BANGLADESH TECHNICAL EDUCATION BOARD

Agargaon, Dhaka-1207.

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

TELECOMMUNICATION TECHNOLOGY
TECHNOLOGY CODE: 694

FIRST SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

Telecommunication 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	65811	Social Science	3	0	3	60	90	0	0	150
2	65812	Physical Education & Life Skill Development	0	3	1	0	0	25	25	50
3	65911	Mathematics-I	3	3	4	60	90	50	0	200
4	65913	Chemistry	3	3	4	60	90	25	25	200
5	66712	Electrical Engineering Fundamentals	3	3	4	60	90	25	25	200
6	69411	Telecommunication Basics	3	3	4	60	90	25	25	200
		Total	15	15	20	300	450	150	100	1000

SOCIAL SCIENCE (65811)

	T	P	C
	3	0	3

OBJECTIVES:

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 team.

DETAIL DESCRIPTION:

1. **Understand the meaning and scope of civics and interrelations of social science.**
    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 Define 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 constitution.
    4.2 Explain the deferent forms of constitution.
    4.3 Explain the salient feature of Bangladesh constitution.

4.4 Define the fundamental rights of Bangladesh constitution.

4.5 Describe the 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.

5.4 Discuss the role of Bangladesh in 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.

7. Understand the fundamental concepts of economics.

7.1 Define Microeconomics and Macroeconomics.

7.2 Discuss the definition of economics as given by eminent economists.

7.3 Describe the importance of economics for Technical Student.

7.4 Define commodity, utility, value, wealth, consumption, income, savings, wages, value in use, value in exchange and salary.

7.5 Differentiate between value in use and value in exchange.

7.6 Explain wealth with its characteristics.

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

8.1 Discuss production mode and process

8.2 Explain the nature of different factors of production.

8.3 Discuss production function.

8.4 Discuss the law of diminishing returns.

8.5 State the application and limitations of the law of diminishing returns.

8.6 Describe the law of production (increasing constant and diminishing).

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

9.1 Define the term, "demand and supply".

9.2 Explain the law of demand and supply.

9.3 Draw the demand and supply curve.

9.4 Discuss market equilibrium.

9.5 Define the utility, total and marginal utility

9.6 Illustrate the law of diminishing utility.

9.7 Explain the law of diminishing marginal utility.

10. Understand national income.

10.1 Define national income.

10.2 Explain how to measure national income.

10. 3Discuss GNP, GDP and NNP.

10.4 Discuss economic development and growth.

11. 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.

12. Understand 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 and 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.

Bangladesh: History & Culture

১৩. ইতিহাস

১৩.১ ইতিহাসের সংজ্ঞা।

১৩.২ বাংলাদেশের আবহাওয়া ও অধিবাসী।

১৩.৩ বাংলায় ইংরেজ শাসন ক্ষমতালাভ ও প্রতিষ্ঠা।

১৩.৪ ব্রিটিশ বিরোধী সশস্ত্র প্রতিরোধ আন্দোলন; সংস্কার আন্দোলন ও জাতীয়তাবাদের বিকাশ এবং বাংলার নবজাগরণ; বঙ্গভঙ্গ ও বঙ্গভঙ্গ উত্তরকালে বাংলার রাজনীতি ও দেশ বিভাগ।

১৩.৫. পাকিস্তান আমলে বাংলাদেশ, বঙ্গবন্ধুর নেতৃত্বে বাংলাদেশের মুক্তি সংগ্রাম ও স্বাধীনতালাভ।

১৪. সংস্কৃতি

১৪.১ সংস্কৃতি।

১৪.২ সভ্যতার সংজ্ঞা।

১৪.৩ সংস্কৃতির প্রকরণ।

১৪.৪ ভাষা আন্দোলন উত্তর বাংলার সংস্কৃতি।

১৪.৫ স্বাধীনতা উত্তর বাংলাদেশের সংস্কৃতির বিবর্তন।

১৪.৬ বাংলাদেশের সংস্কৃতিতে প্রত্নতাত্ত্বিক নিদর্শন ও ক্ষুদ্র নৃতাত্ত্বিক গোষ্ঠীসমূহ।

সহায়ক পুস্তক

১.হক, মোজাম্মেল "পৌরনীতি"– হাসান বুক হাউস।

২. প্রফেসর এমাজউদ্দিন "রাষ্ট্রবিজ্ঞান" আজিজিয়া লাইব্রেরী।

৩. আলী, মাসুম "অর্থনীতি"।

৪.চক্রবর্তী, মনতোষ– "প্রিন্সিপলস অব ইকোনোমিক্স"।

৫. মার্শাল, আলফ্রেড–" প্রিন্সিপলস অব ইকোনোমিক্স"।

৬. রহমান, আনিসুর –"অর্থনীতি"।

৭.রহিম, চৌধুরী, মাহমুদ ও ইসলাম, "বাংলাদেশের ইতিহাস(পরিবর্ধিত ও পরিমার্জিত)"; নওরোজ কিতাবিস্তান, ১৯৯৯।

৮. কে, আলী"বাংলাদেশের ইতিহাস"; আজিজিয়া বুক ডিপো, ২০০১।

৯. সিরাজুল ইসলাম, "বাংলাদেশের ইতিহাস-১৭০৪-১৯৭১"; ১ম, ২য় ও ৩য় খন্ড; বাংলাদেশ এশিয়াটিক সোসাইটি, ২০০০।

১০. কো-আস্তোনভা, প্রি, কতোভন্কি, "ভারত বর্ষের ইতিহাস"; প্রগতি প্রকাশন, ১৯৮৮।

১১. গোপাল হালদার; "সংস্কৃতির রূপান্তর"; মুক্তধারা, ১৯৮৪।

১২. মোতাহের হোসেন চৌধুরী, "সংস্কৃতি কথা"; নওরোজ কিতাবিস্তান, ১৯৯৮।

১৩. গোপাল হালদার, "বাংলা সাহিত্যের রূপরেখা-১ম ও ২য় খন্ড"; মুক্তধারা।

PHYSICAL EDUCATION & LIFE SKILL DEVELOPMENT (65812)

T	P	C
0	3	1

OBJECTIVES:

- To enhance body fitness.
- To make aware of First aid procedure.
- To acquaint with the common games and sports.
- To develop Life Skill.

SHORT DESCRIPTION

Warm up; Yoga; Muscle developing with equipment; Meditation, First aid; Sports science, Games & sports; Life skill development.

DETAIL DESCRIPTION

1. Recite national anthem and make assembly

    1.1 line and file.

    1.2 Make assembly.

    1.3 Recitation of national anthem.

    1.4 National anthem in music.

2. Conduct warm up.

    2.1 Conduct general warm up :

        Spot running (Slow, Medium & Fast), Neck rotation, Hand rotation, Side twisting, Toe touching, Hip rotation, Ankle twisting, Sit up and Upper body bending (Front & Back).

    2.2 Conduct squad drill :

        Line, File, Attention, Stand at ease, Stand easy, Left turn, Right turn, About turn, Mark time, Quick march, Right wheel, Left wheel, Open order march & Closed order march.

    2.3 Conduct specific warm up :

        Legs raising one by one, Leg raising in slanting position, Knee bending and nose touching, Heels raising, Toes touching (standing and laying position), Hand stretch breathing (Tadasana, Horizontal, Vertical).

    2.4 Conduct mass physical exercise

        Hand raising, Side twisting, Front & back bending, Front curl, Straight arm curl two hand, Hands raising overhead and Push up.

3. Conduct YOGA.

    3.1 Dhyanasan : Shabasan, Padmasan, Gomukhasan, Sharbangasan, Shashangasan, Shirshasan

    3.2 Shasthyasan : Halasan, Matshasan, Paban Muktasan, Ustrasan.

    3.3 Prana and Pranayama: Nadisuddhi Pranayma, cooling pranayamas (sitali pranayama, Sitkari Pranayama, Sadanta pranayama), Ujjayi pranayama,

4. Exercise Muscle developing with equipment.

    4.1 Practice Damball: Front curl, Hand sidewise stretching, Arms raising overhead.

    4.2 Practice Barball: Front press, Leg press, rowing motion with leverage bar.

    4.3 Practice Rope climbing: Straight way climbing, Leg raising climbing.

    4.4 Practice Horizontal bar: Chinning the bar with front grip, chinning the bar with wide back grip.

    4.5 Practice Jogging Machine: Slow, Medium, and Fast running.

    4.6 Practice A. B king pro (Rowing Machine): Sit up.

    4.7 Practice Sit up bench: Sit up.

5. **Conduct Meditation.**
   5.1 Define meditation.
   5.2 Classification of Meditation.
   5.3 Nadanusandhana (A-Kara chanting, U-Kara chanting, M-Kara chanting, AUM-kara chanting.
   5.4 OM-Meditation.
   5.5 Cyclic Meditation (Starting Prayer, Instant Relaxation Technique, Centering, Standing Asanas, Sitting Asanas, Quick Relaxation Technique).

6. **Demonstrate First Aid Skill.**
   6.1 Define First aid.
   6.2 Know First aider.
   6.3 Discuss the responsibilities of a First aider.
   6.4 Identify different types of equipment of First aid.
   6.5 Practice Muscle Cramp-Ice applications (Remedy).
   6.7 Practice dislocation-Ice application (Remedy).

7. **Exercise Rules and technique of following games and sports.**
   7.1 Kabadi.
   7.2 Football.
   7.3 Cricket.
   7.4 Badminton.
   7.5 Athletics.
   7.6 Swimming.

8. **Sports Science.**
   8.1 Define exercise physiology.
   8.2 State the function of muscles.
   8.3 Know the concept of work, energy and power.
   8.4 Express the effect of exercise on heart and circulatory system.
   8.5 Show the motor components for physical fitness.
   8.6 Define sports biomechanics.
   8.7 Define sports psychology.
   8.8 State the meaning of nutrition, diet and balanced diet.
   8.9 State the meaning of the terms –test, measurement and evaluation.

9. **Show skill on conversation on day to day life of the following:**
   9.1 Today's market price.
   9.2 Festivals (religious festivals, National festivals).
   9.3 Celebration of National days.
   9.4 Aim in life.
   9.5 Visite to historical places/sites.

10. **Understand human relation.**
   10.1 Define family relation.
   10.2 Know the relation with neighbor.
   10.3 Identify humanitarian service.
   10.4 Explain service for handicapped (intelligent, physical, social etc).
   10.5 Explain service for orphan/patient.

11. **Experience vote of appreciation.**
   11.1 About dress.
   11.2 For good work.
   11.3 For good result.

11.4 For good news.

12. Practice stress management.
12.1 Grow habit to be a man of humor.
12.2 Always keep brain cool.
12.3 Run with positive thinking.
12.4 Explain factors that determine our attitude.
12.5 State the benefits of a positive attitude.
12.6 Follow steps to building a positive attitude.

13. Practice time management.
13.1 Determine essential time for a task.
13.2 Determine delay and unexpected time.
13.3 Determine time for daily activities.
13.4 Plan for daily activities.

14. Play roll to conduct interview technique on:
14.1 Mental preparation to face an interview.
14.2 Selection of dress for interview.
14.3 Introducing himself/herself to the interviewer.
14.4 Coping interview.

15. Practice team work on:
15.1 Organize a team.
15.2 Select a team leader.
15.3 Distribute the task to the members.
15.4 Accept opinion of team members.
15.5 Complet the task as a team.

16. Practice social work.
16.1 Exercise tree plantation.
16.2 Exercise community service.
16.3 Rover Scout.
16.4 Sanitation.
16.5 Pure drinking water.
16.6 Social Culture.

REFERENCE BOOK:
Modern Yoga   _ Kany Lal Shah
Rules of games and sports _ Kazi Abdul Alim
Yoga   _ Sobita Mallick
Iron Man   _ Nilmoni Dass

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

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

10.3 Deduce formula for tan (A ± 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 $\alpha + \beta = \theta$, $\tan\alpha + \tan \beta = b$, $\cot \alpha + \cot \beta = a$,

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 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) = $\dfrac{3 \sin 2\alpha}{1 + 3 \cos 2\alpha}$

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	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

CHEMISTRY (65913)

T	P	C
3	3	4

OBJECTIVES:

1. To understand mole concept and volumetric analysis.
2. To represent the formation of bonds in molecules.
3. Able to select appropriate materials used in construction.
4. Apply knowledge to enhance operative life span of engineering material and structure by various protective methods.

SHORT DESCRIPTION:

Chemistry is a basic science subject which is essential to all engineering courses. It gives knowledge of engineering material, their properties related application and selection of material for engineering application. It is intended to teach student the quality of water and its treatment as per the requirement and selection of various construction materials and their protection by metallic and organic coatings. The topics covered will provide sufficient fundamental as well as background knowledge for the particular branch.

DETAIL DESCRIPTION:

1. Understand Atomic Structure and Chemical Bond.

1.1 Define element, atoms, molecules, Fundamental particle of atom, their mass, charge, location.
1.2 Define atomic number, mass number, Isotope, Isotone and Isobar.
1.3 Explain electronic configuration based on Hunds Rule, Aufbau's principle, Paulis exclusion principle.
1.4 Define atomic weight, equivalent weight of an element, molecular weight, mole in terms of number, mass, volume.
1.5 Define symbol, valency and formula.
1.6 Explain Chemical bond, octet rule.
1.7 Explain Formation of various types of chemical bonds: Covalent, Ionic, Co-ordinate bond.
1.8 Explain the bonding along with example CH_4, H_2, O_2, NaCl, $MgCl_2$.
1.9 Explain Quantum number, Orbit and Orbital.

2. Understand Ionic Equilibrium.

2.1 Explain the concept of acid, base, salt and types of salts.
2.2 Define pH, pOH, pH scale.
2.3 Distinguish between basicity of an acid and acidity of a base.
2.4 State normality, molarity, molality, volumetric analysis.
2.5 Explain Titration and Indicator.
2.6 Describe buffer solution and its mechanism.

3. Understand chemical reaction, oxidation and reduction.

3.1 Define Chemical reaction and explain the various types of chemical reaction.
3.2 Explain the full meaning of a chemical equation.
3.3 State the concept of catalyst.
3.4 Explain the modern concept of oxidation and reduction.
3.5 Describe the simultaneous process of oxidation and reduction.
3.6 Explain the oxidation number.

4. Understand Water Treatment.

4.1 State the concept of hard and soft water.
4.2 Define hardness of water.
4.3 Describe the softening method of permuted process and ion exchange resin process.

4.4 Mention the advantages and disadvantages of hard water in different industries.

4.5 Visit a water treatment plant write a report.

5. Understand Corrosion and Alloy.

5.1 Mention the types of corrosion(dry and wet corrosion).

5.2 Describe atmospheric corrosion, types of atmospheric corrosion and their mechanism, oxide films factors affecting atmospheric corrosion.

5.3 Explain electrochemical corrosion, mechanism of electrochemical corrosion, types of electrochemical corrosion. factors affecting electrochemical corrosion.

5.4. Explain protective measures against corrosion: Coating (Galvanic and Zinc, Organic coating agents, Electroplating, metal cladding)

5.5 Explain the concept of alloy.

6. Understand the Concept of Organic Chemistry and Introduction to polymers.

6.1 Mention types of Chemistry.

6.2 Mention the catenation property of carbon.

6.3 State organic compounds, its properties and applications.

6.4 Explain the classification of organic compound by structure and functional group: Define Homologous series, Alkanes, Alkenes and Alkynes; properties and uses of general formula; Names and structure of first five members hydrocarbons.

6.5 Explain polymer, monomer, classification of polymers, polymerization, addition and condensation polymerization.

6.6 Define plastics and explain its types and uses.

7. Understand Glass and Ceramic.

7.1 Define glass and its constituents; classify glasses, give elementary idea of manufacturing process of glass.

7.2 Give introduction to ceramic materials and its constituent.

7.3 Describe industrial application of glass and ceramic.

7.4 Visit industry and write a report.

8. Understand Soap and Detergent.

8.1 Give introduction to Lipid, Fats and oils.

8.2 Explain saponification of fats and oils, manufacturing of soap.

8.3 Describe synthetic detergent, types of detergents and its manufacturing.

8.4 State exclusives: TNT, RDX, Dynamite.

8.5 Define paint and varnish.

8.6 Describe adhesives.

9. Cement, pulp and papers.

9.1 Classify cement and mention its uses and manufacturing process.

9.2 Describe manufacturing process of pulp and papers.

9.3 Conduct industry visit and reporting.

PRACTICAL:

1. Practice the use of laboratory tools and safety measures.

2. Conduct observation and measurement.

2.1 Determine the strength of HCl solution using 0.1N Na_2CO_3

2.2 Determine the strength of NaOH by using 0.1N HCl solution.

3. Perform qualitative analysis of known and unknown salts.

3.1 Identify known salt (sample Copper, Iron, Aluminum, led, Ammonium and Zinc salt.)
3.2 Identify unknown basic radical (e.g. led, Copper, Iron, Zinc, Aluminum, Ammonium)
3.3 Identify unknown acid radicals (e.g. Chloride, Nitrate, Sulphate, Carbonate)

REFERENCE BOOKS:

1. Higher secondary Chemistry (paper 1st and 2nd)   -Dr.Gazi Md.Ahsanul Karim. And Md.Robiul Islam
2. Higher secondary Chemistry (Paper 1st and 2nd)   -Dr.Soroz kanti Singha Hazari .
3. An Introduction to Metallic corrosion and its prevention - Raj Narayan.
4. Organic Chemistry   - Morrisson and Boyad.
5. Inorganic Chemistry   - Ali Haider

ELECTRICAL ENGINEERING FUNDAMENTALS (66712)

T	P	C
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OBJECTIVES:

• To familiarize the basic electrical quantities & laws and to apply them in solving problems of electrical circuits.
• To acquaint with electromagnetism, electromagnetic induction.
• To develop skill in electrical wiring.
• To familiarize with DC generator, AC generator, AC motor, DC Motor & Transformers.
• To appreciate the safety measures to be taken for electrical wiring.

SHORT DESCRIPTION:

Electric current, Voltage & Resistance; Conductors and insulators; Ohm's law; Kirchhoff's Law; Joule's law; Faraday's law; Basic electrical circuits; Power and energy; Electromagnetic induction; House wiring; Controlling devices; Protective devices; Earthling; DC Motor, AC Motor, DC Generator; AC Generator; Transformer & Electricity Act/Rule.

DETAIL DESCRIPTION:

Theory:

1. Understand electricity and its nature.
1.1 State the meaning of electricity.
1.2 Describe the structure of atom.
1.3 Define current, voltage and resistance.
1.4 State the units of current, voltage and resistance.

2. Understand conductor semiconductor & insulator.
2.1 Define conductor, semiconductor and insulator.
2.2 Explain the conductor, semiconductor and insulator according to electron theory.
2.3 List at least 5 conductors, 5 semiconductor and 5 insulators.
2.4 Describe the factors upon which the resistance of a conductor depends.
2.5 State laws of resistance.
2.6 Prove the relation $R=\rho L/A$
2.7 Explain the meaning of resistivity and name the unit of resistivity.
2.8 Solve problems relating to laws of resistance.

3. Understand Ohm's Law.
3.1 State Ohm's law.
3.2 Deduce the relation between energy current, voltage and resistance.
3.3 Solve problems relating to Ohm's law.

4. Understand Kirchhoff's Law.
4.1 State Kirchhoff's current law.
4.2 Explain the Kirchhoff's current law.
4.3 Sate Kirchhoff's Voltage law.
4.4 Explain the Kirchhoff's Voltage law.
4.5 Solve problem by Kirchhoff's Law

5. Understand electric circuit.
5.1 Define electric circuit.
5.2 Name the different types of electric circuits.
5.3 Define series circuit, parallel circuit and mixed circuit.
5.4 Describe the characteristics of series circuit and parallel circuit.
5.5 Calculate the equivalent resistance of series circuit, parallel circuit.

5.6 Solve problems relating to DC series circuit, parallel circuit and mixed circuit.

5.7 Define inductor, capacitor, inductive reactance & capacitive reactance.

5.8 Write the formula of inductive reactance, capacitive reactance & impedance.

5.9 Draw the AC circuit containing Resistor, Inductor and Capacitor in Series and parallel circuit.

5.10 Problem on AC series & parallel circuit.

6. Apply the concept of electrical power and energy.

6.1 Define electrical power and energy.

6.2 State the unit of electrical power and energy.

6.3 Show the relation between electrical power and energy.

6.4 Name the instruments for measuring electrical power and energy.

6.5 Draw the connection diagram of wattmeter and energy meter in an electrical circuit.

6.6 Solve problems relating to electrical power and energy calculation.

7. Understand the principles of Joule's law.

7.1 Explain Joule's law regarding the development of heat in electrical circuit.

7.2 Describe meaning of "J".

7.3 Solve problems relating to Joule's law.

8. Understand the Faraday's laws of Electromagnetic Inductions

8.1 Define Electromagnetic Inductions.

8.2 Explain Faraday's laws of Electromagnetic Induction.

8.3 Solve problems on Electromagnetic Induction.

9. Understand the uses of wires and cables.

9.1 Define electrical wires and cables.

9.2 Distinguish between wires and cables.

9.3 Describe the procedure of measuring the size of wires and cables by wire gauge.

10. Understand the different methods of house wiring.

10.1 State the meaning of wiring.

10.2 List the types of wiring.

10.3 State the types of wiring used in:

a) Residential building.

b) Workshop

c) Cinema hall/Auditorium

d) Temporary shed

10.4 List the name of fittings used in different types of electrical wiring.

11. Understand the controlling and protective devices & use of those.

11.1 Define controlling device.

11.2 Name the different types of controlling device.

11.3 Define protective device.

11.4 Name the different types of protective device.

11.5 Name the different types of fuses used in house wiring.

11.6 Name the different types of circuit breaker used in house wiring.

12. Understand the necessity of earthing.

12.1 Define earthing.

12.2 Explain necessity of earthing.

12.3 Name different types of earthing.

13. Understand the principle of operation of transformer.

13.1 Define transformer.

13.2 Explain the working principle of transformer.

13.3 Write the equation relating to voltage, current & turns of primary & secondary winding of transformer.

13.4 Name the different losses of transformer.

13.5 Define transformation ratio (voltage, current and turns).

13.6 Solve problems on transformation ratio.

14. Understand the principle of DC generator.

14.1 Define DC generator.

14.2 Classify DC generator.

14.3 Explain the constructional features of DC generator.

14.4 Explain the working principle of DC generator.

14.5 Name the different losses of DC generator.

15. Understand the principle of AC generator.

15.1 Define AC generator.

15.2 Explain the constructional features of AC generator.

15.3 Explain the working principle of AC generator.

15.4 Name the different losses of AC generator.

16. Understand the principle of DC motor.

16.1 Define DC motor.

16.2 Classify DC motor.

16.3 Name the different parts of DC motor.

16.4 Explain the working principle of DC motor.

16.5 Name the different losses of DC motor.

16.6 List the uses of different types of DC motor.

17. Understand the principle of Induction motor.

17.1 Define Induction motor.

17.2 Classify Induction motor.

17.3 Describe the principles of operation of capacitor motor.

17.4 List the uses of induction motor.

18. Understand act/rule of Bangladesh and safety practices.

18.1 Sate electricity act/rule of Bangladesh to be followed in electrical wiring.

18.2 Describe the importance of electricity act/rule.

18.3 Describe safety procedure against electricity hazard.

18.4 List the performance of safety practices for electrical equipment, machines and accessories.

PRACTICAL:

1. Identify and use electrical measuring instruments.

1.1 Identify voltmeters, ammeters, clip-on meter, frequency meter, wattmeter, energy meter and AVO meter.

1.2 Select & read the scale of given meters.

1.3 Connect correctly voltmeter, ammeter, wattmeter and energy meter to a given circuit.

2. Show skill in verification of Ohm's Law.

2.1 Sketch the circuit diagram for the verification of Ohm's Law.

2.2 List tools, equipment and materials required for the experiment.

2.3 Prepare the circuit according to the circuit diagram using proper equipment.

2.4 Check all connections before the circuit is energized.

2.5 Verify the law by collecting relevant data.

3. Show skill in verification of Kirchhoff's Law.

    3.1 Sketch the circuit diagram for the verification of Kirchhoff's Law.

    3.2 List tools, equipment and materials required for the experiment.

    3.3 Prepare the circuit according to the circuit diagram using proper equipment.

    3.4 Check all connections before the circuit is energized.

    3.5 Verify the laws by collecting relevant data.

4. Verify the characteristics of series and parallel circuits.

    4.1 Draw the working circuit diagram.

    4.2 List tools, equipment and materials required for the experiment.

    4.3 Prepare the circuit according to the circuit diagram using proper equipment.

    4.4 Check all connections before the circuit is energized.

    4.5 Record data and verify that in a series circuit total voltage and resistance is equal to the summation of individual voltage and resistance respectively but total current is equal to the individual current.

    4.6 Record data and verify that for a parallel circuit supply voltage is equal to the branch voltage, supply current is equal to summation of branch currents.

5. Show skill in measuring the power of an electric circuit.

    5.1 Sketch the necessary circuit diagram of an electrical circuit with electrical load, ammeter, voltmeter and wattmeter.

    5.2 Prepare the circuit according to the circuit diagram using ammeter, voltmeter and wattmeter.

    5.3 Record the power, measured by the wattmeter and verify the reading with that of calculated from ammeter and voltmeter.

    5.4 Compare the measured data with that of calculated and rated power.

6. Show skill in measuring the energy consumed in an electrical circuit.

    6.1 Sketch the necessary diagram of an electric circuit wattmeter, energy meter and electrical load.

    6.2 Prepare the circuit according to the circuit diagram using wattmeter and energy meter.

    6.3 Record the energy measured by the energy meter and verify with that of calculated from wattmeter for a fixed time.

7. Show skill in using of hand tools, wires and cables.

    7.1 List the hand tools used in electrical wiring.

    7.2 Identify the hand tools used in electrical wiring.

    7.3 Draw neat sketches of hand tools used in electrical wiring.

    7.4 Identify different types of wires and cables.

    7.5 Measure the diameter of the identified wire and cables using standard wire gauge.

8. Show skill in preparing wiring circuit of two lamps controlled from two points separately.

    8.1 Sketch a working circuit of two lamps controlled from two points separately.

    8.2 Make the wiring circuit using required materials and equipment on a wiring board.

    8.3 Test the connection of circuit by providing proper supply.

9. Show skill in preparing wiring circuit of one lamp controlled from two points.

    9.1 Sketch a working diagram of one lamp controlled by two SPD tumbler Switches.

    9.2 Complete the wiring circuit using required materials and equipment on wiring board.

    9.3 Test the connection of circuit by providing proper supply.

10. Show skill in preparing wiring circuit of one bell with two indicating lamp controlled from two points.

    10.1 Sketch a working diagram of one bell with two indicating lamps controlled by two push button switch.

    13.2 Make the wiring circuit using required materials and equipment on wiring board.

    13.3 Test the connection of circuit by providing proper supply.

11. Show skill in preparing wiring circuit of a fluorescent tube light.

11.1 Sketch a working diagram of a fluorescent tube light circuit.

11.2 Make the connection of a fluorescent tube light circuit using required materials and equipment.

11.3 Test the connection of the circuit by providing supply.

12. Find the transformation ratio of a transformer.

12.1 Develop a circuit to perform the experiment.

12.2 Select required equipment and materials.

12.3 Connect the components according to the circuit diagram.

12.4 Check the connections.

12.5 Record the primary (EP) and secondary (ES) voltages.

12.6 Calculate the transformation ratio using the relation

$$\frac{E_S}{E_P} = \frac{N_S}{N_P} = K$$

12.7 Note down the observations.

13. Disassemble and re-assemble the parts of a DC generator/ DC motor.

13.1 Select the necessary tools required for disassembling and re-assembling the parts of DC generator/ DC motor.

13.2 Identify at least ten main parts of the generator/motor.

13.3 Sketch at least ten main parts of the generator/motor.

13.4 Re-assemble the parts of the generator/motor.

13.5 Connect the generator/motor to the proper power source.

13.6 Start the generator/motor.

14. Start a 1-phase capacitor type motor/ceiling fan with regulator.

14.1 Select the equipment and tools required for the experiment.

14.2 Sketch a working diagram.

14.3 Identify the two sets of coils.

14.4 Connect the capacitor with the proper set of coil.

14.5 Connect power supply to the fan motor.

14.6 Test the rotation of the motor in opposite direction by changing the capacitor connection.

14.7 Note down the observations.

REFERENCE BOOKS:

1 A Text Book of Electrical Technology - B. L. Theraja
2 Basic Electricity   - Charles W Ryan
3 Basic Electrical Theory and Practice   - E. B. Babler
4 Electrical Machine   - Siskind

TELECOMMUNICATION BASICS (69411)

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SHORT DESCRIPTION:

Telecommunication and its background; Terms of Communication; Signals and Systems; Communication Frequency and Spectra; Modulation and Demodulation; Multiplexing/ De-multiplexing; Multiple Access Techniques; Radio transmitter; Radio receiver; Network; Internet.

DETAIL DESCRIPTION:

1. **Understand the communication Basics.**

    1.1 Define communication and telecommunication.

    1.2 List the kinds of communication: Verbal, Non-verbal & Machine communication.

    1.3 Purpose of communication: Information, persuasion, entertainment, education, control.

    1.4 Concept of communication system: Information, transmission, channel, reception.

    1.5 Describe the basic communication system with block diagram.

    1.6 Explain modern communication System.

    1.7 Mention the types of communication i.e. Satellite Communication, Optical fiber Communication, RADAR Communication, Microwave Communication, Terrestrial radio network, Cellular Communication etc.

2. **Understand the features of Communication Signals and Systems.**

    2.1 Define Signals and Classification of Signals.

    2.2 Describe the Basic Continuous-Time Signals.

    2.3 Describe the Basic Discrete-Time Signals.

    2.4 Comparison between Continuous-Time Signals & Discrete-Time Signals.

    2.5 Define Systems and Classification of Systems.

    2.6 Describe the data transmission modes.

    2.7 Describe the application of data communication.

    2.8 Mention the advantage of communication system.

    2.9 Explain the nature of audio, video, composite and data signal.

3. **Understand the features of Communication Frequency and Spectra.**

    3.1 Define frequency and spectrum.

    3.2 Mention the allocation of frequency bands for various communication systems.

    3.3 Mention the frequency ranges of audio video and data signal.

    3.4 Explain the channel bandwidth & channel capacity.

    3.5 Describe the factors affecting channel capacity & bandwidth.

    3.6 Solve the problem on channel capacity & bandwidth.

4. **Understand the features of Modulation and Demodulation.**

    4.1 Define modulation and demodulation.

    4.2 Mention the importance of modulation.

    4.3 Explain the wave form of amplitude modulation, frequency modulation.

    4.4 Mention the concept of SSB, SSB-SC, DSB, DSB-SC, VSB modulation.

    4.5 Mention the meaning of the terms modulation index, maximum frequency deviation and deviation Ratio of FM wave.

    4.6 Describe the comparison of AM with FM based on BW requirement, noise & fidelity.

    4.7 Describe the applications of amplitude modulation and frequency modulation.

    4.8 Describe the methods of detection of AM & FM wave.

5. **Understand the Multiplexing/De-multiplexing Techniques.**

5.1 Define multiplexing and de-multiplexing process.

5.2 Mention the importance of multiplexing & de-multiplexing.

5.3 Mention types of multiplexing.

5.4 Describe the frequency division multiplexing (FDM).

5.5 Describe the time division multiplexing (TDM).

5.6 Mention the comparison of FDM & TDM.

5.7 Describe the applications of multiplexing.

6. Understand the Multiple Access Techniques

6.1 Define Multiple Access

6.2 Describe Frequency Division Multiple Access (FDMA)

6.3 Describe Time Division Multiple Access (TDMA)

6.4 Describe Code Division Multiple Access (CDMA)

6.5 Describe Space Division Multiple Access (SDMA)

6.6 Describe Carrier Sense Multiple Access (CSMA)

6.7 Discus the applications of different types of Multiple Access techniques.

7. Understand the features of radio transmitter.

7.1 Define transmitter & radio transmitter.

7.2 Mention the classification of radio transmitters in terms of power, frequency, modulation and service involved.

7.3 Explain the block diagram of AM transmitter.

7.4 Explain the block diagram of FM transmitter.

7.5 Explain the operation of SSB transmitter with block diagram.

7.6 Explain the block diagram of reactance tube FM transmitter.

8. Understand the features of radio receiver.

8.1 Define receiver and classification.

8.2 Describe the operation of Regenerative (autodyne) receiver.

8.3 Explain the principle of super heterodyne receiver.

8.4 Describe the block diagram of typical communication receiver.

8.5 Describe the block diagram of super heterodyne receiver with AFC (Automatic Frequency Control) system.

8.6 Describe the diode balanced modulator with block diagram.

8.7 Describe the FM receiver with block diagram.

9. Understand the features of network.

9.1 Define network

9.2 State the different types of communication network.

9.3 Mention the various types of public broadcast services.

9.4 Define analog telephone, digital telephone, and telegraph.

9.5 Mention and discuss the types of Ethernet.

9.6 Mention the nature of ARPANET

9.7 Describe the principle of telex network.

10. Understand the Basic internet communication.

10.1 Define internet.

10.2 Mention the necessity of internet in modern life.

10.3 Describe the web browsing.

10.4 Define ISP.

10.5 Mention the list of reputed ISP's in Bangladesh.

10.6 Define e-mail, chat, VOIP, video conference, web based Fax, web based SMS.

10.7 Define Wi-Fi, Sci-Fi & Wi-max.

10.8 Define IP telephony system, GPS (Global Positioning System).

10.9 Mention the Application of GPS.

PRACTICAL:

1. Dismantle and assemble of an analogy telephone set.

2. Dismantle and assemble of a digital telephone set

3. Operate telephone and facsimile

4. Establish a telex network.

5. Practice on web browsing.

6. Practice on e-mail management.

7. Practice on web based Fax and SMS.

8. Practice on video conferencing.

9. Observe and demonstrate the operation of AM Transmitter.

10. Observe and demonstrate the operation of AM Receiver.

REFERENCE BOOKS:

1. J. D. Kraus, *Antennas*, 2nd ed., McGraw-Hill.

2. Hwei P. Hsu, Ph.D., *Theory and Problems of Signals and Systems,* SCHAUM'S OUTLINES

3. Monika Khurana, *Data communication System*, Laxmi publications

4. M.L. Gupta, *Electronics and Radio Engineering,*9th ed., DhanpatRai Pub Company

5. Kennedy, Dauis, *Electronics Communication System,*4th ed., McGraw-Hill.

6. B.P Lathi ,*Communication system*, 3rd ed., Oxford University Press

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