6 **Understand the preparation and use of detail working drawing.**

6.1 Explain detail working drawing (with techniques of dimensioning).
6.2 Prepare a detail drawing of engineering component (such as flange coupling connecting rod, tool post etc.).
6.3 Prepare Bill of Materials and title block for the above detail working drawing.

REFERENCE BOOKS :

১. প্রাথমিক ইঞ্জিনিয়ারিং ড্রয়িং -হেমন্ত কুমার ভট্টচার্য
2. Mechanical Engineering Drawing -Ludig
3. Fundamentals of Engineering Drawing -French & Vierck
4. Mechanical Drawing -French Svensen

67022	*MACHINE SHOP PRACTICE -1*	**T**	**P**	**C**
		1	**6**	**3**

OBJECTIVES :

- To enable to recognize commonly used machine tools.
- To provide understanding of functions of commonly used machine tools.
- To develop skills in setting and operating of the machine tools.
- To provide ability to set and operate commonly used allied tools and accessories.

SHORT DESCRIPTION:

Machine tools; Lathe machine; drilling machine; grinding machine; Measuring techniques.

DETAIL DESCRIPTION

Theory :

1 Understand the concept of safely practice of machine shop.
- 1.1 Explain principle of stopping and starting machine tools.
- 1.2 State general safety precautions(man and machine)
- 1.3 State safety precaution during lathe operation.
- 1.4 State safety precaution during working an a drilling machine.
- 1.5 State safety precaution during working an a Grinding machine.

2 Understand the concept of machine tools.
- 2.1 State machine tools.
- 2.2 Classify commonly used machine tools.
- 2.3 List essential features of commonly used machine tools.

3 Understand the application of lathe machine.
- 3.1 Classify different types of lathe machines.
- 3.2 Mention major components of lathe machine.
- 3.3 Explain the function of different parts and attachments of lathe machine.
- 3.4 Carry out basic calculations for speed and feed for lathe works & taper calculation.
- 3.5 Identify single point cutting tools, and tool materials, cutting angles and their relevant functions.

4 Understand the application of drilling machine.
- 4.1 Classify different types of drilling machine.
- 4.2 Explain the function of different drilling machines.
- 4.3 Mention major components of drilling machine.
- 4.4 Mention work holding methods.
- 4.5 Carry out basic calculations for speed and feed.
- 4.6 Identify different types of twist drill and tool materials.

5 Understand the application of grinding machine.
- 5.1 Explain different types of grinding machines.
- 5.2 Distinguish surface grinder, cylindrical grinder and pedestal/bench grinder.
- 5.3 Identify typical operations for the pedestal and surface grinder.
- 5.4 Describe different types of grinding wheels and bond uses.

Practical :

1 Demonstrate and the practice on setting and operating of lathe machine.

1.1 Perform simple setting up of machine, work piece, tool bit and setting machine speed and feed.
1.2 Produce a job as per engineering drawing specification (solid cylinder).
1.3 Carry out machining operations for facing, centre drilling, parallel turning.
1.4 Sharpen a number of commonly used single point cutting tools using pedestal grinder.
1.5 Carry out additional machining operations of knurling, taper turning, drilling, parting off, simple screw cutting and boring.
1.6 Observe workshop safety precautions (in every cases).

2 Demonstrate the setting and operating of a drilling machine.

2.1 Perform simple setting up of machine, work piece, drill bit, speeds and feeds.
2.2 Sharpen a twist drill on the pedestal grinder.
2.3 Drill a number of holes with appropriate drill bit.
2.4 Observe workshop safety precautions.

3 Demonstrate the setting and operating of a grinding machine.

3.1 Grinding wheel balance and soundness by ringing.
3.2 Mount grinding wheel on machine spindle.
3.3 Use the pedestal grinder to grind single point tools and drill bits.
3.4 Perform simple setting up of grinding machine and machine feed.
3.5 Observe ground surface finish, grain direction, bouncing of wheel.
3.6 Carry out wheel dressing exercise on both pedestal grinder and surface grinder.
3.7 Observe workshop safety precautions.

4 Demonstrate workshop maintenance practice.

4.1 Produce a maintenance schedule common used in machine shop.
4.2 Carry out simple maintenance procedures, including lubrication.
4.3 Observe workshop safety precautions.

REFERENCE BOOKS

1 Basic Machine Shop Practice I & II - V. K. Tejwani
2 Workshop Technology I, II & III - W. A. J Chapman
3 Machine Shop Practice I & II - Berghardt
4 Machine Shop Practice - Somenath De
5 Sheet Metal Work - Blackburn & Cassidy

67023 *MECHANICAL WORKSHOP PRACTICE*

T	*P*	*C*
0	**6**	**2**

AIMS
To provide the students with an opportunity to acquire knowledge and skills to

- Perform different metal & fitting works.
- Perform basic welding works.
- Use and take care of fitting and welding tools & equipment.

SHORT DESCRIPTION

Fitting : Safety Precautions, Common hand tools; Measuring instruments; Laying out; Sawing, chipping, filing, grinding and finishing, drilling and thread cutting;
Welding: Arc welding; Gas welding; welding with non-ferrous metal; Resistance welding; TIG & MIG welding; Gas & Plasma cutting.

Practical:

1 Understand the safely productions in Fitting & welding shop:
- 1.1. State general safety precaution in Fitting shop.
- 1.2. State general safety precaution in welding shop.
- 1.3. State the importance of good housekeeping.

2 Demonstrate the application of basic metal working hand tools.
- 2.1 Identify common hand tools used for metal and fitting works.
- 2.2 Check hand tools for sharpness.
- 2.3 Carryout minor maintenance and sharpening of tools used for fitting works.
- 2.4 Follow safety procedure during working in the fitting shop.

3 Demonstrate the application of measuring instruments and gages for bench work.
- 3.1 Identify the measuring and layout tools.
- 3.2 Take measurement with vernier caliper and micrometer.
- 3.3 Measure and layout a fitting job.
- 3.4 Check/measure with gages (sheet and wire gage, drill gage, etc).

4 Show skill in sawing, chipping, filing, drilling, reaming and grinding.
- 4.1 Identify the operations of sawing, chipping, filing, drilling, reaming and.
- 4.2 Perform sawing, chipping, filing, drilling, reaming and grinding operations.
- 4.3 Make a job involving sawing, chipping, filing, drilling, reaming and grinding operations (Hinge, Angle gage, etc).
- 4.4 Follow safety procedures during sawing, chipping, filing, drilling, reaming and grinding.

5 Show skill in cutting threads.
- 5.1 Identify the taps and dies.
- 5.2 Cut internal and external threads with tap and die.
- 5.3 Follow safety procedures during working with taps and dies.

6 Show skill in making sheet metal jobs.
- 6.1 Select appropriate sheet metal.
- 6.2 Select tools and equipment for sheet metal works.
- 6.3 Layout the sheet for jobs.(Development Drawing)
- 6.4 Make seam joint.
- 6.5 Rectangular tray, Dust pan, Funnel etc.

7 Show skill in Arc Welding:
- 7.1 Identify the Arc welding machine.
- 7.2 Select tools and equipment for Arc welding.
- 7.3 Prepare a work piece for an Arc welding joint.
- 7.4 Select Proper current and voltage for Arc welding.
- 7.5 Select appropriate electrode.

7.6 Practice uniform and straight weld bead.
7.7 Make Arc welding joints 1F, 2F (Lap, butt, tee, corner, etc.)
7.8 Follow safe working procedures during Arc welding.

8 Show skill in Gas Welding:

8.1 Identify the Gas welding cylinders.
8.2 Select tools and equipment for Gas welding.
8.3 Prepare a work piece for a Gas welding joint.
8.4 Select appropriate a filler rod and flux.
8.5 Select appropriate flame for Gas welding.
8.6 Practice uniform and straight weld bead.
8.7 Make Gas welding joints 1F, 2F (Lap, butt, tee, corner, etc.)
8.8 Follow safe working procedures during Gas welding.

9 Show skill in Gas and Plasma cutting

9.1 Identify the Gas cutting torch and Plasma cutting machine.
9.2 Select tools and equipment for Gas cutting and Plasma cutting machine.
9.3 Select appropriate flame and high pressure oxygen flow for gas cutting.
9.4 Select appropriate current, voltage and high presser air flow for plasma cutting.
9.5 Metal cutting by gas and plasma cutting machine.
9.6 Follow safe working procedures during Gas and plasma cutting machine.

10 Show Skill in TIG Welding:

10.1 Identify the TIG welding machine.
10.2 Select tools and equipment for TIG welding.
10.3 Prepare a work piece for a TIG joint.
10.4 Select Proper current and voltage for TIG welding.
10.5 Select appropriate electrode and holder / electrode casing.
10.6 Practice uniform and straight weld bead.
10.7 Make TIG welding joints 1F (butt.)
10.8 Follow safe working procedures during TIG welding.

11 Show Skill in MIG Welding:

11.1 Identify the MIG welding machine.
11.2 Select tools and equipment for MIG welding.
11.3 Prepare a work piece for a MIG joint.
11.4 Select Proper current and voltage for MIG welding.
11.5 Select appropriate electrode and pressure roller.
11.6 Practice uniform and straight weld bead
11.7 Make MIG welding joints 1F (butt.)
11.8 Follow safe working procedures during MIG welding.

12 Show skill in resistance welding.

12.1 Identify the resistance welding machines.
12.2 Identify accessories and tools for resistance welding.
12.3 Make spot welding joints.
12.4 Follow safe working procedures during working with spot welding machine.

REFERENCE BOOKS

6	Basic Sheet Metal Practice	—	J. W. Giachino
7	Prathomic Fitting Sikkha	—	Hemanta Kumar Bhattacharia
8	Welding Principles for Engineers	—	Morris
9	Metal Fabrication	—	Robert L. O'con
10	Sheet Metal Work	—	Blackburn & Cassidy
11	Manufacturing Technology Lab Manual	—	T Jeyapoovan • S Sundaram

65712	ENGLISH	T	P	C
		2	0	2

Objectives:

After The Completion of the Course, Learners Will Be Able To Develop-

- Reading, Listening With Understanding
- The Fluency Of Speech
- Grammatical Accuracy With Emphasis On Spelling & Punctuation
- Creative Writing

Seen Comprehension: (Marks-20)

Unit	Lesson	Title
People Or Institutions Making History (Unit One)	1	Nelson Mandela ,From Apartheid Fighter To President
	2	The Unforgettable History
Food Adulteration(Unit Three)	1	Food Adulteration Reaches Height
	2	Eating Habit And Hazards
Human Relationship(Unit Four)	2	Love And Friendship
Environment And Nature (Unit Eight)	1	Water ,Water Everywhere
	5	Kuakata: Daughter Of The Sea
Greatest Scientific Achievement (Unit Thirteen)	1	Some Of The Greatest Scientific Achievements Of The Last 50 Years
	2	Science And Technology Against An Age- Old Disease
Art And Music (Unit Fourteen)	1	What Is Beauty?
	3	Crafts In Our Time
Tours And Travels (Unit Fifteen)	1	Travelling To A Village In Bangladesh
	4	The Wonders of Vilayet

N.B: The Unit Mentioned Refers To The Text Book (1st Paper) English For Today For Class 11- 12 By National Curriculum & Text Book Board, Dhaka.

Grammar (Marks-20)

1. **(A) Uses of Articles.**
   (B) Uses of Tense *(Right Forms Of Verbs with Indicators)
   (C) Classify Verbs: (Regular and Irregular Verbs, Auxiliary, Principal, Finite, Non-Finite Verbs,)

2. **Sentence:**
   (A) Changing Sentences: (Assertive, Interrogative, Optative, Imperative, Exclamatory Simple, Complex and Compound), Comparison of Adjectives/Adverbs

   (B) Question Making: WH, Yes/No, Tag Question

3. Enrich Vocabulary: Synonyms, Antonyms; Suffix And Prefix.

4. Voice, Narration

5. Sentence Analysis:

Study of Part of Speech, (Type Of Verbs-Regular and Irregular Verbs, Auxiliary and Principal Verb)
Study of Phrases and Clauses (Noun/ Adjective/ Verb/ Participle /Adverbial/ Prepositional Phrases and Principal /Sub Ordinate /Co Ordinate Clauses)

Free Writing (Marks -20)

1. Write Dialogues: (With Teacher, Principal, Shopkeeper, Hotel Manager, Station Master, Newcomer, Buyers, Doctor, Friend, Colleagues Etc).
2. Report Writing On Different Events/ Occasions/ Accidents.
3. Writing Situational Personal and Official Letters.
4. Writing Job Application with CV /Appointment Letter / Joining Letter
5. Write A Guided Paragraph With Questions.

65921	MATHEMATICS -2	T	P	C
		3	3	4

OBJECTIVES

- To enable in solving the simultaneous equations with the help of determinant and matrix.
- To make understand the exponential series.
- To provide ability to apply the knowledge of differential calculus in solving problem like slope, gradient of a curve, velocity, acceleration, rate of flow of liquid etc.
- To enable to apply the process of integration in solving practical problems like calculation of area of a regular figure in two dimensions and volume of regular solids of different shapes.

SHORT DESCRIPTION

Algebra : Determinants, Matrix, Exponential Series.

Trigonometry : Inverse circular functions, Properties of triangle and solution of triangles.

Differential Calculus : Function and limit of a function, differentiation with the help of limit, differentiation of functions, geometrical interpretation of $\frac{dy}{dx}$, successive differentiation and Leibnitz theorem, partial differentiation.

Integral Calculus : Fundamental integrals, integration by substitutions, integration by parts, integration by partial fraction, definite integrals.

DETAIL DESCRIPTION

ALGEBRA :

1 Apply determinants to solve simultaneous equations.

1.1 Expand a third order determinant.
1.2 Define minor and co-factors.
1.3 State the properties of determinants.
1.4 Solve the problems of determinants.
1.5 Apply Cramer's rule to solve the linear equation.

2 Apply the concept of matrix.

2.1 Define matrix, null matrix, unit matrix, square matrix. column matrix, row matrix, inverse matrix, transpose matrix, adjoin matrix, rank of a matrix, singular matrix.
2.2 Explain equality, addition and multiplication of matrix.
2.3 Find the rank of a matrix.
2.4 solve the problems of the following types:
  i) Solve the given set of linear equations with the help of matrix.
  ii) Find the transpose and adjoin matrix of a given matrix.

3 Understand exponential series.

3.1 Define e.
3.2 Prove that e is finite and lies between 2 and 3.
3.3 Prove that $e^x = 1 + \frac{x}{\lfloor 1} + \frac{x^2}{\lfloor 2} + \frac{x^3}{\lfloor 3} + \frac{x^4}{\lfloor 4}$ ..... to ∞
3.4 Solve problems of the followings types :
  i) $1 + \frac{1}{\lfloor 2} + \frac{1}{\lfloor 4} + \frac{1}{\lfloor 6}$ + ... to ∞
  ii) $\frac{1}{\lfloor 2} + \frac{1+2}{\lfloor 3} + \frac{1+2+3}{\lfloor 4} + \frac{1+2+3+4}{\lfloor 5}$ + ... to ∞

TRIGONOMETRY

4 Apply the concept of inverse circular function.

4.1 Explain the term inverse circular function and principal value of a trigonometrical ratio.

4.2 Deduce mathematically the fundamental relations of different circular functions.

4.3 Convert a given inverse circular function in terms of other functions.

4.4 Prove mathematically

i) $\tan^{-1} x + \tan^{-1} y = \tan^{-1} \frac{x+y}{1-xy}$.

ii) $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \tan^{-1} \frac{x+y+z-xyz}{1-xy-yz-zx}$

iii) $\sin^{-1} x + \sin^{-1} y = \sin^{-1} \left(x\sqrt{1-y^2} + y\sqrt{1-x^2} \right)$

iv) $2 \tan^{-1} x = \sin^{-1} \frac{2x}{1+x^2} = \cos^{-1} \frac{1-x^2}{1+x^2} = \tan^{-1} \frac{2x}{1-x^2}$

4.5 Solve problems of the following types.

a) $2 \tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{4} = \frac{\pi}{4}$

b) $\cos \tan^{-1} \cot \sin^{-1} x = x$.

c) Prove that the area of the segment cut from a circle of radius r by a chord at a distance d from the centre is given by

$K = r^2 \cos^{-1} \frac{d}{r} - d\sqrt{r^2 - d^2}$

5 Apply the principle of properties of triangles.

5.1 Prove the followings identities :

i) $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$.

ii) $a^2 = b^2 + c^2 - 2bc \cos A$

iii) $a = b \cos C - c \cos B$.

v) $\Delta = \frac{1}{2} bc \sin A$.

5.2 Establish the followings.

a) $\tan \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$

b) $\tan \frac{B-C}{2} = \frac{b-c}{b+c} \cot \frac{A}{2}$

c) $\Delta = \frac{abc}{4R}$

5.3 Solve the problems of the following types:

i) Prove $\cos (B - C) + \cos A = \frac{bc}{2R}$

ii) An object experiences two forces F_1 and F_2 of magnitude 9 and 13 Newtons with an angle 100^0 between their directions. Find the magnitude of the resultant R.

DIFFERENTIAL CALCULUS

6 Understand the concept of functions.

6.1 Define constant, variable, function, domain, range

6.2 Solve problems related to functions.

7 Understand the concept of limits.

7.1 Define limit and continuity of a function.

7.2 Distinguish between $\lim_{x \to a}$ f(x) and f(a).

7.3 Establish (i) $\lim_{x \to 0} \frac{\sin x}{x} = 1$

(ii) $\lim_{x \to 0} \frac{\tan x}{x} = 1$

8 Understand differential co-efficient and differentiation.

8.1 Define differential co-efficient in the form of

$$\frac{dy}{dx} = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$$

8.2 Find the differential co-efficient of algebraic and trigonometrical functions from first principle.

9 Apply the concept of differentiation.

9.1 State the formulae for differentiation:

(i) sum or difference
(ii) product
(iii) quotient
(iv) function of function
(v) logarithmic function

9.2 Find the differential co-efficient using the sum or difference formula, product formula and quotient formula.

9.3 Find the differential co-efficient function of function and logarithmic function.

10 Apply the concept of geometrical meaning of $\frac{dy}{dx}$

10.1 Interpret $\frac{dy}{dx}$ geometrically.

10.2 Explain $\frac{dy}{dx}$ under different conditions

10.3 Solve the problems of the type:
A circular plate of metal expands by heat so that its radius increases at the rate of 0.01 cm per second. At what rate is the area increasing when the radius is 700 cm ?

11 Use Leibnitz's theorem to solve the problems of successive differentiation.

11.1 Find 2nd, 3rd and 4th derivatives of a function and hence find n-th derivatives.
11.2 Express Leibnitz's theorem
11.3 Solve the problems of successive differentiation and Leibnitz's theorem.

12 Understand partial differentiation.

12.1 Define partial derivatives.
12.2 State formula for total differential.
12.3 State formulae for partial differentiation of implicit function and homogenous function.
12.4 State Euler's theorem on homogeneous function.
12.5 Solve the problems of partial derivatives.

INTEGRAL CALCULUS

13 Apply fundamental indefinite integrals in solving problems.

13.1 Explain the concept of integration and constant of integration.
13.2 State fundamental and standard integrals.
13.3 Write down formulae for:
(i) Integration of algebraic sum.
(ii) Integration of the product of a constant and a function.
13.4 Integrate by method of substitution, integrate by parts and by partial fractions.
13.5 Solve problems of indefinite integration.

14 Apply the concept of definite integrals.

14.1 Explain definite integration.

14.2 Interpret geometrically the meaning of $\int_a^b f(x)\,dx$

14.3 Solve problems of the following types:

(i) $\int_0^{\pi/2} \cos^2 x \, dx$. (ii) $\int_0^1 \frac{(\sin^{-1} x)^2}{\sqrt{-x^2}} dx$

P* =Practical continuous assessment

Reference

SL No	Athour	Title	Publication
01	S. P Deshpande	Mathematics for Polytechnic Students	Pune Vidyarthi Graha Prakashan
02	H. K. Das	Mathematics for Polytechnic Students(Volume I)	S.Chand Prakashan
03	Shri Shantinarayan	Engg.Maths Vol I & II	S.Chand & Comp
04	Dr. B M Ekramul Haque	Higher Mathematics	Akshar Patra Prakashani
05	Md. Abu Yousuf	Differential & Integral Calculus	Mamun Brothers

65912	PHYSICS-1	T	P	C
		3	3	4

OBJECTIVES

- To develop the students a background of basic science i.e. Physics required for understanding technological subjects.
- To develop a working knowledge of common engineering and industrial materials and to enable to determine through experiments the properties of such materials.
- To develop through experiments an understanding of fundamental scientific concept.
- To develop a basic knowledge and concept of physical properties of common engineering and industrial materials.

SHORT DESCRIPTION

Measurement, Units; Vector and Scalar quantities; Motion and Equations of motion; Force and Newton's Laws of motion; Gravity and Gravitation; Simple Harmonic motion; Hydrostatics; Surface tension and viscosity; Pressure, Sound; wave and sound Concepts and nature of sound, Velocity of sound, Ultrasonic.

DETAIL DESCRIPTION

THEORY :

1. PHYSICAL WORLD AND MEASUREMENT

1.1. Nature of Physical World.
1.2. Scope and Excitement of Physics.
1.3. Few Terms about Physics.
1.4. Physics and other world of Technological Knowledge.
1.5. Principle of Measurement.
1.6. Fundamental and Derived Quantities and Units.
1.7. Dimensions of Units.
1.8. Errors in Measurement.

2. SCALAR AND VECTOR QUANTITIES

2.1 Define vector and scalar quantities with examples.
2.2 Show the various representations of the vector quantities; and representation of a vector by unit vector.
2.3 Find and explain the resultant of two vectors in different directions.
2.4 Resolve a vector into horizontal & vertical component.
2.5 Explain the dot and cross product of two vectors.
2.6 Define laws of triangle of vector.

3. MOTION AND EQUATIONS OF MOTION

3.1 Define rest and motion
3.2 Classify and explain of motion.
3.3 Define and explain displacement, speed, velocity, acceleration and retardation.
3.4 Deduce the relationship between displacement, velocity, acceleration and retardation from these definitions.
3.5 Motion of a Projectile.
3.6 Equation of motion of a freely moving body thrown obliquely vertically upward or motion of a projectile.
3.7 Define angular velocity and linear velocity with their units.
3.8 Deduce the relation between angular velocity and linear velocity.
3.9 Define centripetal and centrifugal force with examples.

3.10 Prove that centrifugal force = $\frac{mv^2}{r}$

3.11 State and explain the laws of falling bodies and mention the equation of motion of a body when it is projected vertically upwards or downwards.

4. NEWTON'S LAWS OF MOTION FORCE AND FRICTION

4.1 Define force.
4.2 State Newton's laws of motion.
4.3 Define different units of force and their correlation and also mention the dimension of force.
4.4 Prove P=mf, from Newton's 2nd law of motion.
4.5 Find out the resultant of parallel forces.
4.6 Define inertia and momentum
4.7 State and prove the principles of conservation of momentum.
4.8 Define friction and describe the different kinds of friction.
4.9 Define the co-efficient of static friction.
4.10 Show that the co-efficient of static friction is equal to the tangent of angle of repose
4.11 State the merits and demerits of friction.

5. GRAVITY AND GRAVITATION

5.1 Define and explain the Kepler's Law.
5.2 Define gravity and gravitation.
5.3 Define and determine the gravitational constant (G) and also mention its units and dimension.
5.4 Define acceleration due to gravity 'g' and also mention its units and dimension.
5.5 Discuss the variation of 'g' at different places.
5.6 Define mass and weight with their units and dimension.
5.7 Distinguish between mass and weight.
5.8 Define and explain gravitational potential and escape velocity

6. SIMPLE HARMONIC MOTION (SHM)

6.1 Define Periodic and simple harmonic motion (SHM).
6.2 State the characteristics of SHM.
6.3 Describe a simple pendulum and a second pendulum.
6.4 Define effective length, amplitude, phase, complete oscillation, period of oscillation, frequency.
6.5 State and explain the laws of simple pendulum.
6.6 Motion of simple pendulum and it's time period.

7. WORK, POWER AND ENERGY

7.1 Define work, power and energy.
7.2 State the units and dimensions of work, power and energy.
7.3 State and prove the principle of the conservation of energy.
7.4 Define potential energy (PE) and kinetic energy (KE).
7.5 Derive the equation of potential and kinetic energy.
7.6 Recognize that the useful work can be found from:

$$\text{Efficiency} = \frac{\text{output work}}{\text{input work}} \times 100.$$

8. ELASTICITY

8.1 Name some of the general and special properties of matter.
8.2 Define Elasticity and Elastic limit.
8.3 Define perfectly elastic body and perfectly rigid body.
8.4 Define stress and strain with their units and dimensions.
8.5 State and explain the Hook's law.
8.6 Describe various kinds of modulus of elasticity.
8.7 Mention the units and dimensions of modulus of elasticity.
8.8 Define and explain Poisson's ratio.

9. HYDROSTATICS

9.1 Define pressure as force per unit area and state that it is measured in N/m^2 or Pascal.
9.2 State characteristics of liquid pressure.
9.3 Establish the pressure at a point in a fluid depend upon the density of the fluid, the depth in the fluid and acceleration due to gravity.
9.4 Surface tension and surface energy, Angle of contact.
9.5 Capillarity and theory of capillarity.
9.6 Viscosity and co-efficient of viscosity.
9.8 Necessity of viscosity.

10. WAVE AND SOUND

10.1 Wave and wave motion.
10.2 Transverse wave and longitudinal wave.
10.3 Some definitions relating waves.
10.4 Progressive wave and stationary waves.
10.5 Equation of progressive wave.
10.6 Sound and production of sound.
10.7 Sound is a longitudinal traveling wave.
10.8 Interference of sound: Constructive and Destructive interference.
10.9 Define beats and Mechanism of formation of beats.

11. SOUND AND VELOCITY OF SOUND

11.1 Identify that sound is produced by vibration and travels through a medium as a longitudinal wave.
11.2 Recognize that sound can be produced of different pitches (frequencies) & that the human ear has an audible frequency range covering approximately 20 Hz to 20 KHz.
11.3 State the approximate frequency range for
a. infrasonic sound, b. Ultrasonic (supersonic) sound.
11.4 Explain how sound is absorbed, reflected & refracted by different types of surface.
11.5 Describe the practical uses of echo sounding devices.
11.6 Define velocity of sound.
11.7 State the velocity of sound at NTP in still air.
11.8 Compare the effects of pressure, temperature & humidity on the velocity of sound in air.

PRACTICAL

1. Determine accurate diameter/side of an object using vernier calipers.
2. Measure the area of cross section of a wire by micrometer screw gage.
3. Measure the thickness of a glass plate by speedometer.
4. Verify the law of parallelogram of forces by a force board.
5. Draw L-T^2 graph and determine the value of "g" by using a simple pendulum.
6. Determine the coefficient of static friction.
7. Determine Young's modulus of a steel wire by Searle's apparatus.
8. Determine gravity of a solid heavier than and insoluble in water by hydrostatic balance.
9. Determine specific gravity of a liquid by specific gravity bottle.
10. Determine velocity of sound by resonance air column method.

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65811 SOCIAL SCIENCE

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OBJECTIVE

To provide opportunity to acquire knowledge and understanding on :

- importance of civics and its relationship with other social sciences
- The relationship of an individual with other individuals in a society
- social organizations, state and government
- rule of law, public opinion and political parties
- UNO and its roles
- The basic concepts and principles of economics and human endeavor in the economic system.
- The realities of Bangladesh economy and the current problems confronting the country.
- The role of Diploma Engineers in industries.
- our motherland and its historical background
- good citizenship through practicing our socio- economic culture
- liberation war and its background
- nationalism and life style of the nation

SHORT DESCRIPTION

Civics and Social Sciences; Individual and Society; Nation and Nationality; Citizenship; state and government; Law; Constitution; Government and its organs; public Opinion; Political Party; UNO and its organs;
Scope and importance of Economics; Basic concepts of Economics- Utility, Wealth, Consumption, income wages, salary, value in use and savings; Production – meaning, nature, factors and laws; Demand and Supply; market equilibrium, national income, Current economic problems of Bangladesh; Role of Diploma Engineers in the economic development of Bangladesh; Occupations and career planning; Engineering teem.

Part-1 (Civics)

1. **Understand the meaning and scope of civics and inter relations of social sciences.**
   - 1.1 Define civics and social science.
   - 1.2 Explain the importance of civics in the personal and social life of an individual.
   - 1.3 Describe the relationship of all social science (civics, Economics, political science, Sociology, ethics)

2. **Understand the relationship of the individual with the society, Nationality and nation, Rights and duties of a citizen.**
   - 2.1 Define the concept (individual, society, socialization, Nation, Nationality, citizen and citizenship).
   - 2.2 State the relationship among the individuals in the society.
   - 2.3 Discuss the methods of acquiring citizenship and state the causes of losing citizenship
   - 2.4 Describe the rights of a citizen and state the need for developing good citizenship.

3. **Appreciate the relationship between the state and government, law and organs of government.**
   - **3.1** Meaning the state, government and law
   - 3.2 Discuss the elements of state.
   - 3.3 Discuss the classification of the forms of government
   - 3.4 Distinguish between cabinet form of Government and presidential form of government.
   - 3.5 Describe the main organs of Government (legislature, Executive and judiciary)
   - 3.6 Discuss the sources of law

4. **Understand and the classification of constitution**
   - 4.1 Define the Constitution.
   - 4.2 Explain the deferent form of Constitution
   - 4.3 Explain state the salient feature of Bangladesh constitution.

4.4 Define the fundamental rights of Bangladesh constitution.
4.5 Meaning of human rights.

5. Understand the role of UNO in maintaining world peace

5.1 Explain the major functions of UNO.
5.2 State the composition and functions of General Assembly.
5.3 Describe the Composition and functions of Security Council.
6.4 Discuss the role of Bangladesh in the UNO.

6. Understand the role of Ethics values and good governance

6.1 Define the values, ethics and good governance.
6.2 Discuss the role of government to establish good governance

Part-2 (Economics)

1. Understand the fundamental concepts of economics.

1.1 Define the Microeconomics and Macroeconomics.
1.2 Discuss the definition of Economics as given by eminent economists.
1.3 Describe the importance of economics for Technical Student.
1.4 Define commodity, utility, value, wealth, consumption, income, savings, wages, value in use, value in exchange and salary.
1.5 Differentiate between value in use and value in exchange.
1.6 Explain wealth with its characteristics.

2. Understand the production process and the concept of the law of diminishing returns in the production process.

2.1 Discuss production mode and process
2.2 Explain the nature of different factors of production.
2.3 Discuss production function.
2.4 Discuss the law of diminishing returns.
2.5 State the application and limitations of the law of diminishing returns.
2.6 Describe the law of production (increasing constant and diminishing).

3. Understand the concept of demand, supply and utility.

3.1 Define the term, "demand and supply".
3.2 Explain the law of demand and supply .
3.3 Draw the demand and supply curve.
3.4 Discuss Market equilibrium.
3.5 Define the utility, total and marginal utility
3.6 Illustrate the law of diminishing utility.
3.7 Explain the law of diminishing marginal utility

4. Understand national income.

4.1 Define nation income.
4.2 Explain how to measure national income.
4.3 Discuss GNP, GDP and NNP.
4.4 Discuss economic development and growth

5. Understand the current issues and the availability and use of natural resource in the economic development of Bangladesh

5.1 Define rural and urban economics.
5.2 Identify major problems of rural and urban economy.
5.3 Explain the migration of rural population to urban areas.
5.4 List of the Natural resource of Bangladesh and classify them according to sources of availability.
5.5 Explain the importance of the mine, forest and water resources and potential uses for sustainable development.

6. Role of a Diploma Engineer in the Development of Bangladesh Economy.

6.1 Explain the concept of the term, "Engineering team"
6.2 Identify the functions of Engineers, Diploma Engineers, craftsmen forming the engineering team.
6.3 Discuss the role of a Diploma Engineer in the overall economic development of Bangladesh.
6.4 Explain socio-economic status of a diploma Engineer.

Part-3 ((Bangladesh: History& Culture)

সংক্ষিপ্ত বিবরণী

ইতিহাস

- ইতিহাসের সংজ্ঞা।
- বাংলাদেশের আবহাওয়া ও অধিবাসী।
- বাংলায় ইংরেজ শাসন ক্ষমতালাভ ও প্রতিষ্ঠা।
- ব্রিটিশ বিরোধী সশস্ত্র প্রতিরোধ আন্দোলন; সংস্কার আন্দোলন ও জাতীয়তাবাদেও বিকাশ এবং বাংলার নবজাগরণ; বঙ্গভঙ্গ ও বঙ্গভঙ্গ উত্তরকালে বাংলার রাজনীতি ও দেশ বিভাগ।
- পাকিস্তান আমলে বাংলাদেশ, বঙ্গবন্ধুর নেতৃত্বে বাংলাদেশের মুক্তি সংগ্রাম ও স্বাধীনতালাভ।

সংস্কৃতি

সংস্কৃতি, সভ্যতার সংজ্ঞা, সংস্কৃতির প্রকরণ, ভাষা আন্দোলন উত্তর বাংলার সংস্কৃতি, স্বাধীনতা উত্তর বাংলাদেশের সংস্কৃতির বিবর্তন, বাংলাদেশের সংস্কৃতিতে প্রত্নতার্ত্বিক নিদর্শন ও ক্ষুদ্র নৃতাত্ত্বিক গোষ্ঠীসমূহ।

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