BANGLADESH TECHNICAL EDUCATION BOARD

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM

SYLLABUS (PROBIDHAN-2016) **(খসড়া)**

SURVEYING TECHNOLOGY
TECHNOLOGY CODE: 78

SYLLABUS
(PROBIDHAN-2016)

FIRST SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

Surveying Technology
1st 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	61011	Engineering Drawing	0	6	2	0	0	50	50	100
2	66421	Civil Engineering Materials	2	3	3	40	60	25	25	150
3	65711	Bangla	3	3	4	60	90	50	0	200
4	65712	English	2	0	2	40	60	0	0	100
5	65911	Mathematics -1	3	3	4	60	90	50	0	200
6	65912	Physics-1	3	3	4	60	90	25	25	200
	Total		13	18	19	260	390	200	100	950

ENGINEERING DRAWING   **T P C**

                                                                        0 6 2

OBJECTIVES

- To develop the ability to use various drawing instruments and materials.
- To enable in constructing and using various types of scales in drawing.
- To provide the ability to construct various geometrical figures.
- To enable to adopt various symbols used in drawing.
- To understand the orthographic and isometric projection.

SHORT   DESCRIPTION

Drawing instruments and their uses; Lettering, numbering and constructing title strip; Adopting alphabet of lines and dimensioning; Constructing scales; Constructing geometrical figures; Constructing conic sections; Adopting symbols; Views and isometric projections.

DETAIL DESCRIPTION

DRAWING INSTRUMENTS AND MATERIALS

1   Practice with drawing instruments and materials for basic drawing   technique.
  1.1   Identify the different types of drawing instruments.
  1.2   Use different types of drafting equipment.
  1.3   Use different types of drafting software.
  1.4   Identify the standard sizes of drawing board and sheets.
  1.5   Draw the border lines in drawing sheets following standard rule.
  1.6   Draw horizontal, vertical and inclined lines with the help of set squares and T-square.
  1.7   Draw 15 degree, 75 degree, 105 degree and 120 degree angles with the help of set squares.
  1.8   Use lettering guide, template, scale pantograph and French curve.

LETTERING NUMBERING AND TITLE STRIP

2   Letter and number freehand and with instruments.
  2.1   Identify the necessity of good lettering in engineering drawing.
  2.2   Draw freehand single stroke vertical letters from A to Z (upper and lower case) and numbers 0 to 9.
  2.3   Draw freehand inclined (65 degree to 75 degree) single stroke letters from A to Z (upper and lower case) and numbers from 0 to 9.
  2.4   Draw block letters (Gothic) using 5: 4 and 7: 5 proportions and height.
  2.5   Select a suitable size of letters and write a few sentences using all the letters selecting suitable scale.
  2.6   Draw title strip with proper placement using suitable size of letters and measurements.

ALPHABET OF LINES AND DIMENSIONING

3   Adopt the alphabet of lines.
    3.1   Select different lines in drawing.
    3.2   Use center line, hidden line, phantom line, break line, dimension line, extension line, section line and cutting plane line.
    3.3   Use different thickness of line to emphasize a part of drawing.
    3.4   Select recommended grades of pencils for various types of lines for engineering drawing.

4   Adopt the elements and theory of dimensioning.
    4.1   Put dimensions in engineering drawing according to an accepted standard.
    4.2   Identify the elements of dimensions from a given dimensioned drawing.
    4.3   Apply aligned and unidirectional system of dimensioning.
    4.4   Draw size and location of dimension, continuous dimension, staggered dimension and dimensioning in limited space.
    4.5   Add necessary dimension to a given drawing with suitable arrows.

CONSTRUCTION OF SCALE

5   Prepare scale for drawing application.
    5.1   Calculate representative fraction and interpret a scale reading.
    5.2   Use different types of scale to find full size dimension.
    5.3   Draw a plain scale to show meters, centimeters and millimeters of a given distance on object.
    5.4   Draw a diagonal scale to show three units having given RF.
    5.5   Read particular distance on plain and diagonal scale.
    5.6   Use scale of chord.
    5.7   Draw angle of 49 degree, 78 degree and 95 degree with the help of scale of chord.

GEOMETRICAL CONSTRUCTIONS & CONIC SECTIONS

6   Construct geometric figures (regular polygons) & Construct conic sections.
    6.1   Draw regular polygons i.e. pentagon, hexagon and octagon having given one side.
    6.2   Draw an ellipse by concentric circle method.
    6.3   Draw an ellipse by parallelogram method.
    6.4   Draw an ellipse by four center method.
    6.5   Draw a parabola having given foci and director.
    6.6   Draw a parabola from given abscissa and ordinate.

SYMBOLS

7   Adopt standard symbols in drawing.
    7.1   Identify symbols used in drawing.
    7.2   Draw a legend using symbols of different engineering materials.
    7.3   Draw the symbols of different plumbing fittings and fixtures used in drawing.
    7.4   Draw the symbols of different electrical fittings and fixtures used in drawing.
    7.5   Interpret information from drawing containing standard symbols.

8.   Understand the views of engineering drawing.
    8.1   Identify different types of views
    8.2   Interpret different types of views

9   Apply the Principles of orthographic projection to a straight line.

    9.1 Draw the orthographic projection of a straight line under the following conditions : -

        a) Line parallel to both planes

        b) Line perpendicular in vertical plane and parallel to horizontal plan

        c) Line parallel to vertical plane and perpendicular to horizontal plane

        d) Line inclined at given angle to horizontal plane and parallel to vertical plane

        e) Line inclined at given angle to vertical plane and parallel to horizontal plane

10   Apply the principles of orthographic projection of rectangular and circular planes (Lamina)

    10.1   Draw the orthographic projection of rectangular lamina Parallel to both planes.

    10.2   Draw the orthographic projection of rectangular lamina inclined at given angle to horizontal plane

    10.3   Draw the orthographic projection of circular lamina parallel to both planes

11   Apply the principles of orthographic projections of geometric solids

    11.1   Draw the orthographic projection of a cube kept at an angle with one of the planes in first angle method

    11.2   Draw the orthographic projection of a pyramid kept at an angle with both the planes in 1st angle method

    11.3   Draw the orthographic projection of a cone kept at an angle with both the planes in third angle method.

    11.4   Draw the orthographic projection of a prism kept at an angle with vertical plane in third angle method.

ISOMETRIC PROJECTION

12   Understand the importance, use and scope of isometric views in engineering.

    12.1   Identify isometric views

    12.2   Draw the isometric view of rectangular and circular lamina

    12.3   Draw the isometric projection of solids such as: cube, cylinder, pyramid, prism and steps from different orthographic views

    12.4   Draw the isometric projection of three deterrent engineering parts from orthographic views

REFERENCE BOOKS
1   Geometrical Drawing   - I H Morris
2   Prathamic Engineering Drawing - Hemanta Kumar Bhattacharia
3   Civil Engineering Drawing   - Guru Charan singh

CIVIL ENGINEERING MATERIALS   T   P   C

                                    2   3   3

AIMS

- To be able to identify and classify the materials used for construction in engineering field.
- To be able to recognize the sources of various engineering materials.
- To be able to understand the characteristics of various engineering materials.
- To be able to understand the uses of different engineering materials.

SHORT DESCRIPTION

Aspects of engineering materials, Stone, Bricks, Sand, Cement, Concrete, Lime as mortar, Aluminum as construction materials, Glass and ceramics, Tiles, Paints and varnishes, Timber, Iron and steel and Non ferrous metal.

DETAIL DESCRIPTION

1   **Understand the various aspects of engineering materials.**
     1.1   Define engineering materials.
     1.2   Explain General consideration for using engineering materials.
     1.3   Describe the properties of engineering materials.
     1.4   State the factors to be considered during selection of engineering materials.
     1.5   List the engineering materials commonly used in Bangladesh.

2   **Understand the application of stone**
     2.1   Describe the origin of stone.
     2.2   Identify Stones used in different civil engineering works.
     2.3   Describe the different classes of stone geologically.
     2.4   Explain the properties of building stone.
     2.5   Describe the field test and laboratory tests of stone.
     2.6   Explain the essential qualities of good building stones and their uses.
     2.7   Name the places where the different kinds of stone are available.
     2.8   Describe the artificial stone.
     2.9   Describe the various types of artificial stone
     2.10   Explain the advantages and imitations of artificial stone.
     2.11   Describe the uses of artificial stone.

3   **Understand the characteristic of brick as construction materials.**
     3.1   Define bricks.
     3.2   Describe the function &manufacturing procedure of Auto brick/Machine made brick
     3.3   Mention different constituents for manufacturing of good bricks.
     3.4   Explain pug mill, table molding and machine molding.
     3.5   Describe the process of brick drying.
     3.6   Describe the methods of kiln burning of brick.
     3.7   Draw the sketches Bull's trench kiln & Hoffman's kiln.
     3.8   Explain the characteristics of good bricks.
     3.9   Identify the Standard size, shape and weight of the bricks.
     3.10   Describe the techniques of field test of bricks.
     3.11   Describe the necessity of testing bricks in the laboratory.

4   **Understand the application of sand.**
4.1   Mention the classification of sand according to their sources.
4.2   Mention the specifications of good sand.
4.3   Describe the purpose of grading of sand.
4.4   Mention the use of various grades of sand.
4.5   Describe the bulking of sand.
4.6   Name the places of availability of good sand in Bangladesh.

5   **Understand the application of lime.**
5.1   Describe lime as binding materials
5.2   Explain the terms: Calcinations, Quick lime, Slaking, Slaked lime, Setting,   Hydraulicity.
5.3   Distinguish between stone lime and slaked lime .
5.4   Explain the characteristics of good lime.
5.5   Describe manufacturing process, storing and uses of lime.

6   **Understand the application of cement.**
6.1   Define cement.
6.2   Mention the functions of various ingredients of cement.
6.3   Distinguish between wet process and dry process of manufacturing Portland cement.
6.4   Draw a flow diagram based on wet process of manufacturing of cement.
6.5   Mention the uses of cement as engineering material.

7   **Understand the aspects of concrete as engineering material.**
7.1   Define concrete.
7.2   State the different constituents of concrete.
7.3   Explain the function of different constituents of concrete.
7.4   Classify concrete.
7.5   State the advantage of concrete over other similar materials.

8   **Understand the application of tiles**
8.1   Identify the following tiles: Clay tiles, Concrete tiles, Plastic tiles, Mosaic tiles, Marble tiles, Glazed tiles, Homogenous tiles and Wooden tiles.
8.2   Describe the uses of different kinds of tiles.

9   **Understand the Light metal (aluminum/white metal) as construction materials.**
9.1   Explain the important properties of light metal (aluminum/white metal) as construction material.
9.2   Mention the uses of aluminum white/metals.
9.3   Describe the advantages and disadvantages of using aluminum as construction material.

10   **Understand the fundamental concepts of glass and ceramics.**
10.1   Mention the constituents of glass.

10.2   List the properties of glass.
10.3   Mention the uses of glass.
10.4   Describe the constituents of ceramics.
10.5   Mention the classification of ceramics.
10.6   List the properties of ceramics.
10.7   Describe the uses of ceramics in engineering field.

11   Understand the basic concepts of paints and varnishes.
11.1   Define paints and varnish.
11.2   Explain the characteristics of good paint.
11.3   List the essential constituents of paint.
11.4   Explain the functions of pigment.
11.5   List the main constituents of varnishes.
11.6   Explain the characteristics of good varnish.
11.7   Mention the functions of vehicle.
11.8   Describe synthetic materials used for paint and varnishes.

12   Understand the characteristic of timber as construction materials.
12.1   Define timber.
12.2   Mention the classification of trees depending on botanical groups.
12.3   Explain conservation of timber in various market forms.
12.4   Describe the major defects in timber.
12.5   Describe the advantages and disadvantages of using timber in the engineering filed.
12.6   Describe the characteristics of good timber.
12.7   Describe different type of light weight board (Ply board, Melamine board, Plastic board).

13   **Understand the seasoning and preservation of timber.**

13.1   Define seasoning.

13.2   Explain the purpose of seasoning.

13.3   differentiate between seasoning and preservation of timber.

13.4   Classify the different types of artificial seasoning.

13.5   Describe defects in seasoning of timber.

13.6   Describe the methods of application of preservation.

14 **Understand the engineering uses of metals and alloys**.
14.1   Name the common types of iron used in industry.
14.2   Mention the uses of wrought iron and cast iron.
14.3   Mention the classification of steel on the basis of carbon content.
14.4   List the names of commercial steels.
14.5   Describe alloy steel.
14.6   Mention the uses of various alloy steels.
14.7   Define non-ferrous metals.

14.8 List the important non-ferrous metals used in engineering field.
14.9 Mention the uses of non-ferrous metals and alloys like copper, zinc, tin, lead, brass and   bronze.

PRACTICAL:
1. **Show skill in identifying various types of stone**
   - 1.1.   Selected different type of stone in the laboratory.
   - 1.2.   Sketch different type of stone on the basis of formation.
   - 1.3.
2. **Show skill in field test of bricks**
   - 2.1.   Perform field test of bricks
   - 2.2.   Select 1st class , 2nd class, 3rd class bricks and jhama bricks

3. **Show skill in conducting laboratory test of bricks**
   - 3.1.   Perform:
       - (a)   Compression test
       - (b)   Absorption test
   - 3.2.   Determine average weight of a brick.

4. **Show skill in conducting laboratory test of cement**
   - 4.1.   Conduct laboratory tests of cement
       - (a)   Make Cement Paste of Normal Consistency(CPNC)
       - (b)   Determine initial setting time
       - (c)   Perform final setting time
       - (d)   Perform compressive strength test
       - (e)   Perform tensile strength test
       - (f)   Perform fineness test
   - 4.2.   Conduct field tests of cement

5. **Show skill in conducting tests of coarse aggregate**
   - (a)   Specific gravity of sand
   - (b)   Grading of aggregates

6. **Show skill in conducting test of sand**
   - (a)   Bulking of sand
   - (b)   F M of sand
   - (c)   Specific gravity of sand

7. **Show skill in identifying various ferrous and non ferrous metal**
   - 7.1.   Identify mild steel, cast iron, copper, and aluminum, tin by physical observation.

REFERENCE BOOKS

1   A text book on Engineering Materials   —   G. J. Kulkarni
2   Engineering Materials   —   Dr. M. A. Aziz

BANGLA	T	P	C
	৩	৩	৪

উদ্দেশ্য :

১. মাতৃভাষা হিসেবে বাংলা ভাষার প্রকৃতি ও বৈশিষ্ট্য সম্পর্কে ধারণা লাভ। ভাষার ব্যবহারে প্রায়োগিক যোগ্যতা অর্জন।

২.বাংলা সাহিত্য পঠন-পাঠনের মাধ্যমে জাতীয় চেতনা, দেশপ্রেম, মুক্তিযুদ্ধের চেতনা, শুদ্ধাচার, নীতি ও মূল্যবোধের উন্মেষ ঘটানো।

সংক্ষিপ্ত বিবরণী :

মাতৃভাষা ও সৃজনশীলতা : বাংলা ভাষা রীতির বিচিত্রতা, বানান রীতি, পত্র রচনা এবং কবিতা, প্রবন্ধ, নাটক, উপন্যাস ও ছোট গল্প ।

বিশদ বিবরণী:

১.বাংলা ভাষার প্রয়োগ:

ক)বাংলা ভাষা :

ভাষার সংজ্ঞা, বাংলা ভাষা রীতি - সাধু, চলিত , আঞ্চলিক বা উপভাষা (সংজ্ঞা, বৈশিষ্ট্য, পার্থক্য ও উদাহরণ)

খ) বাংলা বানান রীতি ও শব্দ প্রয়োগ:

১.বাংলা একডেমির প্রমিত বানান রীতি, ণ-ত্ব ও ষ-ত্ব বিধি

২. শব্দ ও শব্দের শ্রেণি বিভাগ (সংজ্ঞা, শব্দের গঠন, উৎস বা উৎপত্তি ও অর্থগত)

৩.বাক্য প্রকরণ ও গঠন রীতি (সংজ্ঞা, বাক্য গঠন এবং প্রকার)

গ) পত্র রচনা :

আবেদন পত্র (চাকুরি, ছুটি), চাকুরিতে যোগদান পত্র, মানপত্র, স্মারকলিপি, সংবাদপত্রে প্রকাশের জন্য পত্র

২. বাংলা সাহিত্য:

ক. কবিতা :

১.বঙ্গভাষা –মাইকেল মধুসূদন দত্ত

২. সোনার তরী – রবীন্দ্র নাথ ঠাকুর

৩. উমর ফারৰক –কাজী নজরৰল ইসলাম

৪. বাংলার মুখ আমি– জীবনানন্দ দাশ

৫. আসাদের শার্ট – শামসুর রাহমান

৬. স্বাধীনতা শব্দটি কি করে আমাদের হলো? – নির্মলেন্দু গুণ

খ. প্রবন্ধ :

১. অর্ধাঙ্গী –রোকেয়া সাখাওয়াত হোসেন

২.বইকেনা – সৈয়দ মুজতবা আলী

গ. একাঙ্কিকা (নাটিকা):

১.মানুষ –মুনীর চৌধুরী

ঘ. উপন্যাস:

১.লালসালু – সৈয়দ ওয়ালী উলৰাহ

ঙ.ছোট গল্প:

১. হৈমন্তী – রবীন্দ্র নাথ ঠাকুর

২. একুশের গল্প – জহির রায়হান

৩. পাতালেহাসপাতালে – হাসান আজিজুল হক

ব্যবহারিক

১.নির্ধারিত বক্তৃতা :

বাংলাদেশ ও বাঙালি সংস্কৃতি, বিভিন্ন জাতীয় দিবস (একুশে ফেব্রুয়ারি ও আন্তর্জাতিক মাতৃভাষা দিবস, স্বাধীনতা দিবস, বিজয় দিবস,জাতীয় শোক দিবস, মুজিব নগর দিবস, মহান মে দিবস)

প্রাতিষ্ঠানিক বক্তৃতা- নবাগত শিৰক/ছাত্রছাত্রীদের বরণ, গুরৱত্বপূর্ণ ব্যক্তিবর্গের আগমন উপলৰে বক্তৃতা ।

২. উপস্থিত বক্তৃতা :

বিষয়বস্তু উন্মুক্ত

৩.আবৃত্তি :

১. মানুষ - কাজী নজরৰল ইসলাম

২. আকাশ নীলা - জীবনানন্দ দাশ

৩. পলৰী জননী -জসীম উদ্দীন

৪. ছাড়পত্র - সুকান্ত ভট্টাচার্য

৫. তোমাকে পাওয়ার জন্য হে স্বাধীনতা - শামসুর রাহমান

৬. নিষিদ্ধ সম্পাদকীয় – হেলাল হাফিজ

৪. বিতর্ক (নমুনা)

সংস্কৃতিই আধুনিক মানুষের ধর্ম

তথ্য প্রযুক্তির অবাধ ব্যবহারই যুব সমাজেরঅবৰয়ের মূল কারণ

গতানুগতিক শিৰা নয় কর্মমুখি শিৰাই অর্থনৈতিক মুক্তির চাবিকাঠি

চালকের অসাবধনতাই সড়ক দুর্ঘটনার প্রধান কারণ

মুক্তিযুদ্ধের চেতনাই অসাম্প্রদায়িক বাংলাদেশ প্রতিষ্ঠার মূলমন্ত্র

প্রযুক্তির বিকাশই প্রকৃতি বিনাশের একমাত্র কারণ

৫. প্রতিবেদন প্রণয়ন ও উপস্থাপন:

স্থানীয় বিভিন্ন সমস্যা ও অনুসন্ধানী যে কোন বিষয় ।

ENGLISH Subject Code :…….	T	P	C
	2	0	2

Full Marks: 100

Continuous Assessment : 40 Marks

Theory (Final Exam)   : 60 Marks

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

CONTENT

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.

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MATHEMATICS-1	T	P	C
	3	3	4

OBJECTIVES

- To acquaint the students with the basic terminology of Algebra.

- To be able to understand the complex numbers which are being used in electrical engineering.

- To be able to understand the binomial expansion.

- To be able to use the knowledge of trigonometry in solving problems of engineering importance.

SHORT DESCRIPTION

Algebra : AP & GP, Polynomials & polynomial equations, Complex number, Permutation & Combination, Binomial theorem for positive integral index and negative & fractional index.

Trigonometry: Ratio of associated angles, Compound angles, Transformation formulae, multiple angles and Sub-multiple angles.

DETAIL DESCRIPTION

ALGEBRA :

1   Understand the concept of AP & GP.
   1.1 Define AP and common difference.
   1.2 Find last term and sum of n terms, given first term and common difference.
   1.3 Define GP and common ratio.
   1.4 Find the sum of n terms given first and common ratio.

2   Apply the concept of polynomial in solving the problems.
   2.1   Define polynomials and polynomial equation.
   2.2   Explain the roots and co-efficient of polynomial equations.
   2.3   Find the relation between roots and co-efficient of the polynomial equations.
   2.4   Determine the roots and their nature of quadratic polynomial equations.
   2.5   Form the equation when the roots of the quadratic polynomial equations are given.
   2.6   Find the condition of the common roots of quadratic polynomial equations.
   2.7   Solve the problems related to the above.

3   Understand the concept of complex numbers.
   3.1   Define complex numbers.
   3.2   Perform algebraic operation (addition, subtraction, multiplication, division, square root) with complex number of the form $a + ib$.
   3.3   Find the cube roots of unity.
   3.4   Apply the properties of cube root of unity in solving problems.

4   Apply the concept of permutation.
   4.1   Explain permutation.
   4.2   Find the number of permutation of n things taken r at a time when,
      i) things are all different.
      ii) things are not all different.
   4.3   Solve problems of the related to permutation :
      i)   be arranged so that the vowels may never be separated. From 10 man and 6 women a committee of 7 is to be formed. In how many ways can this be done so as to include at least two women in the committee.

5   Apply the concept of Combination.
   5.1   Explain combination.
   5.2   Find the number of combination of n different things taken r at a time.
   5.3   Explain ^nC_r, ^nC_n, $^nC_0$
   5.4   Find the number of combination of n things taken r at a time in which p particular things
      i) Always occur ii) never occur.

5.5   Establish i) $^nC_r = {}^nC_{n-r}$

ii) $^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

5.6   Solve problems related to combination.

6   **Apply partial fraction to break the numerator and denominator.**
  6.1   Define proper and improper fractions.
  6.2   Resolve in to partial fraction of the followings types :
  a)   Denominator having a non-repeated linear factor.
  b)   Denominator having a repeated linear factor.
  c)   Denominator having a quadratic factors.
  d)   Denominator having a combination of repeated, non-repeated and quadratic factors.

7   **Apply the concept of binomial theorem.**
  7.1   State binomial expression.
  7.2   Express the binomial theorem for positive index.
  7.3   Find the general term, middle term, equidistant term and term independent of x.
  7.4   Use binomial theorem to find the value of
  i) $(0.9998)^2$, correct to six places of decimal.
  ii) $(1 + \sqrt{2})^5 - (1- \sqrt{2})^5$

8   **Apply the concept of binomial theorem for negative index.**
  8.1   Express the binomial theorem for negative and fractional index.
  8.2   Solve problems of the following types:

  Expand (i) $(1 - nx)^{-\frac{1}{n}}$ (ii) $\dfrac{1}{\sqrt{4.08}}$

TRIGONOMETRY :
9   **Apply the concept of associated angles.**
  9.1   Define associated angles.
  9.2   Find the sign of trigonometrical function in different quadrants.
  9.3   Calculate trigonometrical ratios of associated angle.
  9.4   Solve the problems using above.
10   **Apply the principle of trigonometrical ratios of compound angles.**
  10.1 Define compound angles.
  10.2 Establish the following relation geometrically for acute angles.

  i) $\sin (A \pm B) = \sin A \cos B \pm \cos A \sin B$.

  ii) $\cos (A \pm B) = \cos A \cos B \pm \sin A \sin B$.

  10.3 Deduce formula for $\tan (A \pm B)$, $\cot (A \pm B)$.

  10.4 Apply the identities to work out the problems:
  i)   find the value of $\sin 75^0$, $\tan 75^0$.
  ii)   show that $\dfrac{\sin 75° + \sin 15°}{\sin 75° - \sin 15°} = \sqrt{3}$

  iii)   if $\alpha + \beta = \theta$, $\tan\alpha + \tan \beta = b$, $\cot \alpha + \cot \beta = a$,

  show that $(a - b) = ab \cot \theta$.

11   **Apply sum and product formula of trigonometrical ratios.**
  11.1 Express sum or difference of two sines and cosines as a product and vice-versa
  11.2 Solve problems of the followings types:
  i) show that, $\sin 55° + \cos 55° = \sqrt{2} \cos 10°$

  ii) prove that, $\cos 80° \cos 60° \cos 40° \cos 20° = \dfrac{1}{16}$

12   **Apply the concept of ratios of multiple angles.**
  12.1 State the identities for $\sin 2A$, $\cos 2A$ and $\tan 2A$.
  12.2 Deduce formula for $\sin 3A$, $\cos 3A$ and $\tan 3A$.

12.3 Solve the problems of the followings types.

i) express cos 5θ in terms of cos θ.

ii) if tan α = 2 tan β, show that, tan (α + β) = $\dfrac{3 \sin 2\alpha}{1 + 3 \cos 2\alpha}$

13   Apply the concept of ratios of sub-multiple angles.

13.1 Find mathematically the identities for sin α , cos α and tan α in terms of $\dfrac{\alpha}{2}$ and $\dfrac{\alpha}{3}$

13.2 Solve the problems of the type :
find the value of cos 3°, cos 6°, cos 9°, cos 18°, cos 36° etc.

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	Ashim Kumar Saha	Higher Mathematics	Akshar patra Prakashani
04	S.U Ahamed & M A Jabbar	Higher Mathematics	Alpha Prakashani

(Pro-2016)	PHYSICS-I	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 $= \dfrac{mv^2}{r}$

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.

REFERENCE BOOKS:

1.   Higher Secondary Physics - First Part   - by Dr. Shahjahan Tapan
2. A Text Book of Properties of of matter   -By N Subrahmanyam and Brij Lal
3. A Text Book of Sound   -By N Subrahmanyam and Brij Lal
4. Higher Secondary Physics- First Part   -by Prof. Golam Hossain Pramanik
5. Higher Secondary Physics- First Part   -by Ishak Nurfungnabi