TVET FIRST

Part 1
2024 implementation

TVET N4 CURRICULUM GUIDE

A summary of all the changes to the Industrial Electronics N4 and Mechanical Draughting N4 curricula

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Contents

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Industrial Electronics N4

This document contains important information about the revised curriculum for Industrial Electronics N4 for implementation in May 2024.

Overview of main curriculum changes

The syllabus for Industrial Electronics N4 has been reworked and updated. The most notable change is the omission of **8.9** (Testing equipment) from the new curriculum.

Module 1

- The former **8.2** (Direct current theory) is now **Module 1** (Network theorems).
- Norton's theorem is a new addition, with three Learning Outcomes (LOs).
- The maximum power theorem has been moved to **Module 1** from the former **8.1.2**.

Module 2

- **Module 2** (Alternating current theory), with its eight LOs, corresponds largely to **8.1.1** and **8.1.2** in the old syllabus.
- New additions are RL and RC circuits.
- Complex number calculations now include frequency.
- Impedance is specified as 'dynamic impedance'.

Module 3

- The former **8.3** (Semi-conductors – diodes), as well as sections of **8.7** (Electronic power control) correspond largely to the new **Module 3** (Electronic power control).
- A portion of the former **8.3.1** (Properties, characteristic curves and applications of the junction diode) is no longer explicitly specified as a requirement but may be implied.
- A 'PN junction diode' in **8.3.2** is now identified simply as 'diode'.
- The diodes in the former **8.3.4** now include Schottky, Avalanche, and Gunn diodes, and require their operating principles, uses, and characteristic curves.
- The circuit diagram of a Zener voltage regulator is also required (3.1.6).
- The construction of the various power devices in **8.7.1** has not been specified in the new curriculum.
- The former **8.7.3** (Details of single-phase motor speed control) has been removed from the syllabus.

Module 4

- The former **8.4** (Power supplies) broadly matches the updated **Module 4** (Power supplies), although some LOs are now given in more detail.
- The components of a DC power supply must be identified with a sketch (4.1.1).
- Eleven types of transformers are listed, and their operating principles must be explained by way of labelled circuit diagrams (4.1.2).
- Three transformer ratios are listed, which must be explained and calculated (4.1.3).
- Three new LOs require calculating the current voltage or turns on the primary and secondary windings (4.2.2), calculating the KVA rating of a transformer (4.3.1), and explaining the term 'rectification' (4.4.1).

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- The basic operation of filter circuits must be described in words (4.5.1), although their input and output waveforms are no longer explicitly required.

Module 5

- The former 8.5 (Transistor and amplifier devices) and 8.6 (Operational amplifiers) are now combined in the new Module 5 (Amplifiers) with its 26 LOs. Several LOs are new, while others have been specified in greater detail:
  - The concept of a transistor (5.1.1), as well as its operating points (5.1.3), must be explained in words.
  - New LOs deal with the quiescent point or Q point (5.1.5), coupling methods (5.1.6–5.1.7), positive vs negative feedback amplifiers (5.1.10) and four types of feedback connections (5.1.11).
  - The requirements regarding class A, B and AB amplifiers have been specified in greater detail in separate LOs, and the concept of crossover distortion has been added to two LOs.
- The former **8.5.6**, **8.5.7** and **8.5.8** have been removed from the syllabus. (This has been confirmed in correspondence with the Department of Higher Education.)
- The old **8.6.1** has been expanded to include the properties, characteristics and advantages of operational amplifiers.

Module 6

- Several LOs in the former **8.8** (Transducers) have been omitted in the new **Module 6** (Transducers and electronic testing equipment):
  - Applications in circuit diagram configurations are no longer required for resistive transducers (8.8.2), capacitive transducers (8.8.4), inductive transformers (8.8.6), and photo-electric transducers (8.8.8).
  - There are three new LOs for LCDs.
- The former **8.9** (Testing equipment) with its six LOs has been removed.

Aims

The aims of the new syllabus are:

- to equip students with knowledge and fundamental principles in the electronic industry in order to improve their work skills and further their career prospects
- for students to obtain a thorough knowledge of the principles and practices as applied in the electronics industry
- to introduce the application of technological principles and practices, such as:
  - power supplies and control
  - design procedures
  - process control
  - amplification.

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Structure and weighting changes

Previous syllabus (1990)

Old curriculum modules (no weighting given)
1. Alternating current theory
2. Direct current theory
3. Semi-conductors (diodes)
4. Power supplies
5. Transistor and amplifier devices
6. Operational amplifiers
7. Electronic power control
8. Transducers
9. Testing equipment

New syllabus (2024)

New curriculum modules	Weighting
1. Network theorems	20
2. Alternating current theory	20
3. Electronic power control	15
4. Power supplies	15
5. Amplifiers	15
6. Transducers and electronic testing equipment	15
Total	**100**

Detailed curriculum changes

New additions to the 2024 syllabus column are marked in red. Sections in teal in the 1990 syllabus column indicate items that have not been included in the new syllabus.

Previous curriculum (1990)	New curriculum (2024)
8.1 Alternating current theory	
8.1.1 Phasor diagram, simple and complex number calculations of: ● current ● voltage ● impedance ● inductive reactance	(Complex numbers: see 2.4)

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Previous curriculum (1990)	New curriculum (2024)
• capacitive reactance • phase angle: in series, parallel, and series parallel RLC circuits.	
8.1.2 Characteristic curves and calculations of: • Q-factor • bandwidth • maximum power transfer • resonant frequency: in series and parallel resonant circuits.	(Maximum power transfer: see 1.5)
8.2 Direct current theory	**Module 1: Network theorems**
8.2.1 Calculations of current, voltage and power by making use of the following network theorems: • Kirchhoff	**1.1 Kirchhoff's laws** **1.1.1** Explain the two laws of Kirchhoff in electrical circuits: • First law (current law) • Second law (voltage law) Calculate current, voltage and power by using Kirchhoff's laws.
• Superposition	**1.2 Superposition theorem** **1.2.1** Briefly explain the superposition theorem. **1.2.2** Calculate the equivalent resistance, current and voltage by means of the superposition theorem.
• Thevenin	**1.3** Thevenin's theorem **1.3.1** Briefly explain Thevenin's theorem. **1.3.2** Calculate the current, voltage and resistance using Thevenin's theorem. **1.3.3** Draw a neatly labelled circuit diagram of Thevenin's equivalent circuit.
	1.4 Norton's theorem **1.4.1** Briefly explain Norton's theorem. **1.4.2** Calculate the current using Norton's theorem. **1.4.3** Draw a neatly labelled circuit diagram of Norton's equivalent circuit.

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Previous curriculum (1990)	New curriculum (2024)
(See 8.1.2)	**1.5 Maximum power transfer theorem using nodal analysis and Thevenin's equivalent circuits** **1.5.1** Briefly explain the maximum power transfer theorem. **1.5.2** Calculate the current, voltage, resistance and power by using the maximum power transfer theorem.
	Module 2: Alternating current theory
(See 8.1.1)	**2.1 RLC circuits** **2.1.1** Apply the information given in RL, RC, RLC series or parallel circuits to calculate: ● voltage ● current ● inductive reactance ● capacitive reactance ● impedance ● phase angle ● frequency.
(See 8.1.1)	**2.1.2** Draw a neatly labelled phasor and impedance diagram.
(See 8.1.1)	**2.1.3** Analyse phasor diagrams and impedance diagrams to calculate: ● voltage ● current ● inductive reactance ● capacitive reactance ● impedance.
(See 8.1.2)	**2.2 Resonance circuits** **2.2.1** Explain the following terms: ● Resonance frequency ● Dynamic impedance ● Bandwidth ● Quality factor
(See 8.1.2)	**2.2.2** Calculate the resonance frequency, bandwidth, and quality factor for parallel and series RLC circuits.

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Previous curriculum (1990)	New curriculum (2024)
	2.2.3 Draw neatly labelled characteristic curves for the resonance frequency, bandwidth, and quality factor in parallel and series RLC circuits.
	2.3 Dynamic impedance **2.3.1** Calculate the dynamic impedance in LC parallel circuits.
(See 8.1.1)	**2.4 Complex numbers (*j* notation)** **2.4.1** Apply the information given in RLC series or parallel circuits, using complex numbers to calculate: • voltage • current • inductive reactance • capacitive reactance • impedance • phase angle • frequency.
(See 8.1.1)	**2.4.2** Draw a neatly labelled phasor diagram.
8.3 Semi-conductors (diodes)	**Module 3: Electronic power control**
8.3.1 Calculate the forward and reverse saturation current and the forward voltage by making use of the diode equation, properties, characteristic curves and applications of the junction diode.	**3.1** Semiconductor diode **3.1.1** Calculate the diode's forward current, reverse saturation current, and forward voltage drop by means of the diode equation.
8.3.2 Calculate of the forward resistance of a PN junction diode.	**3.1.2** Calculate the forward resistance of the diode.
(See 8.3.4)	**3.1.3** List different types of diodes and their applications.
(See 8.3.4)	**3.1.4** Describe the operating principles and the uses of the following diodes: • Zener • Schottky • Avalanche • Gunn • Tunnel • Varactor

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Previous curriculum (1990)	New curriculum (2024)
(See 8.3.4)	**3.1.5** Draw neatly labelled characteristic curves of the following diodes: • Zener • Schottky • Avalanche • Gunn • Tunnel • Varactor
	3.1.6 Draw a neatly labelled circuit diagram of a Zener voltage regulator.
8.3.3 Calculate current, voltage, and resistance values of a simple voltage regulator which employs a Zener diode and a series resistance.	**3.1.7** Calculate the current, voltage, and resistance values of a Zener voltage regulator.
8.3.4 Properties, characteristic curves and application of: • tunnel diodes • varactor diodes • Zener diodes.	(See 3.1.3, 3.1.4 and 3.1.5)
(See 8.7)	**3.2** Electronic power control **3.2.1** Draw a neatly labelled characteristic curve and describe the operating principle of the following power control devices: • SCR • DIAC • TRIAC • QUADRAC • LASCR
(See 8.7.2)	**3.2.2** Draw a neatly labelled block diagram and describe the operating principle of: • an open loop system • a closed loop system.
8.4 Power supplies	**Module 4: Power supplies** **4.1** Transformers **4.1.1** Identify different components of a DC power supply with the aid of a neatly labelled sketch.

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Previous curriculum (1990)	New curriculum (2024)
8.4.1 Types of transformers available and the application thereof	4.1.2 List and explain the operating principles of the following types of transformers with the aid of a neatly labelled circuit diagram: ● Step down ● Step up ● Centre-tap ● Multiple winding ● Autotransformer ● Isolation transformer ● Power transformer ● Instrument transformer ● Current transformer ● Potential/voltage transformer ● Audio frequency transformer
8.4.2 Calculations by use of the transformer ratio equation	**4.2 Transformer ratios** 4.2.1 Explain in words and by calculating the following transformer ratios: ● Turns ratios ● Voltage ratio ● Current ratio
	4.2.2 Use the information given for a transformer to calculate the current, voltage or turns on the primary and secondary windings.
	4.3 Transformer ratings 4.3.1 Calculate the KVA rating of the transformer.
	4.4 Rectification 4.4.1 Explain the term 'rectification'.
8.4.3 Circuit diagrams, operating principles, input and output waveforms of half-wave and full-wave diode rectification	4.4.2 Describe the operating principles of half- and full-wave rectifiers.
(See 8.4.3)	4.4.3 Draw neatly labelled circuit diagrams and show input and output waveforms of the following rectifiers: ● Half-wave rectifier ● Full-wave (centre-tap or bridge) rectifier

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Previous curriculum (1990)	New curriculum (2024)
8.4.4 Calculations of: ● average direct current values ● RMS values ● efficiency ● ripple factor ● maximum reverse voltage (PIV), in respect of half-wave and full-wave diode rectifier circuits.	**4.4.4** Utilise the information given for different rectifier circuits to calculate: ● average or DC values ● RMS values ● efficiency ● ripple factor ● PIV value
	4.5.1 Briefly describe, in words, the basic operation of filter circuits.
8.4.5 Circuit diagrams, input and output waveforms for: ● simple capacitor filters ● RC filters ● LC filters.	**4.5.2** Draw neatly labelled circuit diagrams of the following filter circuits: ● Capacitor filter ● RC filter ● LC filter
8.4.6 Calculate: ● average direct current values ● RMS values ● Efficiency ● ripple factor: for C, RC and LC filters.	**4.5.3** Utilise the information given for different filters to calculate: ● average/DC values ● RMS values ● efficiency ● the ripple factor.
8.5 **Transistor and amplifier devices**	**Module 5: Amplifiers** 5.1 **Transistors** **5.1.1** Explain in words what you understand by the component called transistors.
8.5.1 Properties, operating principles and formation, and NPN and PNP transistors.	
(See 8.5.2)	**5.1.2** Explain in words the operating principle of a transistor and the construction of transistor amplifier configurations (CE, CB and CC) by means of a fully labelled sketch.
(May be implied in 8.5.1)	**5.1.3** Explain the various operating points within the limits of operation of a transistor.
(See 8.5.2)	**5.1.4** Analyse the DC load line of a common emitter amplifier.

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Previous curriculum (1990)	New curriculum (2024)
	5.1.5 Explain, in words, the term 'quiescent point' (Q-point) and list the factors that affect the stability of the Q-point.
	5.1.6 Explain the different coupling methods used in amplifiers. *Range: Resistance-capacitance, transformer, and direct coupling*
	5.1.7 List the advantages, disadvantages, and applications of the different coupling methods used in amplifiers.
8.5.2 Circuit diagrams, characteristic curves, static load line, dynamic load line, and the relationship between input and output waveforms of: • common emitter amplifier (class A and class B operation) • common collector amplifier • balance amplifier.	**5.1.8** Describe the operation and characteristics of class A, B, AB and C amplifiers.
	5.1.9 Explain the operation and list the advantages of a class B push-pull amplifier.
	5.1.10 Distinguish between positive and negative feedback amplifiers.
	5.1.11 Explain and compare the different types of feedback connections. *Range: Voltage-series, voltage-shunt, current-series, and current-shunt feedback connection*
	5.1.12 List and explain the two types of transistor gains.
	5.1.13 Draw a labelled static/dynamic characteristic curve of a transistor.
(May be included in 8.5.3)	**5.1.14** Utilise the information given in CE, CC and CB transistor circuits to calculate the following: • Static/dynamic current gain • Static/dynamic voltage gain • Static/dynamic power gain

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Previous curriculum (1990)	New curriculum (2024)
8.5.3 Calculate: • current gain • voltage gain • power gain • decibels for class A single stage emitter coupled amplifier.	**5.1.15** Utilise the information given in an amplifier circuit to calculate the following in decibels: • Power gain • Current gain • Voltage gain
	5.1.16 List different types of push-pull amplifiers and their advantages/ disadvantages.
(May be included in 8.5.2)	**5.1.17** Draw neatly labelled circuit diagrams of push-pull amplifiers and show their input and output waveforms.
(See 8.5.2)	**5.1.18** Describe the operation of the common emitter amplifier used in class A and B modes. **5.1.19** Explain the difference between class A, class B, and class AB of amplifiers. **5.1.20** Describe the operating principle of class A, class B, and class AB amplifiers. **5.1.21** List the advantages and disadvantages of non-complementary class B push-pull amplifiers and symmetrical push-pull class AB amplifiers. **5.1.22** Draw neatly labelled circuit diagrams of non-complementary class B, symmetrical push-pull class AB, complementary-symmetry push-pull class B, complementary symmetry push-pull class AB, and the crossover distortion. **5.1.23** Describe the operating principle of non-complementary class B, symmetrical push-pull class AB, complementary-symmetry push-pull class B, complementary symmetry push-pull class AB, and the crossover distortion.

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Previous curriculum (1990)	New curriculum (2024)
8.5.4 *h*-parameter equivalent circuits for common emitter and base amplifiers	**5.1.24** Draw a neatly labelled circuit diagram of an *h*-parameter equivalent circuit for common base and common emitter circuits.
8.5.5 Calculations of gain with the aid of the approximated method	
8.5.6 Basic construction, operating principle, equivalent circuits, and characteristic curves of the unijunction transistor (UJT)	
8.5.7 Application of the unijunction transistor as a trigger for a silicon-controlled rectifier (SCR) circuit	
8.5.8 Basic construction, characteristic curves and operating principle of: ● J-FET ● MOS-FET (N-MOS and P-MOS) ● C-MOS	
8.6 **Operational amplifiers**	**Module 5: Amplifiers (continued)** **5.2.1** List the properties, characteristics, and advantages of an operational amplifier.
8.6.1 Gain calculations, circuit diagrams and the relationship between input and output waveforms of: ● inverter ● non-inverter ● adder ● differentiator ● comparator ● integrator	**5.2.2** Calculate the gain and draw the neatly labelled circuit diagrams with the associated input and output waveforms for an operational amplifier used as: ● an inverting amplifier ● a non-inverting amplifier ● an adder/summing amplifier ● a differentiator ● an integrator ● a comparator.
8.7 **Electronic power control**	(See 3.2)
8.7.1 Construction, operating principle, and characteristic curves of: ● silicon controlled rectifier (SCR) ● diac ● triac ● quadrac ● light activated silicon-controlled rectifier	(See 3.2.1)

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Previous curriculum (1990)	New curriculum (2024)
8.7.2 Block diagram and operating principle of open loop and closed loop systems	(See 3.2.2)
8.7.3 Circuit diagrams, block diagrams, operating principle, and input and output waveforms of single-phase motor speed control systems using an SCR, triac or quadrac	
8.8 **Transducers**	**Module 6: Transducers and electronic testing equipment**
8.8.1 Operating principles and applications of the following resistance transducers: • Potentiometer (angular displacement and barometric pressure) • Strain gauge • Thermistor	6.1 **Transducers** 6.1.1 Explain the operating principles and list the applications of the following resistive transducers: • Potentiometer • Strain gauge • Thermistor
8.8.2 Application in circuit diagram configurations of the following resistance transducers: • Potentiometer • Strain gauge • Thermistor	
8.8.3 Operating principles and applications of the following capacitive transducers: • Pressure • Liquid level	6.1.2 Explain the operational principles and list the applications of the following capacitive transducers: • Pressure • Liquid level
8.8.4 Application and circuit diagram configurations of capacitive transducers to measure pressure and liquid level	
8.8.5 Operating principle and applications of the following inductive transducers: • Differential transformer (LVDT) • Tachogenerator	6.1.3 Explain the operating principles and applications of the following inductive transducers: • Differential transformer • Tacho-generator

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Previous curriculum (1990)	New curriculum (2024)
8.8.6 Application in circuit diagram configuration of the following inductive transformers: • Differential transformer (LVDT) • Tachogenerator	
8.8.7 Operating principles, circuit diagrams, and applications of the following photo-electric transducers: • Light dependent resistor (LDR) • Photo diode • Photo transistor	6.1.4 Describe the operating principles, circuit diagram and applications of the following photo-electric transducers: • Light dependent resistor • Photodiode • Phototransistor
	6.2 **Introduction to LCD**
	6.2.1 Define the term 'LCD'.
	6.2.2 List applications/uses of LCD.
	6.2.3 List different types of LCD.
8.8.8 Application in circuit diagram configuration of the following photo-electric transducers: • Light dependent resistor (LDR) • Photo diode • Photo transistor	
8.9 **Testing equipment**	
8.9.1 Sketches and descriptions of: • cathode ray tube • focus method • deflection method • accelerating anodes	
8.9.2 Block diagram, operating principle, and application of the oscilloscope	
8.9.3 Description of the various controls with calculations in respect of volts/centimetre, periodical time, and frequency	
8.9.4 Block diagrams and the operating principle of the function generator	

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Previous curriculum (1990)	New curriculum (2024)
8.9.5 Graphical representations and application of: ● right-angle wave forms that include rise and fall time, pulse width, mark/space ratio, duty cycle, and pulse repetition frequency ● sinusoidal wave forms ● saw tooth	
8.9.6 Calculation of maximum, RMS, and average values of a sine wave	

Features and benefits of *TVET First Industrial Electronics N4*

This *TVET First* series consists of a Student's Book, a Lecturer's Guide and a Workbook for students.

TVET First is the ideal textbook to guide Industrial Electronics students towards success in their studies. This high-quality Student's Book is packed with features that take students through the complete curriculum and prepare them for examination success. Features of the textbook include the following:

- **Concepts** are defined and explained in understandable language.
- **Diagrams** have been clearly labelled so that students can identify the components and specifications of different electrical circuits and characteristic curves.
- Worked **examples** break down problems into steps that can be followed easily.
- **Calculations** show all steps so that students can follow the reasoning and maths.
- Detailed **tables** compare advantages and disadvantages, formulas, differences, and relationships between different circuits and systems.
- **Activities** are tailored to TVET students to ensure that they are prepared for tests, assignments, internal examinations, and final examinations.
- **Summaries** at the end of every module make revision easier.
- The accompanying Workbook:
  - allows students to engage meaningfully with the activities
  - keeps answers to activities and summative assessments together and neatly organised
  - provides a useful revision aid to prepare for the final examination
  - includes pre-knowledge information that some students will need to master the N4 content.

TVET First author

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Mechanical Draughting N4

This document contains important information about the revised curriculum for Mechanical Draughting N4 for implementation in May 2024.

Overview of main curriculum changes

- The syllabus for Mechanical Draughting N4 has been fully reworked and updated.
- The old **Module 1** (Conventional representation of a single spur gear, spur gears in mesh, square threads and helical springs) has been replaced by **Loci** in the new syllabus.
- The flat-end follower has been added to **Module 2** Topic 2.2 (Outline of the cam).
- **Modules 3, 4 and 5** remain substantively unchanged.

Structure and weighting changes

Previous syllabus (1993)

Old curriculum modules	Weighting
1. Conventional representation of a single spur gear, spur gears in mesh, square threads, and helical springs	12
2. Cam profiles	16
3. Sectional drawing	22
4. Detail drawing	22
5. Assembly drawing	28
Total	**100**

New syllabus (2024)

New curriculum modules	Weighting
1. Loci	12
2. Cam profiles	16
3. Sectional drawing	22
4. Detail drawing	22
5. Assembly drawing	28
Total	**100**

Mechanical Draughting N4

Detailed curriculum changes

New additions to the 2024 syllabus column are marked in red. Sections in teal in the 1993 syllabus column indicate items that have not been included in the new syllabus.

Previous curriculum (1993)	New curriculum (2024)
	Module 1: Loci *On completion of this module, the student should be able to draw the locus of a point on a mechanism.* **1.1** Link mechanism • Draw the simple link mechanism of up-to four arms **1.2** Construction of loci • Draw the locus of a point on the mechanism
Module 2: Cam profiles On completion of this module, the student must be able to draw the following types of cam profiles: constant velocity, uniform acceleration and retardation, and simple harmonic motion, bearing the following in mind:	**Module 2: Cam profiles** On completion of this module, the student should be able to draw the displacement diagram and cam profile.
	2.1 Displacement diagram
• The displacement diagram must be drawn.	• Draw the displacement diagram using the following types of motions: – constant velocity (CV) – simple harmonic motion (SHM) – dwell – uniform acceleration and retardation (UAR)
• The displacement diagram may be drawn on the left-hand side of the cam profile irrespective of whether the cam rotates.	• Draw the displacement diagram on the left-hand side of the cam profile.
• The centre line of the follower must be directly on the centre of the cam (i.e. no offset).	**2.2** Outline of the cam

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Previous curriculum (1993)	New curriculum (2024)
• Both clockwise and anticlockwise rotation may be asked and must be indicated by means of an arrow on the cam profile. • The displacement diagram may be drawn on the left-hand side of the cam profile irrespective of whether the cam rotates clockwise or anticlockwise as long as the profile is correctly drawn and labelled according to its correct direction of rotation when viewed from the front. • only cams with knife edge or roller followers.	• Draw the outline of the cam considering the clockwise and anticlockwise directions. • Indicate the direction of motions using arrows. • Draw the cam profile of knife-edge follower, flat-end follower and roller follower where the centre line of the follower is directly on the centre of the cam as well as where the centre line of the follower is offset.
• The shaft is shown as an outline (line type A) and is hatched.	• Indicate the shaft by hatching.
• Lift must occur during the first 180 degrees of the cam rotation, with any of the above types of motion. • Fall (return) must occur during the last 180 degrees of the cam rotation, with any of the above types of motion. • The lift and fall need not be the same type of motion. • During lift, only one type of motion will be asked. • During fall, only one type of motion will be asked. • Dwell may be included. • All construction lines must be projected and not just marked off with a compass. • The angle of lift and fall, as well as the type of motion, must be indicated on the outside of the cam profile. Abbreviations may be used, e.g., CV, UAR and SHM. • The follower need not be drawn.	• Indicate the angle of lift and fall as well as type of motion of the cam profile.

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Previous curriculum (1993)	New curriculum (2024)
Module 3: Sectional drawing *On completion of this module, the student must be able to draw the primary views of machine components according to scale in first or third angle orthographic projection, bearing the following in mind:*	**Module 3: Sectional drawing** *On completion of this module, the student must be able to draw the primary views of the machine components according to the scale in first or third angle orthographic projection.*
• Full section, half section, cutting planes that change direction, partial section, revolved sections, and removed sections • Cutting plane lines • Outside views • Machine parts with interpenetration curves and fillet radii • Only the starting point and end point need be determined for interpenetration curves larger than 5 mm on the drawing in this module. These points must then be joined using a flexi-curve. • Conventional representation of drilled and tapped holes, bolts, nuts, and studs • Instruction notes: internal and external chamfering, spot facing, counterboring, countersinking, drilling, and tapping specification • Hidden detail may be asked. • Machining and surface texture symbols include the following: – Removal of material by machining – Removal within a limit – Removal between a high and low limit – Production method – Sample length – Machining allowance – No machining – No machining with a limit – Method to avoid repeating a symbol – Surface texture processes: flame cut, saw, mill, ream, bore, turn, grind, polish, and sandcast	**3.1** Sectional views and cutting planes • Draw the full sectional views, half sectional views, partial section, revolved sections, removed sections, and cutting planes. **3.2** Outside views • Draw the outside front view, left view and top view. **3.3** Machine parts • Draw machine parts with interpenetration curves and fillet radii. **NB:** Only the starting point and end point need to be determined for interpenetration curves larger than 5 mm on the drawings in this module. These points must then be joined using flexi-curve. • Draw conventional representation of drilled and tapped holes, bolts, nuts, and studs. • Insert instruction notes, internal and external chamfering, spot facing, counterboring, countersinking, drilling, and tapping specifications on machine parts. **3.4** Machining and surface texture symbols • Draw symbols for removal of material by machining, removal within a limit, and removal between a high and low limit.

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Previous curriculum (1993)	New curriculum (2024)
• Limits and fits (Students will be supplied with tables and are expected to be able to use the applicable tables and thus insert the tolerances in micrometres converted to millimetres on the drawing.	• Draw the symbols for no machining, no machining with a limit, machining allowance, sample length, method to avoid repeating a symbol. • Draw surface texture processes: flame cut, saw, mill, ream, bore, grind, polish, and sandcast.
Module 4: Detail drawing *On completion of this module the student must be able to dismantle the parts of a given assembly drawing and thereafter draw the primary views according to scale and in first or third angle orthographic projection of each separate item (part) bearing the following in mind:*	**Module 4: Detail drawing** *On completion of the module, the student must be able to dismantle the parts of a given assembly drawing and thereafter draw the primary views according to scale and in first and third angle orthographic projection of each separate item (part).*
• Dimensioning	**4.1** Dimensioning • Insert the main dimensions on the drawings of the parts using basic dimensioning and reference dimensioning. • Use the correct dimensioning style, line, arrows and extension line as prescribed by the engineering standards • Insert the tolerance on dimensioning on each separate part.
• Sectional as well as outside views	**4.2** Sectional views and outside views • Draw the sectional views as well as outside views of each separate item (part).
• Conventional representation of drilled and tapped holes as well as specially manufactured bolts and nuts	• Draw conventional representations of drilled and tapped holes, bolts, nuts, and studs.
• Machining and surface texture symbols as well as ISO limits and fits and instruction notes	• Draw machining and surface texture symbols as well as ISO limits, fits, and instruction notes.

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Previous curriculum (1993)	New curriculum (2024)
Module 5: Assembly drawing *On completion of this module, the student must be able to correctly assemble the components given in detail drawings and draw the primary views of the assembly according to scale in first or third angle orthographic projection bearing the following in mind:*	**Module 5: Assembly drawing** *On completion of the module, the student must be able to correctly assemble the components given in detail drawings and draw the primary views of the assembly according to scale in first and third angle orthographic projection.*
● Item numbers and a parts list	**5.1** Item number and parts list ● Draw the parts lists. ● Indicate the item numbers on the components using the balloons.
● Sectional or outside views ● A maximum of ten items (bolts, nuts, studs, pins, etc. excluded) may be given.	**5.2** Sectional views and outside views ● Draw the sectional views as well as outside views of the complete assembly drawing that consists of at most ten items. **NB:** Nuts will not necessarily be shown on the diagram sheet but will be referred to in the parts list.
● Conventional representation of bolts, nuts, studs, drilled, and threaded holes. A nut stencil may be used, but students should be able to construct bolt heads and nuts. A complete assembly drawing will not necessarily be asked. Because of time constraints, the examiner may ask that some of the items be left out.	**5.3** Conventional representation of the mechanical components ● Draw conventional representation of drilled and tapped holes, threaded holes bolts, nuts, and studs. A nut stencil may be used but students must be able to construct the bolt heads and nuts.
Not covered in new syllabus: **Module 1: Conventional representation of a single spur gear, spur gears in mesh, square threads, and helical springs** **1.1** Draw according to first or third angle orthographic projection, the conventional representation of the primary views of a single spur gear as well as spur gears in mesh bearing the following in mind:	

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Previous curriculum (1993)	New curriculum (2024)
• Outside views as well as sectional views • The dedendum circle must be drawn. • Assume that the gears are based on the new metric standards, where clearance = 0,25 × module (not the obsolete standard of 0,157 × module), dedendum = 1,25 × module.	
1.2 Draw, according to first or third angle orthographic projection, the conventional representation of the primary views of internal and external left-hand and right-hand square threads and helical springs bearing the following in mind: • Outside views as well as sectional views • Helical springs made from square or round material.	

Features and benefits of *TVET First Mechanical Draughting N4*

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TVET First authors

M Smit & L Maraschin

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