CARIBBEAN EXAMINATIONS COUNCIL

Caribbean Secondary Education Certificate
CSEC®

TECHNICAL DRAWING SYLLABUS

Effective for examinations from May/June 2002

Including 2006 amendments

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Content

AMENDMENTS

The Technical Drawing Syllabus, previously included in the Industrial Arts Syllabus, is now published under its own cover. The syllabus was revised in 2000 for first examination in 2002. The major amendments are indicated by vertical lines.

Attention is drawn to the following:

i) the organisation of the syllabus into Units and Modules;

ii) the merging of the Plane and the Solid Geometry sections into Unit1: Plane and Solid Geometry;

iii) the revision of the percentage weighting of papers and profile dimensions;

iv) the rewriting of Unit 3: Mechanical Engineering Drawing;

v) the restructuring of the School-Based Assessment component;

vi) the addition of Computer Aided Drafting as an option.

Technical Drawing Syllabus

RATIONALE FOR TEACHING TECHNICAL DRAWING

It is generally recognised that Technical Drawing is the language of communication of technical/vocational occupations and as such, has widespread applications in the life of consumers. It is, therefore, being recommended that every secondary school student should have, at the minimum, a basic knowledge of Technical Drawing.

To this end, the Caribbean Examinations Council recognises the need to provide a programme of studies in Technical Drawing which will cater not only to the above stated interest, but also to those students who will proceed to studies at tertiary levels and/or seek entry level employment in related fields.

The Technical Drawing course as conceived, therefore, will be an essential companion to the cognate CSEC Industrial Technology programme as well as an integral component of the General Education curriculum.

The syllabus also contributes to the development of selected attributes from the CARICOM Ideal Person document as articulated by the CARICOM Heads of Government. This person is one who demonstrates emotional security with a high level of self-confidence and self-esteem, is aware of the importance of living in harmony with the environment and nurtures its development in the economic and entrepreneurial spheres in all other areas of life (CARICOM Education Strategy, 2000).

This holistic development of students aligns with selected competencies advocated in the UNESCO Pillars of learning. These are learning to be, learning to do, and learning to transform one's self and society.

GENERAL OBJECTIVES

This syllabus is designed for candidates to:

(i) develop an understanding of and appreciation of Technical Drawing in the Caribbean Industrial Society;

(ii) discover and develop their talents in the fields of Technical Drawing and related technologies;

(iii) develop technical problem-solving skills in Technical Drawing as related to materials and

processes;

(iv) develop the correct and accepted Technical Drawing skills as demanded by Industry;

(v) be aware of the career opportunities available in Technical Drawing and its related fields;

(vi) have a working knowledge and understanding of Computer Aided Drafting applications;

(vii) develop skills to use drawing in the process of design.

CERTIFICATION AND DEFINITION OF PROFILES

The Technical Drawing course is an integral component of the Technical/Vocational Education programme offered by the Council. **Commencing May/June 2005, Technical Drawing will be examined for certification at the General Proficiency only[1].** *Candidates have the option of using the Computer-Aided Drafting (CAD) method/application to complete Paper 02, Paper 03 and the SBA component of the syllabus.*

Candidates will be awarded an overall grade reported on a 6-point scale, that is, Grades 1-6. In addition to the overall grade, candidate's performance will also be reported under the profile dimensions, Knowledge, Application and Practical Ability.

Definitions

Knowledge	Recall and comprehension of terms, principles, methods, theories and structures; interpretation and extrapolation;
Application	Use of concepts, principles, methods and theories to solve problems in a given situation; analysis, synthesis and evaluation;
Practical Ability	Demonstration of manipulative skills involving the use of drawing instruments, equipment and materials in problem solving situations.

CANDIDATE POPULATION

The syllabus is designed to be covered in the final two years of the five-year secondary school programme and is intended for students enrolled in a full-time programme. However, candidates who do not attend school full-time may undertake the course by observing the following guidelines:

A. **Regulations for Private Institutions**

(i) Candidates entering for the examination through private institutions recognized

[1]Please refer to letter dated November 4, 2002 to Ministries of Education, Schools and Local Registrars.

by the Council will be required to complete all the components of the respective proficiencies.

(i) The School-Based Assessment of such candidates must be monitored by the tutors in the institution through which they register.

B. **Regulations for Private Candidates**

(i) "A private candidate is one not entered through a school or other approved educational institution".

(ii) A private candidate will be required to complete all the components of the respective proficiencies.

(iii) A private candidate must identify a teacher/tutor from a registered institution (school/technical institute/community college) who will assess and approve the candidate's submission for the School-Based Assessment component of the syllabus. The name, school, and territory of the identified teacher/tutor should be submitted to the Council on registration for the subject.

ALLIED SUBJECTS

School candidates should be encouraged to include the following subjects in their programme of study: one of the Industrial Technology subjects (Building Technology; Mechanical Engineering Technology; Electrical and Electronic Technology), English A, Mathematics, Physics.

SUGGESTED TIME ALLOCATION

It is recommended that a minimum of five 40-minute periods per week with no single period be allocated to the subject over a two-year period.

ORGANIZATION OF THE SYLLABUS

The syllabus is divided into three Units:

UNIT 1	-	Plane and Solid Geometry
UNIT 2	-	Building Drawing
UNIT 3	-	Mechanical Engineering Drawing

Candidates are expected to undertake UNIT 1: Plane and Solid Geometry and **EITHER** UNIT 2: Building Drawing **OR** UNIT 3: Mechanical Engineering Drawing.

CERTIFICATION AND DEFINITION OF PROFILES

The Technical Drawing course is an integral component of the Technical/Vocational Education programme offered by the Council. It will, therefore, be examined for certification at both Basic and General Proficiencies. Candidates have the option of using either the Traditional Drawing Method (drawing board and tee square) or Computer Aided Drafting method/applications to

complete the objectives of the syllabus.

Candidates will be awarded an overall grade reported on a 6-point scale, that is, Grades 1-6. In addition to the overall grade, candidate's performance will also be reported under the profile dimensions, Knowledge, Application and Practical Ability.

DEFINITIONS

Knowledge	Recall and comprehension of terms, principles, methods, theories and structures; interpretation and extrapolation;
Application	Use of concepts, principles, methods and theories to solve problems in a given situation; analysis, synthesis and evaluation;
Practical Ability	Demonstration of manipulative skills involving the use of drawing instruments, equipment and materials in problem solving situations.

(Distinction between Basic and General Proficiency)

The Basic Proficiency or "Core" syllabus provides the minimum Technical Drawing skills and competencies.

For the General Proficiency, the syllabus is augmented by additional modules to ensure a more extensive knowledge and understanding of the subject. General Proficiency candidates will normally be expected to proceed to further studies in their chosen subject areas and should be able to respond at a higher level to any of the modules listed in the syllabus, so as to demonstrate their ability to recall and apply the knowledge gained in the solution of problems of a practical nature.

Accordingly, the examinations for Basic Proficiency and General Proficiency differ in:

(i) the extent of the syllabus content to be covered;

(ii) the degree of difficulty of questions in papers other than Paper 1;

(iii) the relative importance of the three profile dimensions - Knowledge, Application, Practical Ability;

The syllabus coverage required is as follows:

BASIC PROFICIENCY

UNIT 1: Solid Geometry)	All areas except Module IX, Auxiliary Projections and Module (Plane and XI, Helical Curves.

EITHER	UNIT 2: (Building Drawing)

All areas except detailed section of staircases, walls and floors.

UNIT 3: (Mechanical Engineering Drawing) All areas except Sectional Assembly Drawings.

GENERAL PROFICIENCY	UNIT 1: (Plane and Solid Geometry) All areas
EITHER	UNIT 2: (Building Drawing) All areas
OR	UNIT 3: (Mechanical Engineering Drawing) All areas

FORMAT OF THE EXAMINATION

BASIC PROFICIENCY

Paper 01 multiple (¼ hours)	A paper common to Basic and General Proficiencies. Sixty (60) choice items on Unit 1 (except Auxiliary Projection, Module IX and Helical Curves, Module XI) - Knowledge, Application and Practical Ability will be tested in the approximate ratio 5:4:1. Each item will be worth one mark.
Paper 02 (1½ hours)	**Plane and Solid Geometry** Six structured questions on the same Unit as Paper 1 – three questions will be set on Modules I-VI and three on Modules VII, VIII and X. Candidates must attempt three questions but not more than two from any part. Each question will be worth 20 marks distributed in the approximate ratio: Knowledge 3: Application 7: Practical Ability 10.
Paper 03 (2½ hours)	**Building or Mechanical Engineering Drawing (Traditional)** Six structured questions testing the objectives of Modules in Unit 2: Building Drawing and Unit 3: Mechanical Engineering Drawing. Three questions will be set on Building Drawing and three on Mechanical Engineering Drawing. Candidates must attempt two questions: one working/assembly drawing and one sketch and design (from area of choice). The working/assembly drawing will be worth 60 marks of which 10 marks will be for (Knowledge), 20 for (Application) and 30 for (Practical Ability). The sketch and design question will be worth 20 marks of which 5 will be for (Knowledge), 7 for (Application) and 8 for (Practical Ability).

OR

Paper 03 (2½ hours)	**Building or Mechanical Engineering Drawing (Computer)** Six structured questions testing the objectives of Modules in Unit 2: Building Drawing and Unit 3: Mechanical Engineering Drawing. Three questions will be set on Building Drawing and three on Mechanical Engineering Drawing. Candidates must attempt two questions: one 2D working/assembly drawing and one 3D solid model design drawing (from area of choice). The working/assembly drawing will be worth 60 marks of which 10 marks will be for (Knowledge), 20 for (Application) and 30 for (Practical Ability). The solid model design drawing question will be worth 20 marks of which 5 will be for (Knowledge), 7 for (Application) and 8 for (Practical Ability).

BASIC PROFICIENCY

School-Based Assessment

During the fourth and fifth terms of the course, candidates will be required to complete a project testing the candidates' ability to design/redesign a Building component or Mechanical Engineering device/gadget to solve a simple functional problem in one of the ten categories, viz:

Categories

I)	Household	vi)	Business/Office
ii)	Education facilities	vii)	Power
iii)	Agriculture/Fishing	viii)	Recreation
iv)	Health facilities	ix)	Construction
v)	Transportation	x)	Manufacturing

The drawing project will carry 50 marks – 5 for Knowledge, 20 for Application and 25 for Practical Ability and will account for 20% of the composite score.

Candidates will be required to prepare a complete set of working drawings of the Building component or Mechanical Engineering device/gadget. Sketches, working/assembly drawings should be kept in a portfolio (laboratory book) which will be assessed by the teacher.

NB: The drawing project must be done in its entirety in the classroom/laboratory under the supervision of a teacher. It is anticipated that the project will not be done under examination conditions. However, the teacher is expected to ensure that the project is developed under his/her supervision and reflects solely the candidate's efforts. Candidates selecting the Traditional Drawing Method **may** complete the SBA drawing project using the Computer Aided Drafting Method/applications.

GENERAL PROFICIENCY

Paper 01 (1¼ hours)

A paper common to Basic and General Proficiencies. Sixty (60) multiple choice items on Unit 1 (except Auxiliary Projection Module IX and Helical Curves Module XI) – Knowledge, Application and Practical Ability will be tested in the approximate ratio 5:4:1. Each item will be worth one mark.

Paper 02 (1½ hours)

Plane and Solid Geometry

Eight questions on Modules of Unit 1– four questions will be set on Modules I – VI and four on Modules VII - XI. Candidates must attempt four questions, two from each part. Each question will be worth 20 marks distributed in the ratio 4:7:9 for (Knowledge), (Application), and (Practical Ability).

Paper 03 (3 hours)

Building and Mechanical Engineering Drawing (By Traditional Method)

Eight questions testing the objectives of Modules in Unit 2: Building Drawing and Unit 3: Mechanical Engineering Drawing of the syllabus. Four questions on Building Drawing and four questions on Mechanical Engineering Drawing. Candidates must attempt two questions: one sectional working/assembly drawing and one sketch and design from area of choice. The sectional working/assembly drawing question will be worth 80 marks of which 16 will be for (Knowledge), 32 for (Application) and 32 for (Practical Ability). The sketch and design question will be worth 20 marks of which 3 will be for (Knowledge), 7 for (Application) and 10 for (Practical Ability).

OR

Paper 03 (3 hours)

Building and Mechanical Engineering Drawing (By Computer)

Eight questions testing the objectives of Modules in Unit 2: Building Drawing and Unit 3: Mechanical Engineering Drawing of the syllabus. Four questions on Building Drawing and four questions on Mechanical Engineering Drawing. Candidates must attempt two questions: one sectional 2D working/assembly drawing and one 3D solid model design drawing from area of choice. The sectional working/assembly drawing question will be worth 80 marks of which 16 will be for (Knowledge), 32 for (Application) and 32 for (Practical Ability). The 3D solid model and design drawing question will be worth 20 marks of which 3 will be for (Knowledge), 7 for (Application) and 10 for (Practical Ability).

SCHOOL-BASED ASSESSMENT

Apart from the allocation of marks, the project is the same as for the Basic Proficiency. However, candidates **must** include a full or part sectional view of the fully assembled component or device/gadget for the Building or Mechanical Engineering Unit. The project will carry 60 marks – 6 for Knowledge, 24 for Application and 30 for Practical Ability and will account for 20% of the composite score.

REGULATIONS FOR RESIT CANDIDATES

Resit candidates who obtained 50% or more of the SBA total may choose **not** to repeat their SBA provided that they rewrite the examination not later than the subsequent year.

Candidates who obtained less than 50% of the total SBA marks **must** be re-assessed during Terms 1 and 2 of the year of the examination.

WEIGHTING

The percentage weighting of the examination components is as follows:

	Basic	General
Paper 1	24	20
Paper 2	24	27
Paper 3	32	33
School-Based Assessment	20	20

DISTRIBUTION OF MARKS BY PAPER AND PROFILE

Profiles	Basic Proficiency					General Proficiency				
	Paper 1	Paper 2	Paper 3	SBA	Total	Paper 1	Paper 2	Paper 3	SBA	Total
Knowledge	30	9	15	5	59	30	16	19	6	71
Application	24	21	27	20	92	24	28	39	24	115
Practical Ability	6	30	38	25	99	6	36	42	30	114
	60	60	80	50	250	60	80	100	60	300

The percentage weighting of the Profile dimensions is as follows:

Profile	Basic	General
Knowledge	24	24
Application	37	38
Practical Ability	39	38

UNIT 1: PLANE AND SOLID GEOMETRY

MODULE I INSTRUMENTS, LETTERING, LINES, DIMENSIONS, SCALES	SPECIFIC OBJECTIVES The student should be able to:	CONTENT
	1. identify common drawing instruments and equipment and state their uses;	Common drawing instruments: T-squares, set squares, scales, pencils, dividers, compasses, protractors, irregular curves.
	2. layout drawing sheet;	Alphabet of lines.
	3. draw and state the name and applications of the types of line used in drawing;	
	4. letter and dimension drawings;	Lettering: styles, guidelines, sizes, composition in lettering Dimensioning: lines and symbols, sizes of dimensions, location, standard detail.
	5. log on to system network;	System in laboratory: CPU, monitor, keyboard, mouse, printer, plotter; protective devices: voltage regulator, serge protector, UPS; care and safety of equipment and Computer software..
	6. practice basic Computer Aided Drafting operations.	Advantages of using Computer Aided Drafting software, Drafting terms: cursor, left-click, right-click, double-click, drag, select, pick, pick button, pick box, return, enter, Esc, tool, icon, tool tip, flyout, coordinate system, line commands, screen control, entering distances using direct distance entry and rectangular and polar coordinate methods.

MODULE I INSTRUMENTS, LETTERING, LINES, DIMENSIONS, SCALES CONT'D	SPECIFIC OBJECTIVES	CONTENT
		adjusting drawing limits, drawing lines, drawing circles, object snap, power snap, dimensioning. Saving and printing drawing.
MODULE II GEOMETRIC CONSTRUCTIONS	The student should be able to:	
	1. bisect straight lines, arcs and angles;	Geometrical terms: bisector, angle, perpendicular, parallel, arc. Angles: definitions and types; acute, right, obtuse, straight line.
	2. draw perpendicular to a given line, at a point on the line or from a point outside the line;	Characteristics of lines in drawing.
	3. draw a line parallel to a given line.	
	4. divide straight lines and angles geometrically;	Proportional division of lines and angles.
	5. copy any given angle.	
MODULE III CONSTRUCTION OF POLYGONS	The student should be able to:	
	1. construct triangles given:- three sides; two angles and one side; two sides and included angle; perimeter and proportion of sides; altitude and base angles; perimeter and base angles;	Triangles: definitions and parts of. Types of triangles: right angled, equilateral, isosceles, scalene, ambiguous case. Necessary data for the construction of triangles. Methods of construction of various types of triangles.
	2. construct a square given the length of one side and the diagonal;	Quadrilaterals: squares, rectangles, parallelograms

MODULE III CONSTRUCTION OF POLYGONS CONT'D	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	3. construct a rectangle given the length of the diagonal and one side;	Properties and identification of geometrical shapes.
	4. construct a parallelo-gram given the lengths of two adjacent sides and an angle;	
	5. construct a rhombus given the length of one diagonal and the length of one side;	Necessary data for the construction of any quadrilateral.
	6. construct a trapezium given the lengths of the sides, the perpendicular distance between them and one angle.	
	7. Construct a regular hexagon and octagon given the distance across flats (A/F); distance across corners (A/C);	Polygons: definition and types - pentagon, hexagon and octagon
	8. construct any regular polygon given the length of a side;	Necessary data for construction of any regular polygon.
	9. construct any regular polygon within a given circle;	
	10. construct any irregular polygon given the length of the sides and the included angles;	Necessary data for construction of any irregular polygon.

MODULE IV CIRCLES, ARCS, CURVES AND TANGENTS	SPECIFIC OBJECTIVES The student should be able to:	CONTENT
	1. construct circles given diameter or circumference;	Definition of a circle: parts of a circle - diameter, radius, arc, chord, quadrant. Properties of a circle.
	2. construct a circle to pass through - three given points; a fixed point and touching a line at a given point; two given points and touching a given line; two given points and touching a given circle;	Construction of circles.
	3. draw three circles which touch each other given the positions of the three centres;	
	4. construct the inscribed, circumscribed and escribed circles of any given triangle and any given regular polygon.	Relationship of the bisectors of the interior angles to the inscribed circle. Definition of inscribed, circumscribed and escribed circles. Relationship between the perpendicular bisector of a line and the circumscribed circle.
	5. inscribe the largest square within a triangle with one side lying on a side of the triangle;	
	6. draw arcs tangential to two straight lines at acute, right and obtuse angles;	Arcs and their relationship to the circle.

MODULE IV CIRCLES, ARCS, CURVES AND TANGENTS CONT'D	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	7. draw tangents to - a circle at a given point on the circumference; a circle from any given point outside of the circle; two given circles;	Definition of a tangent. Tangencies of circles, arcs and straight lines and their practical applications.
	8. construct the common internal and external tangents to two given circles;	Internal and external tangents and their applications. Centres and tangency points.
	9. draw an arc tangential to two given circles of different radii.	
MODULE V EQUIVALENT AREAS; REDUCING AND ENLARGING PLANE FIGURES	The student should be able to:	
	1. construct rectangles equal in area to triangles; squares equal in area to rectangles and triangles; triangles equal in area to quadrilaterals and polygons; squares equal in area to quadrilaterals and polygons;	Areas of triangles, squares, rectangles, quadrilaterals, and polygons.
	2. determine areas of plane figures graphically;	Graphical determination of areas of laminae and combined plane figures.
	3. divide triangles and polygons into a number of equal parts by drawing lines parallel to one side;	Similar triangles and proportional figures.
	4. reduce and enlarge plane figures by linear measurements or ratio of sides; ratio of areas;	Principles involved in reducing and enlarging areas of figures.

MODULE VI LOCI	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	1. draw an ellipse by the foci, trammel, concentric circles and rectangular methods; and construct normal and tangent at a point on the curve;	Conic sections – relation-ships Ellipse: definitions and properties. The ellipse as loci of a moving point. Methods of construction of the ellipse. Parts of the ellipse: major and minor axes, directrix, vertices, focus.
	2. draw by the focus method: parabola; hyperbola;	Parabola and hyperbola: definition and properties. Methods of construction of the parabola and hyperbola. Parts of parabola and hyperbola: vertices, directrix, focus, ordinate.
	3. draw the involute of a square and a circle;	Involute of a circle.
	4. plot and trace the loci of given points;	Simple loci problems with practical applications.
	5. plot and trace the loci in a simple crank mechanism;	
	6. draw an Archimedean Spiral;	Archimedean Spiral. Parts of a spiral: pole, radius, vector, convolution.
	7. draw cycloidal curves.	Cycloidal curves and their applications.
MODULE VII PICTORIAL DRAWINGS	The student should be able to:	Principles of pictorial drawings - isometric, oblique and perspective geometric solids: cones, prisms, pyramids, cylinders, simple models, blocks, isometric circles. Free hand pictorial sketches.
	1. draw isometric, oblique and 1-and 2-point perspective drawings of geometric solids and simple models.	

MODULE VII PICTORIAL DRAWINGS CONT'D	SPECIFIC OBJECTIVES	CONTENT
		Using Drawing Aids: grid, snap, isoplane settings.
MODULE VIII ORTHOGRAPHIC PROJECTION	The student should be able to: 1. draw orthographic projections of geometric solids and simple models using First angle or Third Angle projection;	Planes of projection: horizontal and vertical planes. Plans and elevations. Free hand orthographic
MODULE IX AUXILIARY PROJECTIONS	The student should be able to: 1. draw primary auxiliary views by projection;	Auxiliary planes of projection - oblique planes inclined to both horizontal and vertical planes.
	2. determine the true lengths of straight lines by revolution and auxiliary methods;	Straight lines and laminae inclined to both horizontal and vertical planes.
	3. determine true shapes of laminae by auxiliary projections;	
	4. determine the true shapes of sectioned surfaces of geometric solids;	Cones, cylinders, prisms and pyramids.
	5. construct curves of interpenetration of geometric solids with their axes in the same plane;	Solids with axes in the same plane, cylinder/cylinder, prism/prism, prism/cylinder.

MODULE X SURFACE DEVELOPMENTS	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	1. draw surface developments of right geometric solids;	Cones, cylinders, prisms, pyramids.
	2. draw surface developments of sectioned right geometric solids;	Frusta of cones, pyramids, prisms, cylinders and sheet metal joints, bends, knees.
MODULE XI HELICAL CURVES	The student should be able to:	
	1. draw helical spring of circular cross-section;	Helix curve, pitch, lead.
	2. construct a single helical curve on a cylinder;	

UNIT 2: BUILDING DRAWING

MODULE I BUILDING CODES AND MATERIALS	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	1. demonstrate the application of Building codes as they apply to standard building drawing procedures;	Building code regulations, for example, set backs, road sizes, verge, water zones.
	2. prepare a drawing sheet;	Borders, title blocks
	3. demonstrate standard architectural practice;	Standard drawing practice, for example, lines weight, lettering, symbols, conventions.
	4. prepare drawings to given scales;	Sketching in proportion, working drawings to scale.
	5. produce 2D and 3D solid model drawings of a building or its components.	Drawing Aids, drawing construction lines (c-lines) using cross, parallel with full distance, drawing outline, inserting dimension, hatching, using mirror copy, saving & printing .
MODULE II SITE WORK	The student should be able to:	
	1. prepare working plans of building sites;	Importance of site investigation. Common site clearance practices: demolishing, salvaging, cutting, burning, earth-moving and disposing.
	2. prepare site plans;	Factors important to site layout: slope, layout of land, drainage, sewer disposal, fencing, locating boundaries, building regulations for site layout. Components of site plans. Elementary introduction to sub-soils.

MODULE III FOUNDATIONS	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	1. prepare simple working drawings of foundation work;	Simple concrete foundations for level and sloping ground.
	2. prepare sketches for concrete foundations of buildings;	
	3. prepare sketches for simple reinforcement of foundation work;	Simple reinforcement , orthographic pictorial and freehand sketches
	4. prepare drawings of common footings used in building construction;	Instrument drawings/section details
	5. draw foundation plans;	Position of foundation wall, footing.
MODULE IV FLOOR PLANS AND ELEVATIONS	The student should be able to:	
	1. design and layout a simple floor plan from given specifications;	Orientation and relationship of rooms, positioning of walls, windows, doors, stairs, arches, bathroom and kitchen symbols. Linework, dimensioning annotation. Measuring to scale.
	2. make a freehand sketch of a floor plan;	
	3. draw floor plans to given scales;	
	4. draw elevations of buildings;	Projections and orientation, ground line, floor line, doors and windows in elevation, height of roof, fascia eave, rendering.
MODULE V FLOORS	The student should be able to:	
	1. prepare drawings showing various types of floor and floor section;	Solid, hollow and suspended ground floor, floor covering, for example, tiles, screed.

MODULE VI INTERNAL AND EXTERNAL WALLS AND FINISHING	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	1. draw details of various types of wall;	Stone rubble walls Concrete block walls Brick walls Composite walls Internal and external rendering; sectional details
	2. differentiate between internal and external load bearing and non-load bearing walls;	Load and non-load bearing walls constructions in blocks and timber.
	3. draw detailed framed timber partition;	Treatment of openings in wall.
	4. make working drawings of wall details;	Plastering to walls and ceilings. Internal and external renderings. Sectional details.
MODULE VII ROOFS	The student should be able to:	
	1. draw plan and elevations of various types of roof and roof structure;	Common types of roofs found in the region. Roof terms: ridgeplate, common rafters, hip rafters, valley rafters. Flat roofs in timber and their coverings, gable-end roofs. Pitched roof construction with various coverings. Treatment of gutters, parapets and ventpipes.
	2. prepare working drawings of roof anchorage systems;	Methods of anchorage, hurricane clips/straps, bolts
	3. prepare a working drawing of a roof showing truss details;	Simple contemporary timber trusses.
	4. prepare working drawings showing open and closed eaves;	Eave details, dimensioning and annotations.

MODULE VIII DOORS AND WINDOWS	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	1. prepare drawings showing various types of door and window and their fittings;	Internal and external doors with linings and frames. Common types of windows.
	2. draw a detailed section of a sliding window in a masonry wall;	Horizontal and vertical sliding windows.
	3. prepare typical sectional drawings to show door and window details;	Window casements, iron-mongery and louvres. Positioning of hinges and locks.
MODULE IX STAIRWAYS	The student should be able to:	
	1. draw stairs and calculate risers from given heights;	Principles of construction of straight flight stairs – both timber and simple reinforced concrete.
	2. prepare drawings of common inside stairway;	
	3. prepare a sectional working drawing of a straight flight staircase;	
	4. prepare a detailed drawing of the parts of a step;	
MODULE X SECTIONS	The student should be able to:	
	1. prepare full sectional drawings of single-storey buildings;	Using principles of ortho-graphic projection: found-ation, floors, walls, roofs.

UNIT 3: MECHANICAL ENGINEERING DRAWING

MODULE I PREPARATION OF DRAWING SHEET	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	1. prepare drawing sheet with appropriate title block.	B.S. 308 1984 parts 1 & 2; Engineering Drawing Office Practice - PD 7308; ISO 9000; Title of Drawing, Scale, Date of Drawing, Name of Draftsman, Drawing number, Revisions, Symbol of Projection, Lettering; Size of Drawing Sheets, Use of Guidelines.
MODULE II ORTHOGRAPHIC PROJECTION	The student should be able to:	
	1. draw orthographic views in first-angle or third-angle projection of simple machine parts and components;	Orthographic views in First or Third Angle Projection of vee blocks, plummer block, tool holders, tool post, connecting rod, pulley frame, pulleys, pulley yoke, lever bracket, machine vice body, shaft bearing, angle plate base, pivot block, bearing block, axle support.
	2. use machining symbols on machine parts and components;	Machined surfaces.
	3. prepare scaled orthographic views in first-angle or third-angle projection of simple machine parts and components;	Scales: Reduction 1:2; 1:5; 1:25; 1:50; 1:100:, 1:500. Scale: Enlargement: 2:1, 5:1, 10:1, 25:1, 50:1, 100:1. Diagonal scale. Indicate scale used.

MODULE II ORTHOGRAPHIC PROJECTION CONT'D	SPECIFIC OBJECTIVES The student should be able to:	CONTENT
		Drawing construction lines (c-lines) using cross, parallel with full distance, drawing outline, inserting dimension; mirror copy drawing, inserting angle dimension, drawing centre lines, drawing and dimensioning fillets & chamfer, drawing tangent lines, break objects, hatching, surface texture symbols, leader lines. hidden detail lines, use of shaft generator, saving & printing drawing.
MODULE III ENGINEERING CONVENTIONS	The student should be able to:	
	1. apply conventional representations for machine parts, components;	Conventional representation of bearings, metric screw thread, shafts, springs, gears, knurl, flat on round, square, lap, countersink, counterbore, spot face, chamfer, bevel, tubular sections.
	2. dimension drawings;	Stop (Extension) lines, dimension lines, arrowheads, leaders, overall dimensions, chain dimensioning, linear dimensioning, dual dimensioning, angular dimensioning, arrangement of dimensions, toleranced dimensions, radius, diameter, circles, arcs, metric screw threads.
	3. apply conventional representation of welding and brazing symbols on fabricated machine parts and components.	Welding and brazing symbols.

MODULE IV SECTIONS	SPECIFIC OBJECTIVES	CONTENT
	The student should be able to:	
	1. prepare sectional drawings of simple machines, machine parts and components;	Types of sections: full, half, part, off-set, revolved, removed, local, sectional plan and elevations of vee block, plummer block, connecting rod, pulleys, lever bracket, machine vice body, shaft bearing, angle base plate, support block, support arm, support plate, brackets, jig body, shaper quadrant, tension block, bearing block, lathe tool post, link connector, compound rest, crank;
MODULE V ENGINEERING FASTENERS	The student should be able to:	
	1. make orthographic drawings and free-hand sketches of engineering fasteners;	Engineering fasteners: Temporary fasteners: nuts and bolts, screws, studs, cotters, locknuts, slotted nuts, castle nut, self-locking nut, spring washers, saddle keys, round keys, feather keys, parallel keys, taper keys, woodruff keys, split pins; Permanent fasteners: rivets, conventional representation of welds, and brazings: fillet, vee, butt, spot. Indication of direction, site and location of weld.
MODULE VI ASSEMBLY DRAWINGS	The student should be able to:	
	1. draw plan and elevations in first-angle or third-angle projection of assembled machine parts and components;	Assemblies of shaft and pulleys, casters, jigs and fixtures, machine and bench vices, bearing assemblies, universal couplings, lathe steady, pulley and hook, shaft block and bearing, tool supports and

	SPECIFIC OBJECTIVES	CONTENT
MODULE VI ASSEMBLY DRAWINGS CONT'D	The student should be able to:	
		holders, lathe tail stock, valve link connector, connecting rod and bearing, screw jack, scribing block, clamping devices, vee block and clamp, crank and pin, footstep bearing, clapper box, eccentrics, tool rest, pipe vice, swivel.
	2. Draw sectional plans and elevations of assembled machine parts;	Parts list given machine components showing Part. No., Name of Part, Number required, Material, Remarks, balloon referencing.
	3. Read and prepare working drawings of machine parts and components;	
	4. Prepare parts list of machine components.	
MODULE VII SKETCHING	The student should be able to:	
	1. make freehand sketches of engineering components;	Sketching of engineering features using standard graphic symbols, sectional assemblies;
	2. produce 3D solid model drawing. of engineering components.	Shaped blocks, chisels, punches, nuts and bolts, hammers, saws, vee block, clamps, mallets, anvil, lathe tools, drill bits, taps and dies, reamers, welded joints, lathe tail stock, lathe centres, spanners, wrenches, tri-square, snips, stakes, hand groover, rivet snap, tap wrench.
		Using drawing aids: grid, snap, isoplane setting.

SCHOOL-BASED ASSESSMENT

RATIONALE

School-Based Assessment (SBA) is an integral part of student assessment in the course covered by this syllabus. It is intended to assist students in acquiring certain knowledge, skills and attitudes that are associated with the subject. The activities for the SBA are linked to the syllabus and should form part of the learning activities to enable the student to achieve the objectives of the syllabus.

During the course of study for the subject, students obtain marks for the competence they develop and demonstrate in undertaking their SBA assignments. These marks contribute to the final marks and grades that are awarded to students for their performance in the examination.

The guidelines provided in this syllabus for selecting appropriate tasks are intended to assist teachers and students in selecting assignments that are valid for the purpose of SBA. The guidelines provided for the assessment of the assignments are intended to assist teachers in awarding marks that are reliable estimates of the achievement of students in the SBA component of the course. In order to ensure that the scores awarded by teachers are consistent with the CXC standards, the Council undertakes the moderation of a sample of the SBA assignments marked by each teacher.

School-Based Assessment provides an opportunity to individualise a part of the curriculum to meet the needs of students. It facilitates feedback to the student at various stages of the experience. This helps to build the self-confidence of students as they proceed with their studies. School-Based Assessment also facilitates the development of the critical skills and abilities emphasised by this subject and enhances the validity of the examination on which candidate performance is reported. School-Based Assessment, therefore, makes a significant and unique contribution to both the development of relevant skills and the testing and rewarding of students for the development of those skills.

GENERAL PROFICIENCY

During the fourth and fifth terms of the course, candidates will be required to complete a project testing the candidates' ability to design/redesign a Building component or Mechanical Engineering device/gadget to solve a simple functional problem in one of the ten categories, namely:

Categories

i)	Household	vi)	Business/Office
ii)	Education facilities	vii)	Power
iii)	Agriculture/Fishing	viii)	Recreation
iv)	Health facilities	ix)	Construction
v)	Transportation	x)	Manufacturing

Candidates will be required to prepare a complete set of working drawings of the Building component or Mechanical Engineering device/gadget. Sketches, working/assembly drawings should be kept in a portfolio (laboratory book) which will be assessed by the teacher. Candidates **must** include a full or part sectional view of the fully assembled component or device/gadget for the Building or Mechanical Engineering Unit. The project will carry 60 marks – 6 for Knowledge,

24 for Application and 30 for Practical Ability and will account for 20% of the composite score (See page 4 of this document for detailed criteria and mark scheme).

NB: *The teacher should prepare candidates for the drawing project by discussing with them the stages in the design process: recognition of need; definition of problem; illustration of various aspects of solution; selection of best solution; evaluation of selected solution; and presentation of chosen solution.*

The drawing project must be done in its entirety in the classroom/laboratory. Since this project is part of School-Based Assessment, it must be done under the guidance of the teacher but must be the candidate's own work.

Candidates who opt to use the Traditional Drawing Method for Paper 02 and Paper 03 may, nevertheless, opt to do the SBA drawing project using the Computer Aided Drafting method/application.

RECOMMENDED MINIMUM EQUIPMENT/MATERIAL FOR TECHNICAL DRAWING SYLLABUS

TRADITIONAL DRAWING METHOD (For a Class of 20)

Any suitable classroom can be converted into a Drawing Room with the addition of Drawing Boards.

	EQUIPMENT	QUANTITY
1.	Drawing boards	20
	OR	
	Dual drawing desks	10
	OR	
	Drawing tables	20
2.	Half imperial tee-squares	20
3.	Pair of set squares	20
4.	Protractors, scales and french curves	20
5.	Pair of drawing clips	20
6.	Set of drawing instruments	20

In addition, students will be required to have the following:

(a) A hand towel or cheese cloth;
(b) A good eraser;
(c) Pencil – grades HB, F, H 2H.

COMPUTER AIDED DRAFTING METHOD (For a Class of 10)

It is the responsibility of schools that select the Computer Aided Drafting option to ensure that the required hardware and software are in place to achieve the objectives of the syllabus.

Recommended Hardware

1. PC fitted with an Intel 80486 or Pentium CPU with the following features: 10

   - a minimum of 16 Mbytes memory (RAM);
   - hard disk with at least 70 Mbytes of free space to allow Computer Aided Drafting files to load.

2. A 17 inch VGA monitor 10
3. Mouse & Keyboard 10 each
4. Laser Printer 1
5. Plotter 1
6. UPS/other power protection devices

Recommended Software

1. AutoCAD
   OR
2. AutoCAD LT for Windows 95/98.
   OR
3. Any other Computer Aided Drafting software package offering the advanced features required to complete the syllabus objectives.

NB: The School Edition of the software package selected should be purchased to facilitate its (legal) use on multiple computers.

RECOMMENDED TEXTS

Bankhole, A. & Bland S.	*Technical Drawing 2 Mechanical Drawing*,1990. Essex: Longman Group UK Limited, ISBN 0-582-58857-X.
Boycott, R.W. & Bolan, J.	*Graphics & Design*,1985. London: Edward Arnold (Publishers) Ltd., ISBN 0-7131-0978-5.
Morling, K.	*Geometric and Engineering Drawing* (2nd Edition), 1991. Edward Arnold London, ISBN0-7131-3319-8.
Yarwood, A.	*Technical Drawing With Design*, 1994. The Macmillan Press Ltd., London, ISBN 0-333-60161-0.
Yarwood, A.	*An Introduction to AutoCAD Release 14*, 1998. Addison Wesley Longman Ltd., England, ISBN 0-582-32656-7.
Yarwood, A.	*An Introduction to AutoCAD LT for Windows 95*, 1996. Addison Wesley Longman Ltd., England, ISBN 0-582-30505-5.
	Engineering Drawing Practice Parts 1 & 2. British Standards Institution, 2 Park Street, London WIA 2BS.
Bankhole, A. & Bland S.	*Technical Drawing 1: Plane and Solid Geometry*,1991. Longman, ISBN0-582-65199-5.
Scoa, E.	*Technical Drawing 3: Building Drawing* 1992. Longman ISBN 0-582-65140-9.
Maguire, D & Simmons C.	*A Manual of Engineering Drawing*, 1995. Edward Arnold, London.

Western Zone Office
March 31, 2000

CARIBBEAN EXAMINATIONS COUNCIL
WESTERN ZONE OFFICE

MARK SCHEME

SUBJECT: TECHNICAL DRAWING **PROFICIENCY:** GENERAL **PAPER:** SBA

QUESTION	KNOWLEDGE	MARKS		APPLICATION	MARKS		PRACTICAL ABILITY	MARKS	
		B/D	TOTAL		B/D	TOTAL		B/D	TOTAL
	Knowledge of: - Statement of the problem - Conditions - Drawings: • pictorial; • sectional assembly / working - Dimensioning	 1 1 1 2 1		Principles of : - Statement of the problem • specific - Conditions • operation - Drawings: • pictorial • sectional assembly / working - Design: • function • safety • suitability of materials - Dimensioning	 5 5 2 4 6 2		Accuracy of: - Design - Drawings: • pictorial • sectional assembly/ working - Dimensions - Dimensioning Techniques - Linework/Linetype • outline • centre line • hidden line • hatching line - Text/print • name of project • category - Neatness/CAD presentation	 6 3 5 4 2 4 2 4	
			6			24			30

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