



BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207.

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

AUTOMOBILE TECHNOLOGY

TECHNOLOGY CODE: **662**

2nd SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

AUTOMOBILE TECHNOLOGY (662)

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	66221	Automotive Engine System -1	2	3	3	40	60	25	25	150
2	66712	Electrical Engineering Fundamentals	3	3	4	60	90	25	25	200
3	65711	Bangla	3	3	4	60	90	50	0	200
4	65712	English	2	0	2	40	60	0	0	100
5	65921	Mathematics -2	3	3	4	60	90	50	0	200
6	65912	Physics -1	3	3	4	60	90	25	25	200
Total			16	15	21	320	480	175	75	1050

OBJECTIVES

To provide the students with an opportunity to acquire knowledge and skills of automobile engines and their systems with special emphasis on :

- Automobile engine & it's type.
- Automobile engine dimension.
- Engine parts.
- 2-stroke and 4-stroke engines.
- Operating principle of S.I and C. I engines.
- V-type and opposed cylinder engines.
- Wankel engine.
- Circular engine.
- Automobile gas turbine.
- Turbocharger and supercharger.
- **Automotive fastener.**

SHORT DESCRIPTION

Heat engine and their types, terms and factors related to the engine dimension, stationary and moving engine parts, 4-stroke S.I. and C.I. engine, 2-stroke S.I. and C.I. engines, Wankel engine, V-type and opposed cylinder engine, Circular engine, Automobile gas turbine, Super charger and turbo charger, **Automotive fastener** & engine performance.

DETAIL DESCRIPTION

Theory :

1 Understand engine and its types.

- 1.1 Define heat engine.
- 1.2 Classify heat engine.
- 1.3 Distinguish external & internal combustion engine.
- 1.4 Classify internal combustion (I.C) engine.
- 1.5 Explain combustion process of fuel in I.C engine.

2 Understand the terms and factors related to engine dimension.

- 2.1 Define TDC, BDC, bore, stroke, crank throw, clearance volume, swept volume, compression ratio, etc.
- 2.2 Describe the process of determining co bore stroke ratio mpression ratio of an engine.
- 2.3 Define square engine, over square & under square engine.
- 2.4 Mention the advantages & disadvantage of square engine, over square & under square engine.
- 2.5 Identify different engine according to the valVe arrangement VIZ, I-head, L-head, F-head & T- head engine.
- 2.6 Solve problems on Compression Ratio, piston displacement and clearance volume.

3. Understand features of stationary engine parts.

- 3.1 Identify the stationary engine parts.
- 3.2 Describe the functions, constructions and materials of cylinder head, block & oil pan.
- 3.3 Distinguish short & long block, mono block and individual block.
- 3.4 Describe the function, construction and types of cylinder liners.
- 3.5 Describe the function, construction and materials for exhaust and intake manifold.
- 3.6 Describe the function, construction, types and materials for bearing and valve guide.
- 3.7 Describe the function & Constriction of engine gasket.

4. Understand features of moving engine parts.

- 4.1 Identify the moving engine parts.
- 4.2 Describe the functions, construction, types and material used for crankshaft, camshaft, engine valves, piston, piston rings, piston pins, connecting rod, timing gears, timing chain, timing belt and fly wheel.
- 4.3 Explain the advantage of piston, cylinder head, cylinder block & oil pan made of aluminum alloy.

5. Understand the concept of spark ignition (SI) engine

- 5.1 Describe 4-stroke of S.I. engine.
- 5.2 Interpret the 4-stroke events of S.I. engine with the P.V diagram.
- 5.3 Explain the 4-strokes of a petrol engine.
- 5.4 Describe 2-stroke cycle of S.I. engine.
- 5.5 Explain the operating principle of 2-stroke cycle S.I. engine.
- 5.6 Distinguish between 2-stroke cycle S.I. engine with 4-stroke cycle S.I engine.

6. Understand the compression ignition (CI) engine.

- 6.1 Describe 4-strokes of C.I. engine.
- 6.2 Interpret the 4-stroke events of diesel (C.I) engine with the P.V diagram.
- 6.3 Explain 4 strokes of diesel engine.
- 6.4 Describe 2-stroke cycle C.I engine.
- 6.5 Explain the operating principles of 2-stroke cycle C.I. engine.
- 6.6 Distinguish between 2-stroke cycle C.I. engine with 4-stroke cycle C.I. engine.

7 Understand the feature of wankel engine

- 7.1 Define wankel or rotary engine.
- 7.2 Draw wankel or rotary engine.
- 7.3 Explain the working principles of operation of wankel or rotary engine.
- 7.4 Explain the advantages and disadvantages of wankel or rotary engine over conventional engine.

8 Understand the concept of V-type engine.

- 8.1 State the meaning of V-type engine.
- 8.2 Describe the construction of V-type engine.
- 8.3 Describe the working principle of V-type engine.
- 8.4 Explain the advantages and disadvantages of V-type engine over other engines.

9 Understand the features of opposed cylinder engine.

- 9.1 Define opposed cylinder engine.
- 9.2 Mention the type of opposed cylinder engine.
- 9.3 Describe the operation of opposed cylinder engine with the sketch.
- 9.4 Mention the advantage of opposed cylinder engine over other conventional engine.

10 Understand the features of circular engine.

- 10.1 Define circular engine.
- 10.2 Describe the operation of circular engine.
- 10.3 Mention the advantages of circular engine.
- 10.4 Mention the special use of circular engine.

11 Understand the features of gas turbine.

- 11.1 Define gas turbine.
- 11.2 Describe the principles of operation of gas turbine.
- 11.3 Explain advantages and disadvantages of gas turbine with other automobile engine.

12 Understand the features of turbocharger and supercharger.

- 12.1 Define supercharging.
- 12.2 Describe the operation of a supercharger.
- 12.3 Define turbo charging.
- 12.4 Describe operation of a turbocharger.
- 12.5 Mention the advantage of using turbocharger.
- 12.6 Distinguish the difference between supercharger & turbocharger.

13 Understand the feature of Automotive fasteners.

- 13.1 Define automotive fasteners.
- 13.2 List the different type of fasteners used in automobile.

- 13.3 Identify the different automotive fastener.
- 13.4 Mention the use of different automotive fasteners.

14 Understand the concept of engine efficiencies

- 14.1 Explain volumetric efficiency, thermal efficiency & mechanical efficiency.
- 14.2 Solve problems relating to volumetric efficiency, thermal efficiency & mechanical efficiency.

PRACTICAL

1. Measure **engine capacity** & compression ratio of an engine.
2. Identify stationary & moving engine parts of an automobile engine.
3. Identify major components of S.I. engine and C.I. engine and differentiate them.
4. Demonstrate the construction of cylinder head, cylinder block, oil pan and other stationary parts of engine.
5. Demonstrate the construction of piston and connecting rod assembly & engine bearings.
6. Demonstrate the construction of crank shaft, camshaft, the timing gear, timing chain & timing belt.
7. Demonstrate the operation of a 4-stroke & **2-stroke** cycle petrol engine with the help of a model.
8. Demonstrate the operation of a **4-stroke & 2-stroke** cycle diesel engine with the help of a model.
9. Demonstrate the operation of V-type engine.
10. Demonstrate the operation of horizontal opposed piston engine.
11. Demonstrate the operation of circular engine.
12. Demonstrate the operation of gas turbine.
13. Demonstrate the operation of supercharger & turbocharger.

REFERENCE BOOKS

- 1) Auto Mechanics Fundamentals- Martin W. Stockel & Martin T. Stockel -Goodheartwillcoks publisher)
- 2) Automobile Engineering - R.B Gupta . (Khannapabliher)
- 3) Automobile Technology- N.K Giri (Khannapabliher)
- 4) Automobile Engineering - K.K Ramalingam (Sci Tech publication)
- 5) Automobile Engineering -Dr. Kripal Singh (Standers publication)
- 6) The Automobile - Harbans Singh Rayet (S. Chand publication)

OBJECTIVES

- To familiarize the basic electrical quantities & laws and to apply them in solving problems of electrical circuits.
- To acquaint with electro-magnetism, electro-magnetic 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; Electro-magnetic induction; House wiring; Controlling devices; Protective devices; Earthing; 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 with unit.

2 Understand conductor semiconductor & insulator.

- 2.1 Define conductor, semiconductor and insulator.
- 2.2 Describe the conductor, semiconductor and insulator.
- 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 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 characteristic of series circuit and parallel circuit.
- 5.5 Calculate the equivalent resistance of series circuit and 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.

- 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 of 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 Electro-magnetic Inductions**
- 8.1 Define Electro-magnetic Inductions.
 - 8.2 Explain Faraday's laws of Electro-magnetic Induction.
 - 8.3 Solve problems on Electro-magnetic 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 Uses of wires and cables.
- 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 & uses of them.**
- 11.1 Define controlling device.
 - 11.2 List the different types of controlling devices.
 - 11.3 Define protective devices.
 - 11.4 List the different types of protective devices.
 - 11.5 Uses of different types of fuses used in house wiring.
 - 11.6 Uses of different types of circuit breaker in house wiring.
- 12 Understand the necessity of earthing.**
- 12.1 Define earthing.
 - 12.2 Describe the necessity of earthing.
 - 12.3 List of different types of earthing.
- 13 Understand the principle of operation of transformer.**
- 13.1 Define transformer.
 - 13.2 Describe the working principle of transformer.
 - 13.3 Write the equation relating to voltage, current & turns of primary & secondary winding of transformer.
 - 13.4 List the different losses of transformer.
 - 13.5 Define transformation ratio (voltage, current and turns).
 - 13.6 Solve problems on transformation ratio.
- 14 Concept of the principle of Electrical Machines**
- 14.1 Define electrical machine.
 - 14.2 list of different types of electrical machines.

- 14.3 Define generator.
- 14.4 List of different types of generator.
- 14.5 Uses of generator.
- 14.6 Define motor.
- 14.6 List of different types of motor.
- 14.7 Uses of motor.

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, watt meter 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 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 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 material 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 user 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 uses 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 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 in 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 (E_p) and secondary (E_s) 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 Start a 1-phase capacitor type motor/ceiling fan with regulator.**
- 13.1 Select the equipment and tools required for the experiment.
- 13.2 Sketch a working diagram.
- 13.3 Identify the two sets of coils.
- 13.4 Connect the capacitor with the proper set of coil.
- 13.5 Connect power supply to the fan motor.
- 13.6 Test the rotation of the motor opposite direction by changing the capacitor connection.
- 13.7 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

উদ্দেশ্য :

১. মাতৃভাষা হিসেবে বাংলা ভাষার প্রকৃতি ও বৈশিষ্ট্য সম্পর্কে ধারণা লাভ। ভাষার ব্যবহারে প্রায়োগিক যোগ্যতা অর্জন।
২. বাংলা সাহিত্য পঠন-পাঠনের মাধ্যমে জাতীয় চেতনা, দেশপ্রেম, মুক্তিযুদ্ধের চেতনা, শুদ্ধাচার, নীতি ও মূল্যবোধের উন্মেষ ঘটানো।

সংক্ষিপ্ত বিবরণী :

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

১. বাংলা ভাষার প্রয়োগ:

ক) বাংলা ভাষা :

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

খ) বাংলা বানান রীতি ও শব্দ প্রয়োগ:

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

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

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

গ) পত্র রচনা :

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

২. বাংলা সাহিত্য:**ক. কবিতা :**

১. বঙ্গভাষা - মাইকেল মধুসূদন দত্ত
২. সোনার তরী - রবীন্দ্র নাথ ঠাকুর
৩. উমর ফারুক - কাজী নজরুল ইসলাম
৪. বাংলার মুখ আমি - জীবনানন্দ দাশ
৫. আসাদের শার্ট - শামসুর রাহমান
৬. স্বাধীনতা শব্দটি কি করে আমাদের হলো? - নির্মলেন্দু গুণ

খ. প্রবন্ধ :

১. অর্ধাঙ্গী - রোকেয়া সাখাওয়াত হোসেন
২. বইকেনা - সৈয়দ মুজতবা আলী

গ. একাঙ্কিকা (নাটিকা): মানুষ - মুনীর চৌধুরী

ঘ. উপন্যাস: লালসালু - সৈয়দ ওয়ালী উল্লাহ

ঙ. ছোট গল্প:

১. হৈমন্তী - রবীন্দ্র নাথ ঠাকুর
২. একুশের গল্প - জহির রায়হান
৩. পাতালেহাসপাতালে - হাসান আজিজুল হক

ব্যবহারিক**১. নির্ধারিত বক্তৃতা :**

বাংলাদেশ ও বাঙালি সংস্কৃতি, বিভিন্ন জাতীয় দিবস (একুশে ফেব্রুয়ারি ও আন্তর্জাতিক মাতৃভাষা দিবস, স্বাধীনতা দিবস, বিজয় দিবস, জাতীয় শোক দিবস, মুজিব নগর দিবস, মহান মে দিবস)
প্রাতিষ্ঠানিক বক্তৃতা- নবাগত শিক্ষক/ছাত্রছাত্রীদের বরণ, গুরুত্বপূর্ণ ব্যক্তিবর্গের আগমন উপলক্ষে বক্তৃতা।

২. উপস্থিত বক্তৃতা :

বিষয়বস্তু উন্মুক্ত

৩. আবৃত্তি :

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 (নমুনা)

সংস্কৃতিই আধুনিক মানুষের ধর্ম

তথ্য প্রযুক্তির অবাধ ব্যবহারই যুব সমাজের অবক্ষয়ের মূল কারণ
গতানুগতিক শিক্ষা নয় কর্মমুখি শিক্ষাই অর্থনৈতিক মুক্তির চাবিকাঠি

চালকের অসাবধানতাই 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।

Objectives:

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

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

Seen Comprehension: (Marks-20)

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

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

Grammar (Marks-20)**1. (A) Uses of Articles.**

(B) Uses of Tense *(Right Forms Of Verbs with Indicators)

(C) Classify Verbs: (Regular and Irregular Verbs, Auxiliary, Principal, Finite, Non-Finite Verbs,)

2. Sentence:

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

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

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

4. Voice, Narration

5. Sentence Analysis:

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

Free Writing (Marks -20)

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

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 $e^x = 1 + \frac{x}{L^1} + \frac{x^2}{L^2} + \frac{x^3}{L^3} + \frac{x^4}{L^4} + \dots$ to ∞
- 3.4 Solve problems of the followings types :

i) $1 + \frac{1}{L^2} + \frac{1}{L^4} + \frac{1}{L^6} + \dots$ to ∞

ii) $\frac{1}{L^2} + \frac{1+2}{L^3} + \frac{1+2+3}{L^4} + \frac{1+2+3+4}{L^5} + \dots$ 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

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

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

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

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

- 4.5 Solve problems of the following types.

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

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

- 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 :

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

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

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

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

- 5.2 Establish the followings.

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

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

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

- 5.3 Solve the problems of the following types:

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

- ii) An object experiences two forces F_1 and F_2 of magnitude 9 and 13 Newtons with an angle 100° 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 $\lim_{x \rightarrow a} f(x)$ and $f(a)$.

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

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

8 Understand differential co-efficient and differentiation.

8.1 Define differential co-efficient in the form of

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

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:

$$(i) \int_0^{\pi/2} \cos^2 x \, dx.$$

$$(ii) \int_0^1 \frac{(\sin^{-1} x)^2}{\sqrt{1-x^2}} dx$$

P* = Practical continuous assessment

SL No	Athour	Reference 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 Shantinakaran	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

OBJECTIVES

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

SHORT DESCRIPTION

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

DETAIL DESCRIPTION**THEORY :****1. PHYSICAL WORLD AND MEASUREMENT**

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

2. SCALAR AND VECTOR QUANTITIES

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

3. MOTION AND EQUATIONS OF MOTION

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

- 3.10 Prove that centrifugal force = $\frac{mv^2}{r}$
- 3.11 State and explain the laws of falling bodies and mention the equation of motion of a body when it is projected vertically upwards or downwards.

4. NEWTON'S LAWS OF MOTION FORCE AND FRICTION

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

5. GRAVITY AND GRAVITATION

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

6. SIMPLE HARMONIC MOTION (SHM)

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

7. WORK, POWER AND ENERGY

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

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

8. ELASTICITY

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

9. HYDROSTATICS

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

10. WAVE AND SOUND

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

11. SOUND AND VELOCITY OF SOUND

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

PRACTICAL

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

REFERENCE BOOKS:

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