# BANGLADESH TECHNICAL EDUCATION BOARD

Agargaon, Dhaka-1207.

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

# POWER TECHNOLOGY

**TECHNOLOGY CODE: 671**

# FIRST SEMESTER

# DIPLOMA IN ENGINEERING
# PROBIDHAN-2016

## Power Technology                                    1st Semester

| Sl. No | Subject Code | Name of the subject | T | P | C | Theory | | Practical | | Total |
|--------|--------------|---------------------|---|---|---|--------|------|-----------|------|-------|
| | | | | | | Cont. assess | Final exam | Cont. assess | Final exam | |
| 1 | 61011 | Engineering Drawing | 0 | 6 | 2 | 0 | 0 | 50 | 50 | 100 |
| 2 | 65711 | Bangla | 3 | 3 | 4 | 60 | 90 | 50 | 0 | 200 |
| 3 | 65712 | English | 2 | 0 | 2 | 40 | 60 | 0 | 0 | 100 |
| 4 | 65911 | Mathematics-1 | 3 | 3 | 4 | 60 | 90 | 50 | 0 | 200 |
| 5 | 65912 | Physics-1 | 3 | 3 | 4 | 60 | 90 | 25 | 25 | 200 |
| 6 | 67111 | Power Engineering Fundamentals | 3 | 3 | 4 | 60 | 90 | 25 | 25 | 200 |
| | | **Total** | 14 | 18 | 20 | 280 | 420 | 200 | 100 | 1000 |

# ENGINEERING DRAWING (61011)

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:

**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  Identify 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.

**2  Practice 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 proportions.
    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.

**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.

**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 meter, centimeter and millimeter 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.

**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.

**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.

**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   Prathomic Engineering Drawing - Hemanta Kumar Bhattacharia
3    Civil Engineering Drawing      - Guru Charan singh

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## BANGLA (65711)

| T | P | C |
|---|---|---|
| 3 | 3 | 4 |

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

**২। বাংলা বানান রীতি ও শব্দ প্রয়োগ:**
২.১। বাংলা একাডেমির প্রমিত বানান রীতি, ণ-ত্ব ও ষ-ত্ব বিধি
২.২। শব্দ ও শব্দের শ্রেণি বিভাগ (সংজ্ঞা, শব্দের গঠন, উৎস বা উৎপত্তি ও অর্থগত )
২.৩। বাক্য প্রকরণ ও গঠন রীতি (সংজ্ঞা, বাক্য গঠন এবং প্রকার)

**৩। পত্র রচনা অনুশীলন:**
৩.১। আবেদন পত্র (চাকুরি, ছুটি),
৩.২। চাকুরিতে যোগদান পত্র,
৩.৩। মানপত্র,
৩.৪। স্মারকলিপি,
৩.৫। সংবাদপত্রে প্রকাশের জন্য পত্র

**৪। কবিতা চর্চা:**
৪.১। বঙ্গভাষা –মাইকেল মধুসূদন দত্ত
৪.২। সোনার তরী – রবীন্দ্র নাথ ঠাকুর
৪.৩। উমর ফারুক –কাজী নজরুল ইসলাম
৪.৪। বাংলার মুখ আমি– জীবনানন্দ দাশ
৪.৫। আসাদের শার্ট – শামসুর রাহমান
৪.৬। স্বাধীনতা শব্দটি কি করে আমাদের হলো? – নির্মলেন্দু গুণ

**৫। প্রবন্ধ জানা :**
৫.১। অর্ধাঙ্গী –রোকেয়া সাখাওয়াত হোসেন
৫.২। বইকেনা – সৈয়দ মুজতবা আলী

**৬। একাঙ্কিকা (নাটিকা):**
৬.১। মানুষ –মুনীর চৌধুরী

**৭। উপন্যাস:**
৭.১। লালসালু – সৈয়দ ওয়ালী উল্লাহ

**৮। ছোট গল্প:**
৮.১। হৈমন্তী – রবীন্দ্র নাথ ঠাকুর
৮.২। একুশের গল্প – জহির রায়হান
৮.৩। পাতালেহাসপাতালে – হাসান আজিজুল হক

**ব্যবহারিক:**

১। নির্ধারিত বক্তৃতা অনুশীলন:

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 শিক্ষক/ছাত্রছাত্রীদের বরণ, গুরুত্বপূর্ণ ব্যক্তিবর্গের আগমন উপলক্ষে বক্তৃতা।

২. উপস্থিত বক্তৃতায় অংশগ্রহণ: বিষয়বস্তু উন্মুক্ত

৩. আবৃত্তি অনুশীলন : ১. মানুষ                          - কাজী নজরুল ইসলাম

        ২. আকাশ নীলা          - জীবনানন্দ দাশ

        ৩. পল্লী জননী             - জসীম উদ্দীন

        ৪. ছাড়পত্র                 - সুকান্ত ভট্টাচার্য

          ৫. তোমাকে পাওয়ার জন্য হে স্বাধীনতা  - শামসুর রাহমান

          ৬. নিষিদ্ধ সম্পাদকীয়     – হেলাল হাফিজ

৪. বিতর্ক প্রতিযোগীতা (নমুনা)

সংস্কৃতিই আধুনিক মানুষের ধর্ম

তথ্য প্রযুক্তির অবাধ ব্যবহারই যুব সমাজেরঅবক্ষয়ের মূল কারণ

গতানুগতিক শিক্ষা নয় কর্মমুখি শিক্ষাই 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।

| | | T | P | C |
|---|---|---|---|---|
| **ENGLISH (65712)** | | 2 | 0 | 2 |

## OBJECTIVES:

After the completion of the course, learners will be able to develop-

- Reading & listening skills with understanding
- The fluency of speech
- Grammatical accuracy with emphasis on spelling, punctuation and pronunciation
- Creative writing for communication in real life situation
- Integrating reading, listening, writing & speaking skills

## DETAIL DESCRIPTION:

### Reading Skill:

**1. Demonstrate the ability to use reading skill.**

    1.1 Read the mentioned text and take notes covering the main points, facts from passage read.

    1.2 Recognize how ideas relate to communicative competence.

    1.3 Use digital dictionaries to discover pronunciation, spelling, meaning and uses.

    1.4 Identify main points and summarize the text.

**Contexts and Situations- (**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 Habits 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 (1$^{st}$ Paper) English for Today for class 11 – 12 By National Curriculum & Text Book Board, Dhaka.

### Listening Skill:

**2. Demonstrate the ability to use listening skill.**

    2.1 Listen to instructions and follow them.

    2.2 Take notes from a short talk, story or explanation.

    2.3 use e-book or reading software to follow the accent and pronunciation of the native speaker.

### Speaking Skill:

**3. Demonstrate the ability to use speaking skill.**

    3.1  Ask and answer questions about objects/events/processes.

    3.2  Ask and answer questions about what they have read, listened and written.

    3.3  Participate in controlled conversations in various social situations.

## Writing Skill:

**4. Demonstrate the control of writing skill.**
- 4.1 Develop paragraphs from points/outlines
- 4.2 Write guided paragraph about people, places, events and day -to-day life.
- 4.3 Write guided letter and applications.
- 4.4 Describe objects , events, status and process.

## Functions:
1. Writing dialogues with teacher, principal, shopkeeper, hotel manager, station master, newcomer, buyers, doctor, friend, colleagues.
2. Writing reports on different events/occasions/accidents.
3. Writing situational personal and official letters
4. Writing job applications with CV/appointment letter/joining letter
5. Writing guided paragraphs with clues

## Grammar: Marks-20 (Context & Situations)
(Grammatical items, structures and vocabulary relevant to notions and contexts given bellow will be followed)

**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:**
   a. Study of part of Speech (Type of verbs-Regular and Irregular verbs, Auxiliary and Principal verb)
   b. Study of Phrases and Clauses (noun/adjective/verb/participle/adverbial/prepositional phrases and principal/sub ordinate /co ordinate clauses)

## MATHEMATICS-1 (65911)

| 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:**

**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 related to permutation:
   i)  Be arranged so that the vowels may never be separated.
   ii) From 10 men 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 nCr, nCn, nC0
   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) nCr = nCn-r

    ii) nCr + nCr-1 = n+1Cr

5.6 Solve problems related to the combination.

# 6 Apply partial fractions to break the numerator and denominator.

6.1 Define proper and improper fractions.

6.2 Resolve into partial fraction of the following types:

    a)   Denominator having a non-repeated linear factor.

    b)   Denominator having a repeated linear factor.

    c)   Denominator having a quadratic factor.

    d)   Denominator having a combination of repeated, non repeated and quadratic factors.

# 7 Apply the concept of the 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 the 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) $\dfrac{1}{\sqrt{4.08}}$

# 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 ± B) = sin A cos B ± cos A sin B.

    ii) cos (A ± B) = cosA cosB ± sinAsinB.

10.3 Deduce formula for tan (A ± B), Cot (A ± B).

10.4 Apply the identities to work out the problems:

    i)   Find the value of sin 750, tan 750.

    ii)   Show that $\dfrac{\sin75° + \sin15°}{\sin75° - \sin15°} = \sqrt{3}$

    iii)  if α + β = θ, tanα + tan β = b, cot α+ cot β = a,

        Show that (a − b) = ab cot θ .

# 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 Following types:

    i) Show that, $\sin55° + \cos55° = \sqrt{2}\,\cos10°$

    ii) Prove that, $\cos80° \cos60° \cos40° \cos20° = \dfrac{1}{16}$

# 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 following types.

    i) express cos 5θ in terms of cos θ.

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

**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 $\frac{\alpha}{2}$ and $\frac{\alpha}{3}$

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 | Author | 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 |

# PHYSICS-I (65912)

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## 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 the 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. Understand 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.   Understand 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.   Understand 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.  Show 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.  Understand 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 the angle of repose

4.11. State the merits and demerits of friction.

5. **Understand 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. **Understand 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. Explain the motion of a simple pendulum and determine its time period.

7. **Understand 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. **Understand 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. **Understand Hydrostatics.**

9.1. Define pressure as force per unit area and state that it is measured in N/m2 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. State surface tension and surface energy, Angle of contact.

9.5. Define capillarity and theory of capillarity.

9.6. Explain viscosity and co-efficient of viscosity.

9.7. Mention the necessity of viscosity.

**10. Understand Wave and sound.**

10.1. Define wave and wave motion.
10.2. Differentiate transverse wave and longitudinal wave.
10.3. Define some terms relating waves.
10.4. Compare progressive wave and stationary waves.
10.5. Mention equation of progressive wave.
10.6. Define sound and production of sound.
10.7. Explain 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. Understand 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
11.4. Define Infrasonic sound and Ultrasonic (supersonic) sound.
11.5. Explain how sound is absorbed, reflected & refracted by different types of surface.
11.6. Describe the practical uses of echo sounding devices.
11.7. Define velocity of sound.
11.8. State the velocity of sound at NTP in still air.
11.9. 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 the 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    - Dr. Shahjahan Tapan
2. A Text Book of Properties of matter    - N Subrahmanyam and Brij Lal
3. A Text Book of Sound                    - N Subrahmanyam and Brij Lal
4. Higher Secondary Physics- First Part    - Prof. Golam Hossain Pramanik
5. Higher Secondary Physics- First Part    - Ishak Nurfungnabi

## POWER ENGINEERING FUNDAMENTALS (67111)

| T | P | C |
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**OBJECTIVES:**

To provide the students with an opportunity to develop introductory knowledge of power engineering with special emphasis on:

- Automobiles and automotive shop.
- Steam generator and turbine.
- Fluid and fluid machinery.
- Refrigeration and air Conditioning Equipments.
- Power plants unit.
- Automation of Vehicles
- Shop safety

**SHORT DESCRIPTIONS:**

Automobile and its development, Automobile shop. Automobile Construction, Automotive Engines, Hydraulic and Pneumatic machinery, Steam generators. Fluid Machinery, Refrigerator and Air conditioners, Cold storage, Power plants, and vehicles automation.

**DETAIL DESCRIPTION:**

**1. Understand the concept of an automobile.**
   1.1 State the meaning of an automobile.
   1.2 Describe briefly the history of automobile development.
   1.3 Mention automobile fields and industry in Bangladesh.
   1.4 Mension the Types of automobiles.

**2. Understand the layout of the automobile shop.**
   2.1 Define the layout of automobile shop.
   2.2 Draw a layout of modern automobile shop and identify the different section.
   2.3 List the common tools and equipment used in an automobile shop.

**3. Understand the construction on an automobile.**
   3.1 List the major components of an automobile.
   3.2 Define the body frame, chassis, drive line, transmission, differential and rear axle.
   3.4 State the function of steering system.
   3.5 State functions of the brake and the braking system.
   3.6 State the function of wheels & tyres.

**4. Understand the working principle of an automobile engine.**
   4.1 Define engine.
   4.2 Mention the 2 stroke & 4 stroke Engines.
   4.3 Explain the CI, SI, EFI, and VVTI Engine working principle.

**5. Understand the concept of steam generator and turbine.**
   5.1 Define steam generator, steam engine and steam turbine.
   5.2 Classify boiler, steam engine and turbine.
   5.3 Mention uses of boiler and steam engine.

6. **Understand the concept of fluid and fluid machinery.**
   6.1 Define fluid and fluid Machinery.
   6.2 Define pump and water turbine.
   6.3 Classify pumps and turbine.
   6.4 uses of centrifugal, reciprocating, rotary and turbine pump.

7. **Understand the application of refrigeration and air conditioning equipment.**
   7.1 Define a refrigerator and air conditioner.
   7.2 List of tools and equipment used in refrigerator servicing.
   7.3 Mention the component of refrigeration system.
   7.4 Describe the application of refrigerator and air conditioner.

8. **Understand the concept of power plants.**
   8.1 Define power plant .
   8.2 Types of power plants.
   8.3 Describe major power plant with capacity in Bangladesh.

9. **Understand the concept of hydraulic and pneumatic machinery.**
   9.1 Define hydraulic and pneumatic machinery.
   9.2 List of pneumatic machineries and its use.
   9.3 List of hydraulic machineries and its use .
   9.4 Distinguish between hydraulic and pneumatic machineries .

10. **Understand the concept of automation of vehicle .**
    10.1 Define of vehicle automation .
    10.2 List of vehicle automation level .
    10.3 Mention the use of sensor in vehicle automation .
    10.4 Function of GPRS network used in vehicle automation .

11. **Understand the concept of Shop management and safety.**
    11. 1 Define shop safety.
    11.2 State types of safety.
    11.3  Explain the necessity of safety.
    11.4 List the shop safety materials and equipment.

## PRACTICAL:

1.  Identify the general tools, equipment, instruments and machineries used in the automobile shop.
2.  Identify stationery and moving parts of an automobile engine.
4.  Demonstrate cylinder head, cylinder block, crank shaft, cam shaft, piston, connecting rod etc.
5.  Demonstrate the operation of a 4-stroke petrol engine with the help of a model.
6.  Demonstrate the operation of a 2-stroke petrol engine with the help of a model.
7.  Demonstrate the operation of a 4- stroke diesel engine with the help of a model
8.  Identify major parts of a refrigerators and an air conditioner.
9.  Demonstrate the working cycle of a domestic refrigerator.
10. Draw a layout of steam power plant and its different sections.
11.  Identify components of centrifugal, reciprocating, rotary and turbine pumps.

## REFERENCE BOOKS:
1. Automotive Fundamentals            -F. Nash
2. Vehicle and engine technology  -Heinz Heister
3. Automotive mechanics                  - W H Crouse
4. Hydraulics and Hydraulic machinery      - R. S. Khurmi
5. Heat Engine                          - K.p Roy
6. Automobile Engineering              - Dr. Kripal Singh
7. Thermal Engineering          -  R. S. Khurmi
8. Thermal Engineering          - P.L Ballaney
9. Pumps and compressors                  - Audals