BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207.

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

POWER TECHNOLOGY

TECHNOLOGY CODE: **671**

2nd SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

POWER TECHNOLOGY (671)

2nd SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total
						Theory		Practical		
						Cont. assess	Final exam	Cont. assess	Final exam	
1	67121	Workshop Safety & Management	2	6	4	40	60	50	50	200
2	66711	Basic electricity	3	3	4	60	90	25	25	200
3	65922	Physics -2	3	3	4	60	90	25	25	200
4	65722	Communicative English	1	3	2	20	30	50	0	100
5	65921	Mathematics -2	3	3	4	60	90	50	0	200
6	65812	Physical Education & life skill development	0	3	1	0	0	25	25	50
Total			**12**	**21**	**19**	**240**	**360**	**225**	**125**	**950**

67121 WORKSHOP SAFETY & MANAGEMENT **T P C**
2 6 4

Objectives: To provide the students with an opportunity to develop introductory knowledge of workshop safety & management with special emphasis on:

- Workshop Safety
- Accident
- Workshop Hazard
- Safety awareness and training
- First Aid
- Plant layout for safety
- Safety legislation and management
- Workshop management
- Maintenance of workshops and equipments
- Fire Prevention
- Fire Alarm
- House keeping

Short Description:

Workshop Safety, PPE, IFR, ISR, Accident, Workshop Hazard, measures for preventing industrial hazard, Safety awareness and training, First Aid, First aid materials, Plant layout for safety, Safety legislation and management, General safety rules, Workmen compensation Act 1965, Workshop management, Co-ordination among the top Executive, foreman and skilled workers, Maintenance of workshops and equipments, Fire Prevention, Firefighting equipments, Fire brigade, Fire Alarm, Housekeeping, healthy environment.

Details Description:

1) Understand the feature of Workshop Safety
1.1 Definition of safety
1.2 Objective, function, effects and needs of Workshop Safety
1.3 Discuss Personal Protective Equipment (PPE)
1.4 Discuss General safety precaution (Man, Machine and Materials)
1.5 Define Injury frequency rate (IFR) & Injury severity rate (ISR).
1.6 Describe the comparison of industries on the basis of IFR and ISR

2) Understand the feature of accident at workshop
2.1 Define and mention the types of Accident
2.2 Discuss the causes and effects of different types of accident.
2.3 Describe the cost elements of accident
2.4 Discuss the facts about accident

3) Understand the feature of workshop hazard
3.1 Define workshop hazard
3.2 Discuss the common hazard faced in workshop
3.3 Describe the safety measure for preventive hazard
3.5 Discuss about control of physical, chemical, electrical and fire hazard.
3.5 State the safety measures for preventing industrial hazard

4) Understand the feature of Safety awareness and training
4.1 Define safety awareness and training
4.2 Mention the necessity of safety awareness and training
4.3 State the improvement of safety awareness

5) Understand the feature of first Aid
5.1 Define first aid
5.2 Discuss the necessity of first aid and first aid materials
5.3 Mention first aid materials
5.4 Discuss the maintenance of first aid materials
5.5 Describe various first aid procedure and manual artificial respiration

6) Understand the feature of Plant layout for safety
6.1 Define plant layout

6.2 Objectives of plant layout
6.3 Types of plant layout
6.4 Discuss Plant layout procedure

7) Understand the feature of Safety legislation and management

7.1 Discuss Safety legislation: Acts and Rules
7.2 Define safety management
7.3 Discuss general safety rules
7.4 State safety measures under factory Act

8) Understand the feature of Workshop Management

8.1 Define workshop management
8.2 Objectives, functions and benefits of workshop management
8.3 Describe the function of foreman as a workshop manager
8.4 Describe role of a Sub-Assistant Engineer in workshop

9) Understand the feature of Maintenance of workshops and equipments

9.1 Define and mention the types of maintenance
9.2 Discuss the purpose of maintenance management
9.3 Discuss maintenance organization and schedule
9.4 Explain maintenance of raw materials in the stores.

10) Understand the feature of Fire Prevention

10.1 Describe the importance of fire prevention
10.2 State types and causes of fire
10.3 Discuss the firefighting equipment and the types
10.4 Explain factory fire service rules and National Fire Protection Association (NFPA) code
10.5 Describe maintenance of firefighting equipment

11) Understand the feature of Fire Alarm

11.1 Define, function and importance of fire alarm
11.2 State types and causes of fire alarm
11.3 Describe fire alarm system installation
11.4 Discuss inspection and maintenance of fire alarm system

12) Understand the feature of Housekeeping

12.1 Define house keeping
12.2 State benefits of house keeping
12.3 Describe benefits of healthy environment in the workshop
12.6 Mention housekeeping check list in workshop

Practical:

1. Identify and list Personal Protective Equipment (PPE).
2. Identify and list safety procedures and practices in modern workshop.
3. Prepare a safety audit report.
4. Prepare general safety precaution rules.
5. Demonstrate and practice safety precaution during car lift, hydraulic press and Boiler operation.
6. Prepare and practice recording and reporting chart of an accident.
7. Check hazard areas in your workshop.
8. Practice the safety measures for preventing hazard in the industry.
9. Demonstrate the use of first aid materials and equipments.
10. Practice various first aid procedure and manual artificial respiration.
11. Practice the use of fire fighting equipments.
12. Demonstrate the operation of fire extinguisher.
13. Setup a fire alarm system in your workshop
14. Rehearse the use of firefighting equipment in a real environment

References:

1. R.K.Jain and Sunil S.Rao , Industrial Safety, Health and Environment Management Systems, Khanna publishers , New Delhi.
2. Slote.L.Handbook of Occupational Safety and Health, John Willey and Sons, NewYork 4. Industrial Safety -National Safety Council of Bangladesh.
3. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai
4. Handbook of Environmental Health and Safety: Herman Koren and Michel Bisesi,
5. Risk Assessment and Environmental Management: D. Kofi Asvite-Dualy, John Willey &

Sons.
6. Fire Technology, R.S. Gupta
7. Fire Equipment, David L. Bever
8. Introduction to Environmental Engineering & Science, Gilbert M. M., Pearson Education, Singapore.
9. Industrial Safety – National Safety Council of India

66711 BASIC ELECTRICITY

T	P	C
3	3	4

OBJECTIVES

- To familiarize the basic electrical quantities & laws and to apply them in solving problems of electrical circuits.
- To acquaint with electro-chemistry, electro-magnetism, electro-magnetic induction and electrostatic.
- To introduce electrical wiring.

SHORT DESCRIPTION

Electric current, voltage, resistance ; ohm's law; Conductors, semiconductors and insulators; Basic electrical circuits; Power and energy; Basic electro-chemistry; Electro-magnetism; Electro-magnetic induction; Electrostatics; Wires and cables; Hand tools used in wiring; House wiring; Controlling devices; Protective devices; Earthing.

DETAIL DESCRIPTION

Theory:

ELECTRIC CURRENT, VOLTAGE & RESISTANCE

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.

CONDUCTOR, SEMICONDUCTOR & INSULATOR

2 Understand conductor, semiconductor **and insulator.**

2.1 Define conductor, semiconductor and insulator.
2.2 Explain the conductor, semiconductor, and insulator according to electron theory .
2.3 List different types of conductors, semiconductors and insulators.
2.4 Describe the factors effecting the resistance of a conductor.
2.5 State laws of resistance.
2.6 Prove the relation $R = \rho \frac{L}{A}$
2.7 Explain the meaning of resistivity and name the unit of resistivity.
2.8 Solve problems relating to laws of resistance.

OHM'S LAW

3 Understand Ohm's Law

3.1 State Ohm's law.
3.2 Explain the limitations of Ohm’s law
3.3 Deduce the relation between current, voltage and resistance.
3.4 Solve problems relating to Ohm's law.

BASIC ELECTRIC CIRCUITS

4 Understand electric circuit.

4.1 Define electric circuit.
4.2 State the elements of electrical circuit

4.3 Classify electric circuits.
4.4 Define series circuit, parallel circuit and mixed circuit.
4.5 Describe the characteristic of series circuit and parallel circuit.
4.6 Calculate the equivalent resistance of series circuit, parallel circuit and mixed circuit.
4.7 Solve problems relating to series, parallel and mixed circuit.

POWER AND ENERGY

5 Apply the concept of electrical power and energy.

5.1 Define electrical power and energy.
5.2 State the unit of electrical power and energy.
5.3 Show the relation between electrical power and energy.
5.4 List the name of instruments for measuring electrical power and energy.
5.5 Draw the connection diagram of wattmeter and energy meter in an electrical circuit.
5.6 Solve problems relating to electrical power and energy .

6 Understand the principles of Joule's law.

6.1 Describe the heating effect of electricity.
6.2 Explain Joule's law regarding the development of heat in electrical circuit.
6.3 Explain Mechanical equivalent of heat (J)
6.4 Solve problems relating to Joule's law.

BASIC ELECTRO-CHEMISTRY

6 Understand the concept of cells.

7.1 Describe the meaning of potential difference.
7.2 Define the meaning of cell.
7.3 Classify cell.
7.4 Define Primary Cell
7.5 List different types of primary Cell
7.6 Describe the construction and principle of action of a simple Voltaic cell.
7.7 List the defects of a simple Voltaic cell.
7.8 Describe the causes of defects of a simple Voltaic cell.
7.9 Describe the methods of removing the defects of a simple Voltaic cell.
7.10 Distinguish between Primary & Secondary Cell

8 Understand the concept of capacitors and inductors.

8.1 Define capacitor and capacitance.
8.2 Name the unit of capacitance.
8.3 Name the different types of capacitor.
8.4 State the uses of capacitor.
8.5 Define inductor and inductance.
8.6 Name the unit of inductance
8.7 Name the different types of inductor.
8.8 State the uses of inductor.
8.9 Determine the equivalent capacitance of a number of capacitors connected in series and parallel.
8.10 Explain energy storage in a capacitor.
8.11 Solve the problems relating to capacitors.

ELECTRO - MAGNETISM

9 Understand Electro - magnetism.

9.1 Describe magnetic field, magnetic lines of force and its properties.
9.2 Describe field intensity and magnetic flux density.
9.3 Distinguish between absolute permeability and relative permeability.
9.4 Describe the concept of magnetic effect of electrical current.
9.5 States Maxwell's cork screw rule.
9.6 Explain the force experienced in a current carrying conductor in a magnetic field.
9.7 State Fleming's left hand rule.
9.8 Explain the work done by a moving conductor in a magnetic field.
9.9 Explain the force between two parallel current carrying conductor.

ELECTRO MAGNETIC INDUCTION

10. Understand electro- magnetic induction.

10.1 Define Faraday's laws of electro-magnetic induction.
10.2 Describe the magnitude of dynamically induced emf and statically induced emf
10.3 Solve problems relating to emf generation.
10.4 Define Lenz's law and Fleming's right hand rule for determining the direction of induced emf and current.
10.5 Define self induced emf and self inductance.
10.6 Explain inductance of a iron cored inductor.
10.7 Define mutual inductance and co-efficient of coupling.

WIRES AND CABLES

11. Understand the uses of wires and cables.

11.1 Define electrical wires and cables.
11.2 Distinguish between wires and cables.
11.3 Describe the construction and uses of PVC, VIR, TRS or CTS and flexible wires
11.4 Describe the procedure of measuring the size of wires and cables by wire gauge.
11.5 Describe the current carrying capacity of a wire.

JOINTS AND SPLICES

12. Understand the usefulness of joints and splices.

12.1 Define the meaning of joints and splices.
12.2 State the five steps of making a joint.
12.3 Describe the procedure to make a pig tail joint, western union joint, Britannia joint, duplex joint, tap joint, simple splice.
12.4 Give example of uses of above mentioned joints.

HOUSE WIRING

13. Understand the different methods of house wiring.

13.1 State the meaning of wiring.
13.2 List the types of wiring.
13.3 State the procedure for Channel wiring, surface conduit wring and concealed wiring.
13.4 State the types of wiring used in :
  a) Residential building.
  b) Workshop
  c) Cinema hall/Auditorium
  d) Temporary shed
13.5 List the name of fittings used in different types of electrical wiring.

CONTROLLING DEVICES

14. Understand the construction and uses of controlling devices.

14.1 Define controlling device.
14.2 Name the different types of controlling devices.
14.3 Describe the constructional features and uses of tumbler switch, iron clad switch, push button switch and gang switch.

PROTECTIVE DEVICES

15. Understand the construction and uses of protective devices.

15.1 Define protective devices.
15.2 Name the different types of protective devices.
15.3 Name the different types of fuses used in house wiring.
15.4 Describe the construction and uses of renewable fuse.
15.5 Name the different types of circuit breaker used in house wiring.
15.6 Describe safety procedure against electrical hazards.
15.7 List the performance of safety practices for electrical equipment, machines and accessories.

EARTHING

16. Understand the necessity of ear thing.

16.1 Define earthing and mention the elements of earthing..
16.2 Explain necessity of earthing
16.3 Name different types of ear thing.
16.4 List the value of earthing resistance in different condition.

WIRING DIAGRAM

17. Apply the principle of controlling electrical circuit by switch.

17.1 Sketch the wiring diagram of one lamp controlled by one SPST switch and describe its uses.
17.2 Sketch the wiring diagram of one lamp controlled by two SPDT switch and describe its uses.
17.3 Draw the wiring diagram of a calling bell.
17.4 Draw the wiring diagram of a calling bell with more than one lamp controlled from more than one point.
17.5 Draw the wiring diagram of a fluorescent tube light circuit.
17.6 Describe the working principle of fluorescent tube light.

Practical:

1. Practice with electrical measuring instruments.

1.1 Identify Voltmeters, Ammeters, Ohm 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. Verify Ohm's Law.

2.1 Sketch the circuit diagram for the verification of Ohm's Law.
2.2 List tools, equipment and material 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. Verify the characteristics of series and parallel circuits.

3.1 Draw the working circuit diagram.
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 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.
3.6 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 and total conductance is equal to the summation of branch conductance.

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

4.1 Sketch the necessary circuit diagram of an electrical circuit w electrical load, ammeter, voltmeter and wattmeter.
4.2 Prepare the circuit according to the circuit diagram using ammeter, voltmeter and wattmeter.
4.3 Record the power, measured by the wattmeter and verify t reading with that of calculated from ammeter and voltmeter.
4.4 Compare the measured data with that of calculated and rat power.

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

5.1 Sketch the necessary diagram of an electric circuit wattmeter, energy meter and electrical load.
5.2 Prepare the circuit according to the circuit diagram user wattmeter and energy meter.
5.3 Record the energy measured by the energy meter and verify with that of calculated from wattmeter for a fixed time..

6. Make artificial magnets.

6.1 Make an artificial magnet by rubbing method (Single touch)
6.2 Make an artificial magnet by divided touch method.
6.3 Make an artificial magnet by passing electrical current.
6.4 Detect the polarity of the produced artificial magnet with the help of a compass needle.

7. Practice with 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 making a duplex joint and a T-joint.
8.1 Sketch a duplex joint and a T-joint
8.2 Perform skinning and scraping of two pieces of PVC duplex cal and two pieces of simplex PVC cables.
8.3 Make the joints according to sketches.
8.4 Write a report.

9. Show skill in preparing wring circuit of two lamps controlled from the points separately.
9.1 Sketch a working circuit of two lamps controlled from two point separately.
9.2 Make the wiring circuit using required materials and equipment a wiring board.
9.3 Test the connection of circuit by providing proper supply.

10. Show skill in preparing wiring circuit of one lamp controlled from the points.
10.1 Sketch a working diagram of one lamp controlled by two SPD tumbler switches.
10.2 Complete the wiring circuit using required materials and equipment on wiring board.
10.3 Test the connection of circuit by providing proper supply.

11. Show skill in preparing wiring circuit of one bell with two indicating lamp controlled from two points.
11.1 Sketch a working diagram of one bell with two indicating lamps controlled by two push button switch.
11.2 Make the wiring circuit using required materials and equipment in wiring board.
11.3 Test the connection of circuit by providing proper supply.

12 Show skill in preparing wiring circuit of a fluorescent tube light.
12.1 Sketch a working diagram of a fluorescent tube light circuit.
12.3 Make the connection of a fluorescent tube light circuit using required materials and equipment.
12.4 Test the connection of the circuit by providing supply.

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. Solved Examples in Electrical Calculation - D. K. Sharma
5. Introduction to Electrical Engineering - V.K. Mehta

65922	PHYSICS-2	T	P	C
		3	3	4

OBJECTIVES

- To develop a foundation in scientific principles and processes for the understanding and application of technology.
- To develop an understanding of fundamental scientific concepts through investigation and experimentation.
- To provide a common base for further studies in technology and science.
- To develop the basic knowledge of modern physics.

SHORT DESCRIPTION

Thermometry and Heat Capacity; Expansion of materials (effect of heat); Heat transfer; Humidity; Nature of heat and Thermodynamics; Photometry; Reflection of light; Refraction of light; Electron , photon and Radio activity; Theory of Relativity.

DETAIL DESCRIPTION

THEORY

1. THERMOMETRY AND HEAT CAPACITY

1.1 Define heat and temperature.
1.2 Mention the units of measurement of heat and temperature.
1.3 Distinguish between heat and temperature.
1.4 Identify the range of the Celsius scale determined by the boiling point and melting point of water
1.5 State the construction and graduation of a mercury thermometer.
1.6 Define specific heat capacity, thermal capacity and water equivalent with their units.
1.7 Prove the total heat gained by an object is equal to the sum of the heat lost by all the surrounding objects.
1.8 Explain the principle of calorimetry.
1.9 Define various kinds of specific latent heat.
1.10 Determine the latent heat of fusion of ice and latent heat of vaporization of water.
1.11 Determine the specific heat of a solid by calorimeter.

2. EFFECT OF HEAT ON DIMENSION OF MATERIALS

2.1 Show that different materials change in size at different amounts with the same heat source.
2.2 Explain the meaning of differential expansion in bimetallic strip, thermostats, compensated pendulum etc.
2.3 Explain the methods of overcoming problems caused by the expansion of materials in buildings, machinery, railway lines and bridges.
2.4 Mention the units co-efficient of linear, superficial and cubical expansion of solids.
2.5 Define the co-efficient of linear, superficial and cubical expansion of solids.
2.6 Relation between the co-efficient of linear, superficial and cubical expansion of solids.

2.7 Define real and apparent expansion of liquid.
2.8 Relation between the real and apparent expansion of liquid.

3. HEAT TRANSFER

3.1 Identify the phenomena of heat transferring from hot bodies to cold bodies.
3.2 Explain the methods of heat transfer by conduction, convection and radiation with examples of each type of transfer.
3.3 Define thermal conductivity (K) and Co-efficient of thermal conductivity.
3.4 Find the unit and dimension of Co-efficient of thermal conductivity.
3.5 List the factors which determine the quantity of heat (Q) flowing through a material.
3.6 Show that the quantity of heat flowing through a material can be found from

$$Q = \frac{KA\,(\theta_H - \theta_C)t}{d}$$

3.7 State Stefan-Boltzman Law and wien's law.
3.8 State Newton's law of cooling.
3.9 Explain Green house effect.

4. HUMIDITY

4.1 Define Standard Temperature and Pressure.
4.2 Define Humidity, Absolute Humidity, Relative Humidity and Dewpoint.
4.3 Relation between vapour pressure and air pressure.
4.4 Determine Humidity by wet and dry bulb hygrometer.
4.5 Explain few phenomena related to hygrometry.

5. NATURE OF HEAT AND THERMODYNAMICS

5.1 Describe the caloric theory and kinetic theory of heat.
5.2 Explain the mechanical equivalent of heat.
5.3 State and Explain the first law of thermodynamics .
5.4 Explain Isothermal and adiabatic change.
5.5 Explain Specific heat of a gas, Molar specific heat or molar heat capacity.
5.6 Relate between pressure and volume of a gas in adiabatic Change i, e;$PV\gamma$=const.
5.7 State and Explain Reversible process and irreversible process.
5.8 State & explain 2^{nd} law of thermodynamics
5.9 Entropy: Definition, unit and significant.
5.10 Explain Change of entropy in a reversible and irreversible process.
5.11 Give an example of increase of entropy in irreversible process.

6. PHOTOMETRY

6.1 Define light, medium (transparent, translucent, opaque), luminous & non-luminous bodies, parallel, convergent & divergent of rays.
6.2 Show the travel of light in straight line.
6.3 Define photometry, luminous intensity, luminous flux, brightness and illuminating power.
6.4 Mention relation between luminous intensity & illuminating power.
6.5 Explain inverse square law of light.
6.6 Describe the practical uses of light waves in engineering.

7. REFLECTION OF LIGHT

7.1 Define mirror (plane & spherical), image (real & virtual) and magnification of images.
7.2 Describe the reflection of light.
7.3 State the laws of reflection of light.
7.4 Express the verification of laws of reflection.
7.5 Define pole, principal axis, center of curvature, radius of curvature, principal focus in case of concave & convex mirrors.
7.6 Find the relation between focal length & radius of curvature of a concave & convex mirror.
7.7 Express the general equation of concave and convex mirror.

8. REFRACTION OF LIGHT

8.1 Define refraction of light Give examples of refraction of light
8.2 State the laws of refraction and Express the verification of laws of refraction
8.3 Define absolute and relative refractive index and Relate absolute and relative refractive index
8.4 Explain the meaning of total internal reflection and critical angle and Relate total internal reflection and critical angle.
8.5 Give examples of total internal reflection.
8.6 Describe refraction of light through a prism.
8.7 Express the deduction of the relation between refractive index, minimum deviation and angle of the prism.
8.8 Define lens and mention the kinds of lens.
8.9 Identify and List uses of lens.
8.10 Express the deduction of the general equation of lens (Concave & convex).

9. ELECTRON, PHOTON AND RADIO-ACTIVITY

9.1 Describe Electrical conductivity of gases.
9.2 Describe Discharge tube.
9.3 Cathode ray : Definition and its properties
9.4 X-ray : Definition, properties & uses
9.5 Discuss Photo electric effect .
9.6 Derive Einstein's photo electric equation
9.7 Define and explain radio-activity.
9.8 Describe radio-active decay law.
9.9 Define half-life and mean-life of radio-active atoms.
9.10 Define nuclear fission and fusion.

10. THEORY OF RELATIVITY

10.1 Define Space, time and Mass.
10.2 Define rest mass.
10.3 Express the theory of relativity.
10.4 Explain special theory of relativity and its fundamental postulate.
10.5 Mention different Kinds of theory of relativity.
10.6 The Relativity of Length - Length contraction.
10.7 The Relativity of Time – Time dilation.
10.8 Deduce Einstein's mass -energy relation

PRACTICAL

1. Compare the operation of common thermometers.
2. Determine the co-efficient of linear expansion of a solid by Pullinger's apparatus.
3. Measure the specific heat capacity of various substances.(Brass, steel).
4. Determine the latent heat of fusion of ice.
5. Determine the water equivalent by calorimeter.
6. Compare the luminous intensity of two different light sources.
7. Verify the laws of reflection.
8. Find out the focal length of a concave mirror.
9. Determine the refractive index of a glass Slab.
10. Determine the angle of Minimum deviation and refractive index of a glass prism by using I-D graph.

REFERENCE BOOKS:

1. Higher Secondary Physics – Second Part - by Dr. Shahjahan Tapan
2. A Text Book of Heat and Thermodynamics - by N Subrahmanyam and Brij Lal
3. A Text Book of Optics - by N Subrahmanyam and Brij Lal
4. Higher Secondary Physics -Second Part - by Prof. Golam Hossain Pramanik
5. Higher Secondary Physics -Second Part - by Ishak Nurfungnabi
6. Thermodynamics - by K K Ramalingam

65722 **COMMUNICATIVE ENGLISH** **T P C**
1 3 2

Full Marks: 100 (Practical-50.Theoretical-50)

Introduction

This Course Will Provide A Unique Foundation In The Basic Level For Developing Listening, Speaking, Reading And Writing Skills Into Some Of More Specialized And Advanced Capabilities Of Basic Operation In Communication.

Theory Part

Total Mark: : 50
Continuous Assessment : 20
Final Exam : 30

Objectives:

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

Creative Writing Ability
Transferring Information, Ideas And Knowledge
#Communicative Competence Effectively In The Workplace Situation.

1.Comprehension For Reading Task (Mark:10)

(Text May Be Taken From Contemporary Journals, Editorial of News Papers Or From Online Resources)

Test Items:

1. MCQ (Guessing Meaning from Context)
2. Rearranging
3. Gap-Filling (With Clues or Without Clues)
4. Answering Questions
5. Summarizing

2. Composition (Mark: 20)

The Following Are The Topic Title Introduced For Writing Task:

1. Introduce Formal/Informal Greeting &Farewell
2. Describe The Idea Of Communication & Presentation Skills
3. Write Paragraph On The Basis Of Comparison and Contrast
4. Narrate Process, Stories And Interpreted Charts, Graphs.
5. Write Letters to the Print and Electronic Media
6. Write Letters of Advice, Complaints, Inquiry, Order and Cancellation
6. Prepare Seven Days Weather Report.
7. Make An Attractive Poster For The People Giving Advice To Protect The Environment.
8. Prepare A Series Of Questions About Personal Information, Place Of Interest, Foods, Hobby And Employment Opportunity.

9. Write Dialogue On The Following Situations
   # About Exchanging Views With A Person And Introducing One Narrating Daily Activities
   # Meeting At The Train Station & Asking Question About The Departure And Arrival Of The Train To The Station Manager
   # Meeting at The Airport And Asking The Flight Schedule
   # Getting To The Hotel And Asking For A Reservation
   # Social Language for Telephonic Conversation
   # Talking About the Weather, Trips & Sight Seeing
   # Asking Permission and Making Request.
   # Talking About Office and Office Manner
   # Talking About Etiquette and Manner

10. Prepare Job Application With A Complete CV For Job Suitable For You.

Practical Part:

Objectives:

1. **Communicate The Areas That Learners Encounter In Real Life Situation.**
2. **Reinforce The Basic Language Skills Of Listening And Speaking.**
3. **Integrate ICT As Tools In Learning Language.**

Course Content

Unit	Lesson	Title
1. Use Of Dictionary	Define Dictionary	1.1 Know How To Use A Dictionary 1.2 Learn At Least 10 Words In A Day With Correct Pronunciation (Follow The Link : Www.Marriunm-Englishdictionary.Com)
2. Basic Vocabulary Practice	Basic Words For Communication By ODGENS	2.1 Use 10 Most Common Formulas (Structure) To Write Correct Sentence. (Follow The Link: Www.Odgensbasicvocabulary.Com Www.Grammarly.Com)
3.Listening Skill Practice	Listen To The Audio Video Presentation On Current Real Life Situation	3.1 Practice Audio Video Conferencing Activities. 3.2. Communicate With The English Speaking People Online (Link: Www.Speaking24.Com)
4. Speaking Skill Practice (Self Interpretation)	Introduce Yourself With The Vocabulary Prescribed By ODGENS	4.1 Browse Vocabulary Related Phrases To Introduce You. (Link : Www.Youtube.Com/ Let Me Introduce Myself)
5. Listening Skill Practice	Listen To The Weather Reports, Sports Commentary In The English TV Channels.	5.1 Prepare Seven Days Weather Report For The Place You Are Staying. 5.2. Make Some Attractive Poster To Protect The Environment.
6. Speaking Skill Practice	Identify Formal And Informal Social Language	6. 1 Practice Conversation Emphasizing On Greetings & Farewell (Link- Www.Esl.Guide@About.Com) 6.2 Take Part In Audio Video Conferencing Activities 6.3 Ask Questions About Personal Information, Place Of Interest, Food, Hobby, Employment Opportunity With Foreign Friends Using Social Media.
7. Writing Skill Practice	Develop Paragraph	7.1 Develop Paragraph On The Basis Of Comparison, Contrast And Analysis. Check Plagiarism Wordiness By The Correction Software (Www.Grammarly.Com) 7.2. Write E-Mail, Send And Reply E-Mail
8. Listening Skill Practice	Watch Short Films, Documentary And Listen To The English Music(With Lyric) To Practice In A Group	8.1 Listen To Hard Talk, Interview 8.2. Prepare A Series Of Questions To Interview A Celebrity 8.3. Down Load Documentary From Www.Youtube.Com/Education
9.Presentation	Define Presentation	9.1 Edutain/Entertain Yourself Preparing A Documentary In A Group With The Activities Done During The Period Of Class Hours In The Lab For Communicative English.

Evaluation:

Students Can Be Evaluated Individually Or In A Group On The Basis Of Performance Done In The Lab. Furthermore, They May Be Given Online Test Using Authenticated Websites Like Www.Britishcoucil.Org/Education/Blog/Podcast/News/Weather,Www.Englishteststore.Com.Www.Ieltsexam.Com

Lab-Facilitator, 30 Students In A Group:

Physical Facility	Size (In Ft)	Area (In Sq Ft)
Class Room Cum Laboratory	1 5 × 20	300
Library	15 × 20	300
Wash Room	4 × 7	28

Lists Of Equipments And Resources For 30 Learners:

Personal Computers With Accessories	15
Projector Multimedia	01
Printer	01
Scanner	01
Modem	01
Essential Software	01 Set
Internet Connection For Each Computer	Broad Band/Dial Up
Camera (Digital)	01
Video Conferencing Equipments	01 Set
TV Card	01
Satellite Cable Connection	01
Head Phone	15
Related Books And Journals	01
First Aid Box	01

Reference:

Www.Britishcouncil.Org,Www.Marium-Websters.Com,Www.Compellingconversation.Com, Www.Esl.Guide@About.Com, Www.Bbc.Com/News, Www.Speaking24.Com, Www.Itutor.Com, Www.Ieltsexam.Com, Www.Englishteststore.Com, Www.Ginger.Com, Www.Grammarly.Com

(Note: This Course May Be Introduced After Fourth Semester Coz It Needs Some Maturity Of The Students To Adopt With The Course Materials And The Contents. These Themes Are Suggestive Not Prescriptive.)

65921 MATHEMATICS -2 **T P C**
3 3 4

OBJECTIVES

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

SHORT DESCRIPTION

Algebra : Determinants, Matrix, Exponential Series.

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

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

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

DETAIL DESCRIPTION

ALGEBRA :

1 Apply determinants to solve simultaneous equations.

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

2 Apply the concept of matrix.

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

3 Understand exponential series.

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

i) $1 + \frac{1}{\lfloor 2} + \frac{1}{\lfloor 4} + \frac{1}{\lfloor 6} + \ldots\ldots$ to ∞

ii) $\frac{1}{\lfloor 2} + \frac{1+2}{\lfloor 3} + \frac{1+2+3}{\lfloor 4} + \frac{1+2+3+4}{\lfloor 5} + \ldots\ldots$ to ∞

TRIGONOMETRY

4 Apply the concept of inverse circular function.

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

4.2 Deduce mathematically the fundamental relations of different circular functions.

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

4.4 Prove mathematically

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

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

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

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

4.5 Solve problems of the following types.

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

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

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

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

5 Apply the principle of properties of triangles.

5.1 Prove the followings identities :

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

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

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

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

5.2 Establish the followings.

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

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

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

5.3 Solve the problems of the following types:

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

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

DIFFERENTIAL CALCULUS

6 Understand the concept of functions.

6.1 Define constant, variable, function, domain, range

6.2 Solve problems related to functions.

7 Understand the concept of limits.

7.1 Define limit and continuity of a function.

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

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

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

8 Understand differential co-efficient and differentiation.

8.1 Define differential co-efficient in the form of

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

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

9 Apply the concept of differentiation.

9.1 State the formulae for differentiation:

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

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

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

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

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

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

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

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

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

12 Understand partial differentiation.

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

INTEGRAL CALCULUS

13 Apply fundamental indefinite integrals in solving problems.

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

14 Apply the concept of definite integrals.

14.1 Explain definite integration.

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

14.3 Solve problems of the following types:

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

P* =Practical continuous assessment

Reference

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

65812 PHYSICAL EDUCATION AND LIFE SKILL DEVELOPMENT **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. National Anthem and Assembly

1.1 Line and File.
1.2 Make assembly.
1.3 Recitation of national anthem.
1.4 National anthem in music.

2. Warm up

2.1 **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 **Squad Drill :**

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

2.3 **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 Mass Physical Exercise

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

3. 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 Pramayama, sadanta pranayama), Ujjayi pranayama,

4. Muscle Developing with equipment

4.1 Damball : Front curl, Hand sidewise stretching, Arms raising overhead.
4.2 Barball : Front press, Leg press, Rowing motion with leverage bar.
4.3 Rope climbing : Straight way climbing, Leg raising climbing.
4.4 Horizontal bar : Chinning the bar with front grip, Chinning the bar with wide back grip.
4.5 Jogging Machine : Slow, Medium, and Fast running.
4.6 A. B king pro (Rowing Machine): Sit up.
4.7 Sit up bench: Sit up.

5 **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, Centring, Standing Asanas, Sitting Asanas, Quick Relaxation Technique).

6. **First Aid**

6.1 Define First Aid.
6.2 What do you mean by First Aider.
6.3 Discuss the responsibilities of a First Aider.
6.4 Different types of equipment of First Aid.
6.5 Muscle Cramp-Ice application (Remedy).
6.7 Dislocation-Ice application (Remedy).

7. Rules and Technique of 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 Definition of Exercise physiology.
8.2 Function of muscles.
8.3 Concept of work, energy and power.
8.4 Effect of exercise on heart and circulatory system.
8.5 Motor components for physical fitness.
8.6 Definition of sports Biomechanics.
8.7 Definition of sports psychology.
8.8 Meaning of nutrition, Diet and Balanced diet.
8.9 Meaning of the terms –Test, measurement and Evaluation.

9. Show skill on conversation on day to day life

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 Visited historical places/sites.

10. Human relation

10.1 Family relation.
10.2 Relation with nighbour.
10.3 Humanitarian Service.
10.4 Service for handicapped (intelligent, physical, social etc).
10.5 Service for orphan / Patient.

11 Vote of appreciation

11.1 About dress .
11.2 For good work.
11.3 For good result.
11.4 For good news.

12. Stress Management

12.1 Habit to be a man of humor.
12.2 Always brain should be cool.
12.3 Positive thinking.

12.4 Factors that determine our attitude.
12.5 The benefits of a positive attitude.
12.6 Steps to building a positive attitude.

13 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 Interview Technique

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 Team work

15.1 Organized a team.
15.2 Selection of team leader.
15.3 Distribution the task to the members.
15.4 Accepting opinion of team members.
15.5 Completion of task as a team.

16 Social work

16.1 Tree plantation.
16.2 Community service.
16.2.1 Rover Scout.
16.2.2 Sanitation.
16.2.3 Pure drinking water.
16.2.4 Social Culture.

Reference Book

Modern Yoga _Kany Lal Shah
Rules of games and sports_ Kazi Abdul Alim
Yoga _ Sobita Mallick
Iron Man_ Nilmoni Dass