ALIGARH MUSLIM UNIVERSITY, ALIGARH

FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABUS FOR

DIPLOMA IN ENGINEERING

The candidates shall be selected for admission to Diploma in Engg Course according to their preference indicated by them in their Application Form and merit determined through an objective type (multiple choice questions) comprising the following subjects.

There shall be one objective type paper of 100 marks comprising 100 questions with the following breakup :

a) Science (Physics, Chemistry and Life Science)	:	50 Marks
b) Mathematics	:	30 Marks
c) General Knowledge	:	05 Marks
d) English	:	05 Marks
e) Indo-Islamic Culture	:	10 Marks

Note : The Admission Tests will be based on the syllabi prescribed by the Aligarh Muslim University for its Secondary School Certificate Examination (Class IX and X). The test paper for Diploma in Engineering will be available in three languages (English / Hindi / Urdu). The general standard of the Test shall be that of the qualifying examination which is presently almost similar to the CBSE / NCERT syllabus of Physics, Chemistry and Mathematics

SCIENCE

Physics

Motion : Distance and displacement, velocity, Uniform and Non Uniform motion along a straight line; acceleration, distance time and velocity-time graphs for uniformly accelerated motion, equations of motion by graphical method; elementary idea of uniform circular motion.

Force and Newton's Laws: Force and motion, Newton's laws of motion, inertia of a body, inertia and mass, momentum, force and acceleration. Elementary ideas of conservation of momentum, action and reaction forces.

Gravitation : Gravitation, Universal law of gravitation force of gravitation of the earth (gravity), acceleration due to gravity; mass and weight; free fall.

Work, Energy and Power : Work done by a force, energy, power; kinetic and potential energy; Laws of Conservation of energy.

Flotation : Thrust and pressure, Archimedes' Principal, buoyancy, elementary idea of relative density.

Sound : Nature of sound and its propagation in various media, speed of sound, range of hearing in humans; ultrasound; reflection of sound; echo and SONAR.

P.T.O.

Effect of current : Potential, Potential differences, Ohm's Law; Series combination of resistors, Parallel combination of resistors; Power dissipation due to current; inter relation between P, V, I and R.

Magnets : Magnetic field, field lines, field due to a current carrying wire, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's left hand rule. Electro magnetic induction, Induced potential difference, Induces current. Direct current. Alternating current; frequency of AC. Advantage of AC over DC. Domestic electric circuits.

Natural Phenomena: Convergence and divergence of light. Images formed by a concave mirror; related concepts; centre of curvature; principal axis. Optic centre, focus, focal length.

Refraction; Laws of Refraction : Image formed by a convex lens; functioning of a lens in human eye; problems of vision and remedies. Applications of spherical mirrors and lenses. Applications of concept of refraction; velocity of light; refractive index, twinkling of stars, dispersion of light, Scattering of light.

Sources of energy : Different forms of energy, leading to different sources for human use; fossils fuels solar energy; biogas; wind, water and tidal energy; nuclear energy; Renewable versus non-renewable sources.

Chemistry

MATTER – NATURE AND BEHAVIOUR

Definition of Matter: Solid, Liquid, and gas; Characteristics – shape, volume, density; change of state melting (absorption of heat), freezing, evaporation, (cooling by evaporation), condensation, sublimation.

Nature of Matter : Elements, Compounds and mixture; Heterogeneous and Homogeneous mixtures, colloids and suspensions.

Particle Nature, Basic Units : Atoms and molecules, law of constant proportions. Atomic and molecular masses.

Mole Concept : Relationship of mole to mass of the particles and numbers, valency, chemical formula of common compounds.

Structure of Atom : Electrons, protonos and neutrons; Isotopes and Isobars.

OUR ENVIRONMENT

Physical Resources : Air, Water, Soil : Air for respiration, for combustion, for moderating temperatures, movement of air and its role in bringing rains across India. Air, water and solid pollution (brief introduction) holes in ozone layer.

Bio-geochemical cycles in Nature : Water, oxygen, carbon, nitrogen

Acids, bases and salts : General properties, examples and uses.

Chemical Reactions : Types of chemical reaction; combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction in terms of gain and loss of oxygen and hydrogen.

Metal and Non-Metals : General properties of metals and non-metals brief discussion of basic metallurgical processes.

Carbon Compound : Carbon compounds, elementary idea about bonding.

Some Important Chemical Compounds : Soap-cleansing action of soap.

Periodic Classification of elements : Gradation in properties : Mendeleev periodic table, modern period table.

Conservation of natural Resources : Management of natural resources. Conservation and judicious use of natural resources, coal, and petroleum conservation.

P.T.O.

LIFE SCIENCE

CLASS X

Theme: The World of Living

Life Processes: "Living" things; Basic Concept of Nutrition, Respiration, transport and excretion in plants and animals.

Control and Coordination in plants and animals: Tropic movements in plants; Introduction to plant hormones; control and co-ordination in animals; voluntary, involuntary and reflex action, nervous system; chemical co-ordination, animal hormones.

Reproduction: Reproduction in plants and animals (Asexual and Sexual) Needs for and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Heredity and evolution: Heredity; Origin of life; Brief introduction; Basic concepts of evolution.

Theme: Natural Resources

Unit 5: Conservation of natural resources: Forest and wild life, people's participation, chipko movement, legal perspectives in conservation and international scenario, coal and petroleum.

The Regional Environment: Big dams: advantages and limitations; alternatives if any. Water harvesting. Sustain ability of natural resources

Unit 5: Our Environment : Eco-system, Food-Chain and webs

Our environmental problems, their solutions, Biodegradable, and non biodegradable substences, ozone depletion.

LIFE SCIENCE

CLASS IX

Food: Plant and animal breeding and selection for quality improvement and management; use of fertilizers; manures; protection from pests and diseases; organic farming.

Biological Diversity: Diversity of plants and animals- basic issues in scientific naming, basis of classification. Hierarchy of categories /groups, Major groups of plants (salient features) (Bacteria, Thalophyta, Bryophyta, pteridophyta, gymnosperms and Angiosperms). Major groups of animals (Salient features) (Non-chordates upto phyla and chordates upto classes).

Cell- Basic unit of Life: Cell as a basic unit of life; prokaryotic and eukaryotic cells, multicellular organizations; cell membrane and cell wall, cell organelles; chloroplast, mitochondria, vacuoles, ER, golgi apparatus; nucleus, chromosomes-basic structure, number.

*Tissues, organs, organ systems, organism.

Structure and functions of animal and plant tissue (four types in animals; merismetic and permanent tissues in plants).

Health and Diseases: Health and its failure. Infectious and Non-infectious diseases, their causes and manifestation . Diseases caused by microbes (Virus, Bacteria and protozoans) and their prevention, Principles of treatment and prevention.

Transport of materials in the living systems : diffusion/ exchange of substances between cells and their environment and between the cells themselves in the living system; role in nutrition, water, and food transport, excretion, gaseous exchange .

MATHEMATICS

NUMBER SYSTEMS

1. Real Numbers: Review of representation of natural numbers, integers, rational numbers on the number line. Representation of terminating / non-terminating recurring decimals, on the number line through successive magnification. Rational numbers as recurring / terminating decimals.

Examples of nonrecurring / non terminating decimals such as $\sqrt{2}, \sqrt{3}, \sqrt{5}$ etc. Existence of non-rational numbers (irrational-numbers) such as $\sqrt{2}, \sqrt{3}$, and their representation on the number line. Explaining that every real number is represented by a unique point on the number line and conversely, every point on the number line represents a unique real number.

Existence of $\sqrt{x}$, for a given positive real number x (visual proof to be emphasized). Definition of n^{th} root of a real number.

Rationalization (with precise meaning) of real numbers of the type $\frac{1}{a+b\sqrt{x}}, \frac{1}{\sqrt{x}\pm\sqrt{y}}$ & $\frac{1}{x\pm\sqrt{y}}$ (and their combinations) where x and y are natural number and a, b are integers.

Recall of laws of exponents with integral powers. Rational exponents with positive real bases (to be done by particulars cases, allowing learner to arrive at the general laws).

2. **Euclid's division lemma, Fundamental Theorem of Arithmetic-** Statements after reviewing work done earlier and after illustrating and motivation through examples, Proof of results- irrationality of $\sqrt{2}, \sqrt{3}, \sqrt{5}$ etc. Decimals expansions of rational numbers in terms of termination/ non-termination recurring decimals.

ALGEBRA

1. Polynomials: Definition of a polynomial in one variable, its coefficients, with examples and counter examples, coefficients of a polynomial, terms of a polynomial and zero of the polynomials. Degree of a polynomial. Zero polynomial, constant polynomial, linear , quadratic, cubic polynomials; monomials, binomials trinomials. Factors and multiples. Zeros/roots of a polynomial/equation. State and motivate the Remainder Theorem, with examples and analogy to integers. Statement and proof of the Factor Theorem. Factorization of $ax^2 + bx + c$, $a \neq 0$ where a, b and c are real numbers, and of cubic polynomials using the Factor Theorem.

Recall of algebraic expressions and identities. Further identities of type
$(x+y+z)^2 = x^2 + y^2 + z^2$ 2 xy + 2yz + 2zx, $(x \pm y)^3 = x^3 \pm y^3 \pm 3xy\,(x \pm y)$

$X^3 \pm y^3 = (x \pm y)\,(x^2 \pm xy + y^2)$, $x^3+y^3+z^3-3xyz=(x+y+z)\,(x^2+y^2+z^2-xy-yz-zx)$ and their use in factorization polynomials. Simple expressions reducible to these polynomials.

Zeros of polynomial. Relationship between zeros and coefficients of a polynomial with particular reference to quadratic polynomials. Statement and simple problems on division algorithm for polynomials with real coefficients.

2. Linear Equations in Two Variables: Recall of linear equations in one variable. Introduction to the equation in two variables. Prove that a linear equation in two variables has infinitely many solutions and justify their solutions being written as ordered pairs of real numbers, plotting them and showing that they lie on a line. Examples, problems from real life including problems on Ratio and Proportion and with algebraic and graphical solutions being done simultaneously.

Pair of Linear Equations in two variables: Pair of linear equations in two variables and their graphical solution. Geometric representation of different possibilities of solutions / consistency and inconsistency.

Algebraic conditions for number of solutions. Solution of pair of linear equations in two variables algebraically – by substitution, by elimination and by cross multiplication method. Simple situational problems must be included. Simple problems on equations reducible to linear equations.

3. Quadratic Equations: Standard form of a quadratic equation $ax^2+bx+c=0$, $(a \neq 0)$. Solution of the quadratic equations (only real roots) by factorization, by completing the square and by using quadratic formula. Relationship between discriminant and nature of roots. Problems related to day to day activities to be incorporated.

4. Arithmetic progressions: Motivation for studying Arithmetic Progression. Derivation of standard results of finding the n^{th} term and sum of first n terms of an Arithmetic Progression and their application in solving daily life problems.

COORDINATE GEOMETRY

1. Coordinate Geometry : The Cartesian plane, coordinates of a point, names and terms associated with the coordinate plane, notations, plotting points in the plane, graph of linear equations as examples; focus on linear equations of the type ax + by + c = 0 by writing it as y = mx + c and linking with the chapter on linear equations in two variables.

Lines (In two-dimensions): Review the concepts of coordinate geometry done earlier including graphs of linear equations. Awareness of geometrical representation of quadratic polynomials. Distance Formula between two points and section formula (internal division and external division). Area of a triangle.

GEOMETRY

1. Introduction to Euclid's Geometry: History - Euclid and geometry in India. Euclid's method of formalizing observed phenomenon into rigorous mathematics with definitions, common / obvious notions, axioms / postulates and theorems. The five postulates of Euclid. Equivalent versions of the fifth postulate. Showing the relationship between axiom and theorem.

For example:

1. (Axiom) Given two distinct points, there exists once and only one line through them.
2. (Theorem) (Prove) two distinct lines cannot have more than one point in common.

2. Lines and Angles

1. (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is 180^o and the converse.
2. (Prove) If two lines intersect, the vertically opposite angles are equal.
3. (Motivate) Results on corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines.
4. (Motivate) Lines, which are parallel to a given line, are parallel.
5. (Prove) The sum of the angles of a triangle is 180^o
6. (Motivate) If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interiors opposite angles.

3. Triangles

1. (Motivate) Two triangles are congruent if any two sides and the included angle of one triangle is equal to any two sides and the included angle of the other triangle (SAS Congruence rule).
2. (Prove) Two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle (ASA Congruence rule).
3. (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS congruence rule).
4. (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are equal (respectively) to the hypotenuse and a side of the other triangle (RHS congruence rule).
5. (Prove) The angle opposite to equal sides of a triangle are equal.
6. (Motivate) The sides opposite to equal angles of a triangle are equal.
7. (Motivate) Triangle inequalities and relation between angle and facing side inequalities in triangles.

Definition examples, counter examples of similar triangles.

8. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two side in distinct points, the other two sides are divided in the same ratio.
9. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.
10. (Motivate) Mid-point theorem as a special case of (ix)
11. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.
12. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.
13. (Motivate) If one angle of triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.
14. (Motivate) If perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.
15. (Prove) The ratio of the areas of two similar triangles is equal to the ratio of the square on their corresponding sides.
16. (Prove) In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.

17. (Prove) In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angles opposite to the first side is a right triangle.

4. Quadrilaterals

1. (Prove) The diagonal divides a parallelogram into two congruent triangles.
2. (Motivate) In a parallelogram opposite sides are equal, and conversely.
3. (Motivate) in a parallelogram opposite angles are equal, and conversely.
4. (Motivate) a quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.
5. (Motivate) in a parallelogram, the diagonals bisect each other and conversely.
6. (Motivate) in a triangle, the line segment joining the mid points of any two sides is parallel to the third side and (motivate) its converse) (Mid-point theorem).

5. Area

Review concept of area, recall area of rectangle.

1. (Prove) Parallelograms on the same base (or equal base) and between the same have the same area.
2. (Motivate) triangles on the same base and between the same parallels are equal in area and its converse.

6. Circles: Through examples, arrives at definitions of circles related concept, radius, circumference, diameter, chord, secant, arc, segment, sector, subtended angle.

1. (Prove) Equal chords of a circle subtend equal angles at the centre and (motivate) its converse.
2. (Motivate) the perpendicular from the center of a circle to a chord bisects the chord and conversely the line draw through the center of a circle to bisect a chord is perpendicular to the chord.
3. (Motivate) There is one and only one circle passing through three given non collinear points.
4. (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the center(s) (or their respective centres and conversely.
5. (Prove) The angle subtended by an arc at the center is double the angle subtended by it at any point on the remaining part of the circle.
6. (Motivate) Angles in the same segment of a circle are equal.
7. (Motivate) If a line segment joining two points subtended equal angle at two other points laying on the same side of the line containing the segment, the four points lie on a circle.
8. (Motivate) The sum of the either pair of the opposite angles of a cyclic quadrilateral is 180^o and its converse.

Tangents to a circle motivated by chords drawn from points coming closer and closer to the point.

9. (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
10. (Prove) The lengths of tangents drawn from an external point to circle are equal

MENSURATION

1. **Areas:** Area of a triangle using Hero's formula (without proof) and its application in finding the area of a quadrilateral.

2. **Surface Areas and Volumes:**
   a. Surface areas and volumes of cubes, cuboids, spheres (including hemispheres) and right circular cylinders/cones.
   b. Problems on finding surface areas and volumes of combinations of any two of the following : cubes cuboids, spheres, hemispheres and right circular cylinders / cones. Frustum of a cone.
   c. Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solid be taken).

3. **Areas related to circle:** Motivate the area of a circle; area of sectors and segments of a circle. Problems based on areas and perimeter / circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60^o, 90^o and 120^o only. Plane figures involving triangles, simple quadrilaterals and circle should be taken).

STATISTICS AND PROBABILITY

1. **Statistics :** Introduction to statistics: Collection of data, presentation of data-tubular form, ungrouped/grouped, bar graphs, histograms (with varying base length), frequency polygons, qualitative analysis of data to choose the correct form of presentation for the collected data. Mean, median, mode of ungrouped data.
2. **Mean, Median and Mode** of grouped data (bimodal situation to be avoided). Cumulative frequency graph.
3. **Probability:** History, Repeated experiments and observed frequency approach to probability. Focus is on empirical probability. (A large amount of time to be devoted to group and to individual activities to motivate the concept; the experiments to be drawn from real-life situations, and from examples used in the chapter on statistics).

4. **Classical definition of probability.** Simple problems on single events, not using set notation.

TRIGONOMETRY

1. Introduction to Trigonometry: Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined); motivate the ratios, whichever are defined at 0^o & 90^o, Values (with proofs) of the trigonometric ratios of 30^o, 45^o and 60^o. Relationships between the ratios.

2. **Trigonometric identities :** Proof and applications of the identity $\sin^2 A+\text{Cos}^2 A=1$. Only simple identities to be given. Trigonometric ratios of complementary angles.

3. Heights and Distances: Simple and believable problems on heights and distances. Problems should not involved more than two right triangles. Angles of elevation / depression should be only 30^o, 45^o and 60^o

. **----------**

GENERAL KNOWLEDGE

1. Current Affairs — 05 Marks
2. Awards and Honours (Civilian and Nobel)
3. Games and Sports
4. Religious Scriptures

ENGLISH

(05 marks)

1. Subject - Verb Agreement
2. Use of Prepositions / Conjuctions
3. Active and Passive Voice
4. Vocabulary & Usage
5. Use of Articles
6. Idioms & Phrasal Verbs
7. Detecting errors in Sentences

INDO ISLAMIC CULTURE

A. Muslims in India : An Overview — 06 Marks

1. Famous Rulers of Sultanat & Mughal Empire:
Qutubuddin Aibak, Alauddin Khilji, Firoz Shah Tughlaq, Zahiruddin Babar, Sher Shah Suri, Jalaluddin M. Akbar, Aurangzeb Alamgir.

2. Indo – Islamic Architecture (Famous Monuments):
Qutub Minar, Golcanda Monuments, Red Fort, Taj Mahal, Jama Masjid, The Gol Gumbaz, Atala Masjid.

3. Religious Co-existence: Select Sufism Tradition and Bhakti Movement:
Amir Khusru, Khwaja Gesu Daraz, Khwaja Moinuddin Chishti, Baba Farid Ganje Shakkar, Khwaja Nizamuddin Awliya, Sheikh Ahmad Sirhindi, Shah Waliullah, Guru Nanak Dev, Kabir Das, Mira Bai, Tulsidas.

4. Contribution of Muslims in the Indian Freedom Movement:
Bahadur Shah Zafar, Tipu Sultan, Maulana Mahmoodul Hasan, Ali Brothers, Maulana Hasrat Moohani, Maulana Abul Kalam Azad.

B. Sir Syed and Aligarh Movement: — 04 Marks

a. Life and works of Sir Syed
b. Literary Contribution of Sir Syed
c. Architect of Educational Reforms : Bridging tradition and Modernity; Establishment of AMU

SUGGESTED BOOKS :

- Text Book of History Class IX – X
- Sir Syed by Sir Syed Academy (A Short Introduction – AMU Centenary Year 2020).
- Qazi Zainul Aabideen, Tarikh e Millat
- Knowing India : A Transforming Story by D.K. Hari and D.K. Hema Hari
- India 2024 Current Affairs by Rajendra Prasad
- Glimpse of Scriptures of Religions of Indian Origin by Ashok K. Sinha