

Ministry of Education and Science of Ukraine

THE DRAWING

Curriculum for comprehensive schools

Grade 11

Standard level

Number of hours	Content of study material	State requirements for the general education level of students
1	<p>Introduction Importance of graphic documents in human practice; place and role of drawing course in the school system.</p>	<p>Student: Explains the purpose of graphic documents in people's practical activities; the place and role of the drawing course in the school system.</p>
2	<p>Creating images on drawings A concept of projection methods. Rectangular projections as a means of representing a three-dimensional object on a plane. Construction of projections of objects on one, two and three mutually perpendicular projection planes. The concept of a view as a type of images in the drawing. Mutual arrangement of views in the drawing and their names: front view, top view, left view.</p>	<p>Student: knows the basic methods of projection; elements of projection apparatus; planes of projections; names of views in drawings and their mutual arrangement; requirements for the main view in a drawing; is able to construct projections of objects onto one, two and three mutually perpendicular planes of projection; place views on the drawing in a projective relationship.</p>
2	<p>General requirements for the making and execution of drawings An understanding of national standards governing the execution of drawings. Formats of drawings. Working field and frame drawing. Main inscription on the drawing. Lines in the drawing: solid thick basic line, solid thin line, solid wavy line, dashed line, dashed line and dashed line with two dots. Correlation of line widths and their designation. Basic information on drawing fonts: types, proportions. Letters, numerals and symbols in drawings. Scales of drawings: purpose, types and symbols. Basic information on dimensioning in the drawing: extension and dimension lines, arrows for diameter and radius, notation of thickness and length of a part, placement of dimension lines</p>	<p>Student: knows A-4 format size; drawing frame size; purpose of the main inscription on the drawing; purpose of the main types of drawing lines; rules for drawing inscriptions; rules for drawing linear dimensions in parallel and oblique dimension lines, circle and arc dimensions, corner sizes; can construct the frame of the drawing; execute the main inscription on the drawing; draw lines of appropriate thickness; execute inscriptions in drawing font; apply linear dimensions and dimensions of curvilinear elements of the contours of images within the scope of studied rules; determine the scale when drawing, their types and designations on the drawing.</p>
4	<p>Geometric constructions in drawings Analysis of graphic composition of images in drawings. Axis and centre lines along the contours of images. Instrumental and graphic construction techniques (angles, perpendicular and parallel lines, division of circles and segments into equal parts). Contours of images with smoothly conjugated elements. Basic geometric elements of conjugation: centre and points of conjugation Construction of a tangent to one and two circles. Construction of conjugate straight lines, arc with line, two arcs (inner, outer and combined). Dimensioning of tense elements. Image contours with slope and taper. Definition of slope and taper. Marking of dips and tapers in drawings. Dimensioning of</p>	<p>Student: knows basic geometric elements of conjugation: centre and points of conjugation; ways of construction of conjugate straight lines, arc with a line, two arcs; ways of dividing an angle and a segment into equal parts; ways of dividing a circle into equal parts; rules of drawing dimensions of tense elements; rules of making images with slope and taper; is able to determine the list of constructions that constitute the outline of the image; perform the construction of angles, parallel and perpendicular lines, division of a circle and segments into equal parts, conjugation of straight lines, arc with a straight line, two</p>

	tapered surfaces.	arcs, to apply the dimensions of conjugate elements; perform the image with slope and taper.
8	<p>Drawing and reading views on drawings</p> <p>Rational sequence of drawing views. Requirements for the main view on the drawing. Determining the required and sufficient number of views in the drawing. Dimensioning in drawings, taking into account the shape of objects. Some conventions in drawing dimensions. Reading blueprints. Analyzing the geometric shape of an object from its drawing. Finding projections of surface elements in the drawing of the object. Projections of points lying on the surface of the object. Development drawing of geometric body surfaces. Development drawing of faceted surfaces. Development drawing of cylindrical and conical surfaces. Construction of development drawings of surfaces of technical products made of sheet material.</p>	<p>Student:</p> <p>knows the rules of constructing views on the drawing; requirements for the main view on the drawing; the convention of drawing dimensions that reduce the number of images; rules for finding projections of surface elements on the drawing of an object; ways of creating a development drawing of surfaces of geometric bodies; is able to determine the main view of the object, the rational number of views in the drawing; arrange the image in the drawing; apply dimensions in the drawings of objects according to their shape; perform simple dynamic spatial transformations of objects; create reamers of surfaces of geometric bodies and simple technical products made of sheet material.</p>
8	<p>Cross-section and section drawings</p> <p>The concept of a cross-section drawing. Cross-section drawing formation. Types of cross-section drawings: drawn and superimposed. Execution and notation of cross-section drawings. Conditions established for carrying out the sections. Graphical symbols for materials in the sections. The concept of section drawing as a type of drawing images. Formation of a section drawing. The difference between a cross-section and section drawings. Types of sections: simple and complex, complete and local. Making and marking of section. Combination of views with part of sections. Conditions and simplification in the performance of section.</p>	<p>Student:</p> <p>knows the purpose of cross-section and incision; classification of different types of cross-sections and sections; the difference between section and cross section; is able to perform and mark cross-sections and sections on drawings of objects; read drawings containing cross-sections and sections; apply the necessary conventions and simplifications when making cross-sections and sections</p>
4	<p>Images of objects in the drawings</p> <p>Generalized concept of image. Dependence of the number of images on the complexity of the shape of the object. Conventions and simplifications in the drawings. Additional and local views. Layout of images in the drawing.</p>	<p>Student:</p> <p>knows the requirements for the optimal number of images in the drawing; conventions that provide a rational reduction in the number of images; requirements for the composition of images in the drawing; is able to perform and read drawings containing the studied conventions; compose images on the drawing field; apply the necessary local and additional views when making drawings, conventions that allow you to rationally reduce the number of images in the drawing, to determine the necessary and sufficient number of images in the drawing.</p>
6	<p>Axonometric projections. Technical drawing.</p> <p>Purpose and main types of axonometric projections. Angular frontal oblique projection. Rectangular isometric projection. Axis</p>	<p>Student:</p> <p>knows the purpose of axonometric projections, characteristic features of oblique frontal dimetric projection, characteristic</p>

	<p>directions - indices of distortion, dimensioning in images. Axonometric projections of circles and flat shapes. Axonometric projections of three-dimensional objects. Construction of technical drawings of objects depicted in a system of rectangular projections. Selection of the type of axonometric projection and the optimal method for their construction. Ways of representing three-dimensional objects in technical drawings.</p>	<p>features of rectangular isometric projection; conditions affecting the choice of axonometric projection type to construct a subject image of an object; the purpose of a technical drawing and how it differs from a drawing; knows how to make axonometric projections of planar figures and geometric bodies; to choose the type of axonometric projection to construct the object image of an object; to apply dimensions to axonometric projections of objects; make technical drawings of common parts.</p>
2	<p>Key information on drawing parts Concept of a part as a component of a product. Typical and original parts. Constructive elements of parts. Key information about the working drawings. Requirements for the working drawings. Structure and content of the working drawing.</p>	<p>Student: knows the main structural elements of the parts; knows the differences between typical and original parts; the structural elements of parts; can read work drawings for parts.</p>
7	<p>Information necessary for making and reading parts drawings. Imaging of parts in the work drawings. The reproduction of the parts, taking into account the manufacturing methods. Conditionalities and simplifications in the making of the images of the parts. Dimensions and deviation limits in the parts drawing. Dimensioning based on the technology of production parts. Dimensions of the structural parts of the components. Dimensional chains and dimensional bases. Dimensioning in the parts drawings. Preferred dimensional number system. Marking in the drawings of boundary shape deviations and arrangement of parts surfaces. Marking in the drawings of the surface roughness requirements of the parts. Drawing basic information about the part material and its condition (heat treatment, coating etc.) Text part of the detail drawing. Drawing of parts, the shape of which is limited mainly by rotation surfaces, planes; drawing of parts made of sheet material; drawing of parts obtained by casting, forging, etc. Drawing of typical parts of machines and mechanisms: housings, covers, shafts, sleeves, springs, etc. Drawing of parts with standardised representations. Group drawings of standardised and normalised parts.</p>	<p>Student: knows the convention and simplification in the making of images of parts; rules of dimensioning and limit deviations in the drawings of parts, taking into account the technology of production; rules of marking surface roughness parameters in the drawings; rules of marking the basic information about the material of the parts and their condition in the drawings; rules of drawing typical parts and parts with standard images; rules of drawing standardized and normalized parts; knows how to draw images of parts according to the methods of production; dimensions and tolerances of parts in the drawings according to production technology; mark the roughness of surfaces, the basic information about the material of the parts and their condition in the drawings; make drawings of typical parts and parts with standardized images, standardized and normalized parts;</p>
8	<p>Part sketches General information on sketches and their purpose. Requirements for the execution and execution of the sketches. Sequence of sketching. Selection of the images of the part in the sketch. Image of the structural elements of the parts. Technique of geometric constructions</p>	<p>Student knows the purpose of the sketch; the sequence of measuring the part in the sketch; can select measuring tools according to the requirements for accurate measurement; draw simple sketches from a natural part.</p>

	<p>on sketches. Drawing measurements on sketches of patterns. Measuring tools and techniques for measuring patterns. The sequence of measurement of the patterns in the sketch. Choice of measuring tools depending on the requirements for accurate measurement. Direct and mediocre measurements. The concept of structural and technological bases. Application of normalised diameters, lengths, tapers, etc., when drawing dimensions on sketches.</p>	
8	<p>Key information on assembly drawings General information on assembly drawings. Purpose and contents of the assembly drawing. Dimensioning and assembly drawings. Images and dimensions in assembly drawings. Drawing positions on the representation of components of the product and drawing up a specification. Conventionality and simplifications in assembly drawings. Representation of springs, moving parts, product in extreme or intermediate positions in the assembly drawing. Conditions and simplifications in the assembly drawings.</p>	<p>Student: knows the purpose and content of the assembly drawing; purpose and content of the specification for the assembly drawing; rules of execution of images and drawing of the sizes on assembly drawings; features of execution of sections on assembly drawings; can read images on assembly drawings; specification of the assembly drawing.</p>
4	<p>The representation of the connections in the assembly drawings General concept of connection. Classification of connections according to the degree of mobility, according to the nature of the assembly. Characteristic features of the main types of connections. Designation of dimensions and fits of the mating surfaces. Types of connections with the help of threads. Symbols and symbols for threads in the drawings of parts. Structural and technological threads. Standard fasteners threaded connections: bolts, studs, screws, nuts, fittings, etc. Ways of depicting and designating cryptographic parts on connection drawings. Drawing of bolt, stud, screw and pipe connections. Drawing of keyway connections of parts. Symbols on the keyway connection drawings. Use of reference materials when making keyway connections.</p>	<p>Student: knows the types of detachable and non-detachable connections; rules of conditional representation of designation of the studied types of carvings; basic parameters and characteristic features of metric, trapezoidal, persistent and tubular cylindrical threads; characteristic features of the image of bolted, stud, screw, key joints; is able to determine with the help of reference materials the required dimensions of fasteners; read the symbols of threaded and keyed connections; conditionally mark threaded and key joints in the drawings; Simplified drawing of threaded and keyway connections of parts.</p>
6	<p>Reading and detailing assembly drawings Reading assembly drawings according to the plan. Reading assembly drawings using control questions. Conventions and simplifications in assembly drawings. Detailing of assembly drawings. Purpose and content of the process of detailing the assembly drawing. Sequence of detailing. Coordinating the size of parts in the process of detailing. Graph of scales.</p>	<p>Student: knows the sequence of reading assembly drawings; definition of details, conventions and simplifications used in assembly drawings; can read images on assembly drawings; to detail drawings of products consisting of 5-6 details; match the dimensions of the parts in the detailing process.</p>